SEQUENCE LISTING

<110> PRESIDENT AND FELLOWS OF HARVARD COLLEGE

<120> ADENOSINE NUCLEOBASE EDITORS AND USES THEREOF

<130> H0824.70244WO00

<140> Not Yet Assigned
<141> 2017-08-03

<150> US 62/370,684
<151> 2016-08-03

<150> US 62/454,035
<151> 2017-02-02

<150> US 62/473,714
<151> 2017-03-20

<160> 5526

<170> PatentIn version 3.5

<210> 1
<211> 167
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 1

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                  10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80
```

```
Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp
                165
```

<210> 2
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 2

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Ser Gly Gly Ser Ser Gly Gly Ser
1               5
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<210> 3
<211> 84
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 3

```
Met Thr Asn Leu Ser Asp Ile Ile Glu Lys Glu Thr Gly Lys Gln Leu
1               5                   10                  15
```

```
Val Ile Gln Glu Ser Ile Leu Met Leu Pro Glu Glu Val Glu Glu Val
            20                  25                  30


Ile Gly Asn Lys Pro Glu Ser Asp Ile Leu Val His Thr Ala Tyr Asp
        35                  40                  45


Glu Ser Thr Asp Glu Asn Val Met Leu Leu Thr Ser Asp Ala Pro Glu
    50                  55                  60


Tyr Lys Pro Trp Ala Leu Val Ile Gln Asp Ser Asn Gly Glu Asn Lys
65                  70                  75                  80


Ile Lys Met Leu
```

<210> 4
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 4

```
Pro Lys Lys Lys Arg Lys Val
1               5
```

<210> 5
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 5

```
Met Asp Ser Leu Leu Met Asn Arg Arg Lys Phe Leu Tyr Gln Phe Lys
1               5                   10                  15


Asn Val Arg Trp Ala Lys Gly Arg Arg Glu Thr Tyr Leu Cys
            20                  25                  30
```

<210> 6
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 6
gaacacaaag catagactgc ggg 23

<210> 7
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 7
gaacacaaag catagactgc tgg 23

<210> 8
<211> 160
<212> PRT
<213> Staphylococcus aureus

<400> 8

Met Gly Ser His Met Thr Asn Asp Ile Tyr Phe Met Thr Leu Ala Ile
1 5 10 15

Glu Glu Ala Lys Lys Ala Ala Gln Leu Gly Glu Val Pro Ile Gly Ala
20 25 30

Ile Ile Thr Lys Asp Asp Glu Val Ile Ala Arg Ala His Asn Leu Arg
35 40 45

Glu Thr Leu Gln Gln Pro Thr Ala His Ala Glu His Ile Ala Ile Glu
50 55 60

Arg Ala Ala Lys Val Leu Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu
65 70 75 80

```
Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Thr Ile Val Met
                85                  90                  95


Ser Arg Ile Pro Arg Val Val Tyr Gly Ala Asp Asp Pro Lys Gly Gly
            100                 105                 110


Cys Ser Gly Ser Leu Met Asn Leu Leu Gln Gln Ser Asn Phe Asn His
        115                 120                 125


Arg Ala Ile Val Asp Lys Gly Val Leu Lys Glu Ala Cys Ser Thr Leu
    130                 135                 140


Leu Thr Thr Phe Phe Lys Asn Leu Arg Ala Asn Lys Lys Ser Thr Asn
145                 150                 155                 160


<210>  9
<211>  161
<212>  PRT
<213>  Bacillus subtilis

<400>  9

Met Thr Gln Asp Glu Leu Tyr Met Lys Glu Ala Ile Lys Glu Ala Lys
1               5                   10                  15


Lys Ala Glu Glu Lys Gly Glu Val Pro Ile Gly Ala Val Leu Val Ile
            20                  25                  30


Asn Gly Glu Ile Ile Ala Arg Ala His Asn Leu Arg Glu Thr Glu Gln
        35                  40                  45


Arg Ser Ile Ala His Ala Glu Met Leu Val Ile Asp Glu Ala Cys Lys
    50                  55                  60


Ala Leu Gly Thr Trp Arg Leu Glu Gly Ala Thr Leu Tyr Val Thr Leu
65                  70                  75                  80


Glu Pro Cys Pro Met Cys Ala Gly Ala Val Val Leu Ser Arg Val Glu
                85                  90                  95
```

Lys Val Val Phe Gly Ala Phe Asp Pro Lys Gly Gly Cys Ser Gly Thr
100 105 110

Leu Met Asn Leu Leu Gln Glu Glu Arg Phe Asn His Gln Ala Glu Val
115 120 125

Val Ser Gly Val Leu Glu Glu Glu Cys Gly Gly Met Leu Ser Ala Phe
130 135 140

Phe Arg Glu Leu Arg Lys Lys Lys Lys Ala Ala Arg Lys Asn Leu Ser
145 150 155 160

Glu

<210> 10
<211> 16
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 10

Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser
1 5 10 15

<210> 11
<211> 1561
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 11

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

```
Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240
```

```
Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445
```

```
Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655
```

```
Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860
```

```
Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880


Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895


Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910


Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925


Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940


Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960


Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975


Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990


Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005


Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020


Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035


Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050


Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065
```

```
Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                 1075                 1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                 1090                 1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                 1105                 1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                 1120                 1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                 1135                 1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                 1150                 1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                 1165                 1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                 1180                 1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                 1195                 1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                 1210                 1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                 1225                 1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                 1240                 1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                 1255                 1260
```

```
Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455
```

Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu Asp Lys Val Leu
1460 1465 1470

Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala
1475 1480 1485

Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro
1490 1495 1500

Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg Tyr
1505 1510 1515

Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser
1520 1525 1530

Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly
1535 1540 1545

Gly Asp Ser Gly Gly Ser Pro Lys Lys Lys Arg Lys Val
1550 1555 1560

<210> 12
<211> 1561
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 12

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

```
Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270
```

```
Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480
```

```
Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685
```

```
Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895
```

```
Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095
```

```
Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290
```

```
Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                 1300                 1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                 1315                 1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                 1330                 1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                 1345                 1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                 1360                 1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                 1375                 1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                 1390                 1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                 1405                 1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                 1420                 1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                 1435                 1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                 1450                 1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                 1465                 1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                 1480                 1485
```

```
Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500


Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515


Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530


Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545


Gly Asp  Ser Gly Gly Ser Pro  Lys Lys Lys Arg Lys  Val
    1550                1555                1560
```

<210> 13
<211> 1561
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 13

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80
```

```
Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Gly Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285
```

```
Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495
```

```
Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700
```

```
Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720


Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735


Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750


Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765


Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780


Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800


Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815


Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830


Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845


Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860


Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880


Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895


Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910
```

```
Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110
```

```
Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                 1120                 1125


Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                 1135                 1140


Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                 1150                 1155


Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                 1165                 1170


Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                 1180                 1185


Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                 1195                 1200


Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                 1210                 1215


Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                 1225                 1230


Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                 1240                 1245


Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                 1255                 1260


Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                 1270                 1275


Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                 1285                 1290


Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                 1300                 1305
```

```
Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500
```

Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg Tyr
1505 1510 1515

Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser
1520 1525 1530

Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly
1535 1540 1545

Gly Asp Ser Gly Gly Ser Pro Lys Lys Lys Arg Lys Val
1550 1555 1560

<210> 14
<211> 1561
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 14

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
85 90 95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Val Ala Lys Thr Gly
100 105 110

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320
```

```
Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525
```

```
Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735
```

```
Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940
```

```
Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140
```

```
Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335
```

```
Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530
```

```
Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545


Gly Asp  Ser Gly Gly Ser Pro  Lys Lys Lys Arg Lys  Val
    1550                1555                1560


<210>  15
<211>  1648
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  15

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95


Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
            100                 105                 110


Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125
```

```
Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335
```

```
Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540
```

```
Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560


Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575


Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590


Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605


Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620


Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640


Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655


Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670


Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685


Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700


Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720


Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735


Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750
```

```
Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960
```

```
Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
               965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155
```

```
Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350
```

```
Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545
```

```
Gly Asp  Ser Gly Gly Ser Thr  Asn Leu Ser Asp Ile  Ile Glu Lys
    1550                 1555                 1560


Glu Thr  Gly Lys Gln Leu Val  Ile Gln Glu Ser Ile  Leu Met Leu
    1565                 1570                 1575


Pro Glu  Glu Val Glu Glu Val  Ile Gly Asn Lys Pro  Glu Ser Asp
    1580                 1585                 1590


Ile Leu  Val His Thr Ala Tyr  Asp Glu Ser Thr Asp  Glu Asn Val
    1595                 1600                 1605


Met Leu  Leu Thr Ser Asp Ala  Pro Glu Tyr Lys Pro  Trp Ala Leu
    1610                 1615                 1620


Val Ile  Gln Asp Ser Asn Gly  Glu Asn Lys Ile Lys  Met Leu Ser
    1625                 1630                 1635


Gly Gly  Ser Pro Lys Lys Lys  Arg Lys Val
    1640                 1645
```

<210> 16
<211> 1648
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 16

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60
```

```
Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Gly Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270
```

```
Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480
```

```
Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685
```

```
Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895
```

```
Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095
```

```
Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290
```

```
Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                 1300                 1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                 1315                 1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                 1330                 1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                 1345                 1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                 1360                 1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                 1375                 1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                 1390                 1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                 1405                 1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                 1420                 1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                 1435                 1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                 1450                 1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                 1465                 1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                 1480                 1485
```

```
Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Thr  Asn Leu Ser Asp Ile  Ile Glu Lys
    1550                1555                1560

Glu Thr  Gly Lys Gln Leu Val  Ile Gln Glu Ser Ile  Leu Met Leu
    1565                1570                1575

Pro Glu  Glu Val Glu Glu Val  Ile Gly Asn Lys Pro  Glu Ser Asp
    1580                1585                1590

Ile Leu  Val His Thr Ala Tyr  Asp Glu Ser Thr Asp  Glu Asn Val
    1595                1600                1605

Met Leu  Leu Thr Ser Asp Ala  Pro Glu Tyr Lys Pro  Trp Ala Leu
    1610                1615                1620

Val Ile  Gln Asp Ser Asn Gly  Glu Asn Lys Ile Lys  Met Leu Ser
    1625                1630                1635

Gly Gly  Ser Pro Lys Lys Lys  Arg Lys Val
    1640                1645
```

<210> 17
<211> 1648
<212> PRT
<213> Artificial Sequence

<220>

<223> Synthetic Polypeptide

<400> 17

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                  10                  15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Val Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190
```

```
Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400
```

```
Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605
```

```
Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815
```

```
Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020
```

```
Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215
```

```
Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410
```

```
Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Thr  Asn Leu Ser Asp Ile  Ile Glu Lys
    1550                1555                1560

Glu Thr  Gly Lys Gln Leu Val  Ile Gln Glu Ser Ile  Leu Met Leu
    1565                1570                1575

Pro Glu  Glu Val Glu Glu Val  Ile Gly Asn Lys Pro  Glu Ser Asp
    1580                1585                1590

Ile Leu  Val His Thr Ala Tyr  Asp Glu Ser Thr Asp  Glu Asn Val
    1595                1600                1605
```

Met Leu Leu Thr Ser Asp Ala Pro Glu Tyr Lys Pro Trp Ala Leu
1610 1615 1620

Val Ile Gln Asp Ser Asn Gly Glu Asn Lys Ile Lys Met Leu Ser
1625 1630 1635

Gly Gly Ser Pro Lys Lys Lys Arg Lys Val
1640 1645

<210> 18
<211> 1648
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 18

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
85 90 95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
100 105 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
115 120 125

```
Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335
```

```
Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540
```

```
Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750
```

```
Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960
```

```
Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
               965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
           980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp Ala Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155
```

```
Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350
```

```
Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545
```

```
Gly Asp  Ser Gly Gly Ser Thr  Asn Leu Ser Asp Ile  Ile Glu Lys
    1550                 1555                 1560


Glu Thr  Gly Lys Gln Leu Val  Ile Gln Glu Ser Ile  Leu Met Leu
    1565                 1570                 1575


Pro Glu  Glu Val Glu Glu Val  Ile Gly Asn Lys Pro  Glu Ser Asp
    1580                 1585                 1590


Ile Leu  Val His Thr Ala Tyr  Asp Glu Ser Thr Asp  Glu Asn Val
    1595                 1600                 1605


Met Leu  Leu Thr Ser Asp Ala  Pro Glu Tyr Lys Pro  Trp Ala Leu
    1610                 1615                 1620


Val Ile  Gln Asp Ser Asn Gly  Glu Asn Lys Ile Lys  Met Leu Ser
    1625                 1630                 1635


Gly Gly  Ser Pro Lys Lys Lys  Arg Lys Val
    1640                 1645
```

<210> 19
<211> 1648
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 19

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45
```

```
Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Gly Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255
```

```
Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460
```

```
Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480


Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495


Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510


Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525


Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540


Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560


Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575


Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590


Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605


Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620


Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640


Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655


Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670
```

```
Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880
```

```
Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
               885                 890                 895


Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910


Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925


Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940


Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960


Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
               965                 970                 975


Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990


Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005


Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp Ala Ile
    1010                1015                1020


Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035


Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050


Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065


Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080
```

```
Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275
```

```
Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470
```

```
Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Thr  Asn Leu Ser Asp Ile  Ile Glu Lys
    1550                1555                1560

Glu Thr  Gly Lys Gln Leu Val  Ile Gln Glu Ser Ile  Leu Met Leu
    1565                1570                1575

Pro Glu  Glu Val Glu Glu Val  Ile Gly Asn Lys Pro  Glu Ser Asp
    1580                1585                1590

Ile Leu  Val His Thr Ala Tyr  Asp Glu Ser Thr Asp  Glu Asn Val
    1595                1600                1605

Met Leu  Leu Thr Ser Asp Ala  Pro Glu Tyr Lys Pro  Trp Ala Leu
    1610                1615                1620

Val Ile  Gln Asp Ser Asn Gly  Glu Asn Lys Ile Lys  Met Leu Ser
    1625                1630                1635

Gly Gly  Ser Pro Lys Lys Lys  Arg Lys Val
    1640                1645
```

<210> 20
<211> 1648
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 20

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                  10                  15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Val Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190
```

```
Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400
```

```
Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605
```

```
Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815
```

```
Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp Ala Ile
    1010                1015                1020
```

```
Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215
```

```
Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410
```

```
Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Thr  Asn Leu Ser Asp Ile  Ile Glu Lys
    1550                1555                1560

Glu Thr  Gly Lys Gln Leu Val  Ile Gln Glu Ser Ile  Leu Met Leu
    1565                1570                1575

Pro Glu  Glu Val Glu Glu Val  Ile Gly Asn Lys Pro  Glu Ser Asp
    1580                1585                1590

Ile Leu  Val His Thr Ala Tyr  Asp Glu Ser Thr Asp  Glu Asn Val
    1595                1600                1605
```

```
Met Leu  Leu Thr Ser Asp Ala  Pro Glu Tyr Lys Pro  Trp Ala Leu
    1610                1615                1620


Val Ile  Gln Asp Ser Asn Gly  Glu Asn Lys Ile Lys  Met Leu Ser
    1625                1630                1635


Gly Gly  Ser Pro Lys Lys Lys  Arg Lys Val
    1640                1645


<210>  21
<211>  1784
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  21

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95


Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
            100                 105                 110
```

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320
```

```
Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525
```

```
Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735
```

```
Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940
```

```
Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960


Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975


Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990


Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005


Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020


Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035


Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050


Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065


Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080


Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095


Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110


Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125


Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140
```

```
Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335
```

```
Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530
```

```
Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Lys  Gly His Leu Thr Arg  Leu Gly Leu
    1550                1555                1560

Glu Phe  Phe Asp Gln Pro Ala  Val Pro Leu Ala Arg  Ala Phe Leu
    1565                1570                1575

Gly Gln  Val Leu Val Arg Arg  Leu Pro Asn Gly Thr  Glu Leu Arg
    1580                1585                1590

Gly Arg  Ile Val Glu Thr Gln  Ala Tyr Leu Gly Pro  Glu Asp Glu
    1595                1600                1605

Ala Ala  His Ser Arg Gly Gly  Arg Gln Thr Pro Arg  Asn Arg Gly
    1610                1615                1620

Met Phe  Met Lys Pro Gly Thr  Leu Tyr Val Tyr Ile  Ile Tyr Gly
    1625                1630                1635

Met Tyr  Phe Cys Met Asn Ile  Ser Ser Gln Gly Asp  Gly Ala Cys
    1640                1645                1650

Val Leu  Leu Arg Ala Leu Glu  Pro Leu Glu Gly Leu  Glu Thr Met
    1655                1660                1665

Arg Gln  Leu Arg Ser Thr Leu  Arg Lys Gly Thr Ala  Ser Arg Val
    1670                1675                1680

Leu Lys  Asp Arg Glu Leu Cys  Ser Gly Pro Ser Lys  Leu Cys Gln
    1685                1690                1695

Ala Leu  Ala Ile Asn Lys Ser  Phe Asp Gln Arg Asp  Leu Ala Gln
    1700                1705                1710

Asp Glu  Ala Val Trp Leu Glu  Arg Gly Pro Leu Glu  Pro Ser Glu
    1715                1720                1725
```

Pro Ala Val Val Ala Ala Ala Arg Val Gly Val Gly His Ala Gly
1730 1735 1740

Glu Trp Ala Arg Lys Pro Leu Arg Phe Tyr Val Arg Gly Ser Pro
1745 1750 1755

Trp Val Ser Val Val Asp Arg Val Ala Glu Gln Asp Thr Gln Ala
1760 1765 1770

Ser Gly Gly Ser Pro Lys Lys Lys Arg Lys Val
1775 1780

<210> 22
<211> 1784
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 22

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
85 90 95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Gly Ala Lys Thr Gly
100 105 110

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320
```

```
Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525
```

```
Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735
```

```
Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940
```

```
Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140
```

```
Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335
```

```
Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530
```

```
Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Lys  Gly His Leu Thr Arg  Leu Gly Leu
    1550                1555                1560

Glu Phe  Phe Asp Gln Pro Ala  Val Pro Leu Ala Arg  Ala Phe Leu
    1565                1570                1575

Gly Gln  Val Leu Val Arg Arg  Leu Pro Asn Gly Thr  Glu Leu Arg
    1580                1585                1590

Gly Arg  Ile Val Glu Thr Gln  Ala Tyr Leu Gly Pro  Glu Asp Glu
    1595                1600                1605

Ala Ala  His Ser Arg Gly Gly  Arg Gln Thr Pro Arg  Asn Arg Gly
    1610                1615                1620

Met Phe  Met Lys Pro Gly Thr  Leu Tyr Val Tyr Ile  Ile Tyr Gly
    1625                1630                1635

Met Tyr  Phe Cys Met Asn Ile  Ser Ser Gln Gly Asp  Gly Ala Cys
    1640                1645                1650

Val Leu  Leu Arg Ala Leu Glu  Pro Leu Glu Gly Leu  Glu Thr Met
    1655                1660                1665

Arg Gln  Leu Arg Ser Thr Leu  Arg Lys Gly Thr Ala  Ser Arg Val
    1670                1675                1680

Leu Lys  Asp Arg Glu Leu Cys  Ser Gly Pro Ser Lys  Leu Cys Gln
    1685                1690                1695

Ala Leu  Ala Ile Asn Lys Ser  Phe Asp Gln Arg Asp  Leu Ala Gln
    1700                1705                1710

Asp Glu  Ala Val Trp Leu Glu  Arg Gly Pro Leu Glu  Pro Ser Glu
    1715                1720                1725
```

```
Pro Ala  Val Val Ala Ala Ala  Arg Val Gly Val Gly  His Ala Gly
    1730                1735                1740


Glu Trp  Ala Arg Lys Pro Leu  Arg Phe Tyr Val Arg  Gly Ser Pro
    1745                1750                1755


Trp Val  Ser Val Val Asp Arg  Val Ala Glu Gln Asp  Thr Gln Ala
    1760                1765                1770


Ser Gly  Gly Ser Pro Lys Lys  Lys Arg Lys Val
    1775                1780
```

<210> 23
<211> 1784
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 23

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95
```

```
Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Val Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300
```

```
Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510
```

```
Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720
```

```
Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925
```

```
Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125
```

```
Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320
```

```
Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515
```

```
Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Lys  Gly His Leu Thr Arg  Leu Gly Leu
    1550                1555                1560

Glu Phe  Phe Asp Gln Pro Ala  Val Pro Leu Ala Arg  Ala Phe Leu
    1565                1570                1575

Gly Gln  Val Leu Val Arg Arg  Leu Pro Asn Gly Thr  Glu Leu Arg
    1580                1585                1590

Gly Arg  Ile Val Glu Thr Gln  Ala Tyr Leu Gly Pro  Glu Asp Glu
    1595                1600                1605

Ala Ala  His Ser Arg Gly Gly  Arg Gln Thr Pro Arg  Asn Arg Gly
    1610                1615                1620

Met Phe  Met Lys Pro Gly Thr  Leu Tyr Val Tyr Ile  Ile Tyr Gly
    1625                1630                1635

Met Tyr  Phe Cys Met Asn Ile  Ser Ser Gln Gly Asp  Gly Ala Cys
    1640                1645                1650

Val Leu  Leu Arg Ala Leu Glu  Pro Leu Glu Gly Leu  Glu Thr Met
    1655                1660                1665

Arg Gln  Leu Arg Ser Thr Leu  Arg Lys Gly Thr Ala  Ser Arg Val
    1670                1675                1680

Leu Lys  Asp Arg Glu Leu Cys  Ser Gly Pro Ser Lys  Leu Cys Gln
    1685                1690                1695

Ala Leu  Ala Ile Asn Lys Ser  Phe Asp Gln Arg Asp  Leu Ala Gln
    1700                1705                1710
```

```
Asp Glu  Ala Val Trp Leu Glu  Arg Gly Pro Leu Glu  Pro Ser Glu
    1715                1720                1725


Pro Ala  Val Val Ala Ala Ala  Arg Val Gly Val Gly  His Ala Gly
    1730                1735                1740


Glu Trp  Ala Arg Lys Pro Leu  Arg Phe Tyr Val Arg  Gly Ser Pro
    1745                1750                1755


Trp Val  Ser Val Val Asp Arg  Val Ala Glu Gln Asp  Thr Gln Ala
    1760                1765                1770


Ser Gly  Gly Ser Pro Lys Lys  Lys Arg Lys Val
    1775                1780
```

<210> 24
<211> 1787
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 24

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95
```

```
Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300
```

```
Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510
```

```
Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720
```

```
Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925
```

```
Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125
```

```
Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320
```

```
Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515
```

```
Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Asp  Leu Ala Ser Leu Arg  Ala Gln Gln
    1550                1555                1560

Ile Glu  Leu Ala Ser Ser Val  Ile Arg Glu Asp Arg  Leu Asp Lys
    1565                1570                1575

Asp Pro  Pro Asp Leu Ile Ala  Gly Ala Ala Val Gly  Phe Glu Gln
    1580                1585                1590

Gly Gly  Glu Val Thr Arg Ala  Ala Met Val Leu Leu  Lys Tyr Pro
    1595                1600                1605

Ser Leu  Glu Leu Val Glu Tyr  Lys Val Ala Arg Ile  Ala Thr Thr
    1610                1615                1620

Met Pro  Tyr Ile Pro Gly Phe  Leu Ser Phe Arg Glu  Tyr Pro Ala
    1625                1630                1635

Leu Leu  Ala Ala Trp Glu Met  Leu Ser Gln Lys Pro  Asp Leu Val
    1640                1645                1650

Phe Val  Asp Gly His Gly Ile  Ser His Pro Arg Arg  Leu Gly Val
    1655                1660                1665

Ala Ser  His Phe Gly Leu Leu  Val Asp Val Pro Thr  Ile Gly Val
    1670                1675                1680

Ala Lys  Lys Arg Leu Cys Gly  Lys Phe Glu Pro Leu  Ser Ser Glu
    1685                1690                1695

Pro Gly  Ala Leu Ala Pro Leu  Met Asp Lys Gly Glu  Gln Leu Ala
    1700                1705                1710
```

```
Trp Val  Trp Arg Ser Lys Ala  Arg Cys Asn Pro Leu  Phe Ile Ala
    1715                1720                1725


Thr Gly  His Arg Val Ser Val  Asp Ser Ala Leu Ala  Trp Val Gln
    1730                1735                1740


Arg Cys  Met Lys Gly Tyr Arg  Leu Pro Glu Pro Thr  Arg Trp Ala
    1745                1750                1755


Asp Ala  Val Ala Ser Glu Arg  Pro Ala Phe Val Arg  Tyr Thr Ala
    1760                1765                1770


Asn Gln  Pro Ser Gly Gly Ser  Pro Lys Lys Lys Arg  Lys Val
    1775                1780                1785


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<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  25

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80
```

```
Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Gly Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285
```

```
Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495
```

```
Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700
```

```
Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720


Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735


Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750


Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765


Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780


Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800


Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815


Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830


Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845


Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860


Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880


Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895


Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910
```

```
Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110
```

```
Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                 1120                 1125


Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                 1135                 1140


Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                 1150                 1155


Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                 1165                 1170


Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                 1180                 1185


Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                 1195                 1200


Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                 1210                 1215


Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                 1225                 1230


Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                 1240                 1245


Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                 1255                 1260


Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                 1270                 1275


Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                 1285                 1290


Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                 1300                 1305
```

```
Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500
```

```
Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Asp  Leu Ala Ser Leu Arg  Ala Gln Gln
    1550                1555                1560

Ile Glu  Leu Ala Ser Ser Val  Ile Arg Glu Asp Arg  Leu Asp Lys
    1565                1570                1575

Asp Pro  Pro Asp Leu Ile Ala  Gly Ala Ala Val Gly  Phe Glu Gln
    1580                1585                1590

Gly Gly  Glu Val Thr Arg Ala  Ala Met Val Leu Leu  Lys Tyr Pro
    1595                1600                1605

Ser Leu  Glu Leu Val Glu Tyr  Lys Val Ala Arg Ile  Ala Thr Thr
    1610                1615                1620

Met Pro  Tyr Ile Pro Gly Phe  Leu Ser Phe Arg Glu  Tyr Pro Ala
    1625                1630                1635

Leu Leu  Ala Ala Trp Glu Met  Leu Ser Gln Lys Pro  Asp Leu Val
    1640                1645                1650

Phe Val  Asp Gly His Gly Ile  Ser His Pro Arg Arg  Leu Gly Val
    1655                1660                1665

Ala Ser  His Phe Gly Leu Leu  Val Asp Val Pro Thr  Ile Gly Val
    1670                1675                1680

Ala Lys  Lys Arg Leu Cys Gly  Lys Phe Glu Pro Leu  Ser Ser Glu
    1685                1690                1695
```

Pro Gly Ala Leu Ala Pro Leu Met Asp Lys Gly Glu Gln Leu Ala
1700 1705 1710

Trp Val Trp Arg Ser Lys Ala Arg Cys Asn Pro Leu Phe Ile Ala
1715 1720 1725

Thr Gly His Arg Val Ser Val Asp Ser Ala Leu Ala Trp Val Gln
1730 1735 1740

Arg Cys Met Lys Gly Tyr Arg Leu Pro Glu Pro Thr Arg Trp Ala
1745 1750 1755

Asp Ala Val Ala Ser Glu Arg Pro Ala Phe Val Arg Tyr Thr Ala
1760 1765 1770

Asn Gln Pro Ser Gly Gly Ser Pro Lys Lys Lys Arg Lys Val
1775 1780 1785

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<212> PRT
<213> Artificial Sequence

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

```
Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Val Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285
```

```
Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495
```

```
Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700
```

```
Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910
```

```
Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110
```

```
Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                 1120                 1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                 1135                 1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                 1150                 1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                 1165                 1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                 1180                 1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                 1195                 1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                 1210                 1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                 1225                 1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                 1240                 1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                 1255                 1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                 1270                 1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                 1285                 1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                 1300                 1305
```

```
Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500
```

```
Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Ser Gly Gly Ser Asp  Leu Ala Ser Leu Arg  Ala Gln Gln
    1550                1555                1560

Ile Glu  Leu Ala Ser Ser Val  Ile Arg Glu Asp Arg  Leu Asp Lys
    1565                1570                1575

Asp Pro  Pro Asp Leu Ile Ala  Gly Ala Ala Val Gly  Phe Glu Gln
    1580                1585                1590

Gly Gly  Glu Val Thr Arg Ala  Ala Met Val Leu Leu  Lys Tyr Pro
    1595                1600                1605

Ser Leu  Glu Leu Val Glu Tyr  Lys Val Ala Arg Ile  Ala Thr Thr
    1610                1615                1620

Met Pro  Tyr Ile Pro Gly Phe  Leu Ser Phe Arg Glu  Tyr Pro Ala
    1625                1630                1635

Leu Leu  Ala Ala Trp Glu Met  Leu Ser Gln Lys Pro  Asp Leu Val
    1640                1645                1650

Phe Val  Asp Gly His Gly Ile  Ser His Pro Arg Arg  Leu Gly Val
    1655                1660                1665

Ala Ser  His Phe Gly Leu Leu  Val Asp Val Pro Thr  Ile Gly Val
    1670                1675                1680

Ala Lys  Lys Arg Leu Cys Gly  Lys Phe Glu Pro Leu  Ser Ser Glu
    1685                1690                1695
```

```
Pro Gly  Ala Leu Ala Pro Leu  Met Asp Lys Gly Glu  Gln Leu Ala
    1700                1705                1710


Trp Val  Trp Arg Ser Lys Ala  Arg Cys Asn Pro Leu  Phe Ile Ala
    1715                1720                1725


Thr Gly  His Arg Val Ser Val  Asp Ser Ala Leu Ala  Trp Val Gln
    1730                1735                1740


Arg Cys  Met Lys Gly Tyr Arg  Leu Pro Glu Pro Thr  Arg Trp Ala
    1745                1750                1755


Asp Ala  Val Ala Ser Glu Arg  Pro Ala Phe Val Arg  Tyr Thr Ala
    1760                1765                1770


Asn Gln  Pro Ser Gly Gly Ser  Pro Lys Lys Lys Arg  Lys Val
    1775                1780                1785


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<211>  1550
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  27

Met Ser Glu Val Glu Phe Ser Tyr Glu Tyr Trp Met Arg His Ala Leu
1               5                  10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60
```

```
Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Ser His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270
```

```
Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480
```

```
Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685
```

```
Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895
```

```
Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp Ala Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095
```

```
Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290
```

```
Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485
```

```
Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500


Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515


Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530


Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545


Gly Asp
    1550
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<211> 1550
<212> PRT
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<222> (155)..(155)
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<400> 28

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Met Ser Glu Val Glu Phe Ser Tyr Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60
```

```
Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Ser His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Xaa Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270
```

```
Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480
```

```
Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685
```

```
Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895
```

```
Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp Ala Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095
```

```
Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290
```

```
Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365

Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485
```

```
Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500


Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515


Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530


Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545


Gly Asp
    1550
```

<210> 29
<211> 181
<212> PRT
<213> Erwinia tasmaniensis

<400> 29

```
Met Ala Ser Arg Gly Val Asn Lys Val Ile Leu Val Gly Asn Leu Gly
1               5                   10                  15


Gln Asp Pro Glu Val Arg Tyr Met Pro Asn Gly Gly Ala Val Ala Asn
            20                  25                  30


Ile Thr Leu Ala Thr Ser Glu Ser Trp Arg Asp Lys Gln Thr Gly Glu
        35                  40                  45


Thr Lys Glu Lys Thr Glu Trp His Arg Val Val Leu Phe Gly Lys Leu
    50                  55                  60


Ala Glu Val Ala Gly Glu Tyr Leu Arg Lys Gly Ser Gln Val Tyr Ile
65                  70                  75                  80


Glu Gly Ala Leu Gln Thr Arg Lys Trp Thr Asp Gln Ala Gly Val Glu
                85                  90                  95


Lys Tyr Thr Thr Glu Val Val Val Asn Val Gly Gly Thr Met Gln Met
```

100 105 110

Leu Gly Gly Arg Ser Gln Gly Gly Gly Ala Ser Ala Gly Gly Gln Asn
115 120 125

Gly Gly Ser Asn Asn Gly Trp Gly Gln Pro Gln Gln Pro Gln Gly Gly
130 135 140

Asn Gln Phe Ser Gly Gly Ala Gln Gln Gln Ala Arg Pro Gln Gln Gln
145 150 155 160

Pro Gln Gln Asn Asn Ala Pro Ala Asn Asn Glu Pro Pro Ile Asp Phe
165 170 175

Asp Asp Asp Ile Pro
180

<210> 30
<211> 209
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 30

Met Ala Gly Ala Gln Asp Phe Val Pro His Thr Ala Asp Leu Ala Glu
1 5 10 15

Leu Ala Ala Ala Ala Gly Glu Cys Arg Gly Cys Gly Leu Tyr Arg Asp
20 25 30

Ala Thr Gln Ala Val Phe Gly Ala Gly Gly Arg Ser Ala Arg Ile Met
35 40 45

Met Ile Gly Glu Gln Pro Gly Asp Lys Glu Asp Leu Ala Gly Leu Pro
50 55 60

Phe Val Gly Pro Ala Gly Arg Leu Leu Asp Arg Ala Leu Glu Ala Ala
65 70 75 80

```
Asp Ile Asp Arg Asp Ala Leu Tyr Val Thr Asn Ala Val Lys His Phe
                85                  90                  95

Lys Phe Thr Arg Ala Ala Gly Gly Lys Arg Arg Ile His Lys Thr Pro
            100                 105                 110

Ser Arg Thr Glu Val Val Ala Cys Arg Pro Trp Leu Ile Ala Glu Met
        115                 120                 125

Thr Ser Val Glu Pro Asp Val Val Val Leu Leu Gly Ala Thr Ala Ala
    130                 135                 140

Lys Ala Leu Leu Gly Asn Asp Phe Arg Val Thr Gln His Arg Gly Glu
145                 150                 155                 160

Val Leu His Val Asp Asp Val Pro Gly Asp Pro Ala Leu Val Ala Thr
                165                 170                 175

Val His Pro Ser Ser Leu Leu Arg Gly Pro Lys Glu Glu Arg Glu Ser
            180                 185                 190

Ala Phe Ala Gly Leu Val Asp Asp Leu Arg Val Ala Ala Asp Val Arg
        195                 200                 205

Pro
```

<210> 31
<211> 313
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 31

```
Met Ile Gly Gln Lys Thr Leu Tyr Ser Phe Phe Ser Pro Ser Pro Ala
1               5                   10                  15

Arg Lys Arg His Ala Pro Ser Pro Glu Pro Ala Val Gln Gly Thr Gly
```

```
            20                  25                  30

Val Ala Gly Val Pro Glu Glu Ser Gly Asp Ala Ala Ala Ile Pro Ala
        35                  40                  45

Lys Lys Ala Pro Ala Gly Gln Glu Glu Pro Gly Thr Pro Pro Ser Ser
    50                  55                  60

Pro Leu Ser Ala Glu Gln Leu Asp Arg Ile Gln Arg Asn Lys Ala Ala
65                  70                  75                  80

Ala Leu Leu Arg Leu Ala Ala Arg Asn Val Pro Val Gly Phe Gly Glu
                85                  90                  95

Ser Trp Lys Lys His Leu Ser Gly Glu Phe Gly Lys Pro Tyr Phe Ile
            100                 105                 110

Lys Leu Met Gly Phe Val Ala Glu Glu Arg Lys His Tyr Thr Val Tyr
        115                 120                 125

Pro Pro Pro His Gln Val Phe Thr Trp Thr Gln Met Cys Asp Ile Lys
    130                 135                 140

Asp Val Lys Val Val Ile Leu Gly Gln Glu Pro Tyr His Gly Pro Asn
145                 150                 155                 160

Gln Ala His Gly Leu Cys Phe Ser Val Gln Arg Pro Val Pro Pro Pro
                165                 170                 175

Pro Ser Leu Glu Asn Ile Tyr Lys Glu Leu Ser Thr Asp Ile Glu Asp
            180                 185                 190

Phe Val His Pro Gly His Gly Asp Leu Ser Gly Trp Ala Lys Gln Gly
        195                 200                 205

Val Leu Leu Leu Asn Ala Val Leu Thr Val Arg Ala His Gln Ala Asn
    210                 215                 220

Ser His Lys Glu Arg Gly Trp Glu Gln Phe Thr Asp Ala Val Val Ser
```

225 230 235 240

Trp Leu Asn Gln Asn Ser Asn Gly Leu Val Phe Leu Leu Trp Gly Ser
245 250 255

Tyr Ala Gln Lys Lys Gly Ser Ala Ile Asp Arg Lys Arg His His Val
260 265 270

Leu Gln Thr Ala His Pro Ser Pro Leu Ser Val Tyr Arg Gly Phe Phe
275 280 285

Gly Cys Arg His Phe Ser Lys Thr Asn Glu Leu Leu Gln Lys Ser Gly
290 295 300

Lys Lys Pro Ile Asp Trp Lys Glu Leu
305 310

<210> 32
<211> 219
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 32

Lys Gly His Leu Thr Arg Leu Gly Leu Glu Phe Phe Asp Gln Pro Ala
1 5 10 15

Val Pro Leu Ala Arg Ala Phe Leu Gly Gln Val Leu Val Arg Arg Leu
20 25 30

Pro Asn Gly Thr Glu Leu Arg Gly Arg Ile Val Glu Thr Gln Ala Tyr
35 40 45

Leu Gly Pro Glu Asp Glu Ala Ala His Ser Arg Gly Gly Arg Gln Thr
50 55 60

Pro Arg Asn Arg Gly Met Phe Met Lys Pro Gly Thr Leu Tyr Val Tyr
65 70 75 80

```
Ile Ile Tyr Gly Met Tyr Phe Cys Met Asn Ile Ser Ser Gln Gly Asp
                85                  90                  95

Gly Ala Cys Val Leu Leu Arg Ala Leu Glu Pro Leu Glu Gly Leu Glu
            100                 105                 110

Thr Met Arg Gln Leu Arg Ser Thr Leu Arg Lys Gly Thr Ala Ser Arg
        115                 120                 125

Val Leu Lys Asp Arg Glu Leu Cys Ser Gly Pro Ser Lys Leu Cys Gln
    130                 135                 140

Ala Leu Ala Ile Asn Lys Ser Phe Asp Gln Arg Asp Leu Ala Gln Asp
145                 150                 155                 160

Glu Ala Val Trp Leu Glu Arg Gly Pro Leu Glu Pro Ser Glu Pro Ala
                165                 170                 175

Val Val Ala Ala Ala Arg Val Gly Val Gly His Ala Gly Glu Trp Ala
            180                 185                 190

Arg Lys Pro Leu Arg Phe Tyr Val Arg Gly Ser Pro Trp Val Ser Val
        195                 200                 205

Val Asp Arg Val Ala Glu Gln Asp Thr Gln Ala
    210                 215
```

<210> 33
<211> 222
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 33

```
Asp Leu Ala Ser Leu Arg Ala Gln Gln Ile Glu Leu Ala Ser Ser Val
1               5                   10                  15

Ile Arg Glu Asp Arg Leu Asp Lys Asp Pro Pro Asp Leu Ile Ala Gly
```

20 25 30

Ala Ala Val Gly Phe Glu Gln Gly Gly Glu Val Thr Arg Ala Ala Met
35 40 45

Val Leu Leu Lys Tyr Pro Ser Leu Glu Leu Val Glu Tyr Lys Val Ala
50 55 60

Arg Ile Ala Thr Thr Met Pro Tyr Ile Pro Gly Phe Leu Ser Phe Arg
65 70 75 80

Glu Tyr Pro Ala Leu Leu Ala Ala Trp Glu Met Leu Ser Gln Lys Pro
85 90 95

Asp Leu Val Phe Val Asp Gly His Gly Ile Ser His Pro Arg Arg Leu
100 105 110

Gly Val Ala Ser His Phe Gly Leu Leu Val Asp Val Pro Thr Ile Gly
115 120 125

Val Ala Lys Lys Arg Leu Cys Gly Lys Phe Glu Pro Leu Ser Ser Glu
130 135 140

Pro Gly Ala Leu Ala Pro Leu Met Asp Lys Gly Glu Gln Leu Ala Trp
145 150 155 160

Val Trp Arg Ser Lys Ala Arg Cys Asn Pro Leu Phe Ile Ala Thr Gly
165 170 175

His Arg Val Ser Val Asp Ser Ala Leu Ala Trp Val Gln Arg Cys Met
180 185 190

Lys Gly Tyr Arg Leu Pro Glu Pro Thr Arg Trp Ala Asp Ala Val Ala
195 200 205

Ser Glu Arg Pro Ala Phe Val Arg Tyr Thr Ala Asn Gln Pro
210 215 220

<210> 34

<211> 1367
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 34

```
Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15


Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
            20                  25                  30


Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45


Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
    50                  55                  60


Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65                  70                  75                  80


Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
                85                  90                  95


Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110


Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125


Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140


Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160


Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175
```

```
Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380
```

```
Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590
```

```
Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800
```

```
Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp Ala Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005
```

```
Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035

Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050

Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
    1055                1060                1065

Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080

Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095

Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110

Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125

Lys Tyr  Gly Gly Phe Asp Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200
```

```
Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
    1205                 1210                 1215


Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                 1225                 1230


Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                 1240                 1245


Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
    1250                 1255                 1260


Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                 1270                 1275


Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                 1285                 1290


Asn Lys  His Arg Asp Lys Pro  Ile Arg Glu Gln Ala  Glu Asn Ile
    1295                 1300                 1305


Ile His  Leu Phe Thr Leu Thr  Asn Leu Gly Ala Pro  Ala Ala Phe
    1310                 1315                 1320


Lys Tyr  Phe Asp Thr Thr Ile  Asp Arg Lys Arg Tyr  Thr Ser Thr
    1325                 1330                 1335


Lys Glu  Val Leu Asp Ala Thr  Leu Ile His Gln Ser  Ile Thr Gly
    1340                 1345                 1350


Leu Tyr  Glu Thr Arg Ile Asp  Leu Ser Gln Leu Gly  Gly Asp
    1355                 1360                 1365


<210>  35
<211>  1367
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide
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<400> 35

```
Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15

Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
            20                  25                  30

Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45

Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
    50                  55                  60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65                  70                  75                  80

Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
                85                  90                  95

Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110

Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140

Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
```

195 200 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
210 215 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225 230 235 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
245 250 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
260 265 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
275 280 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
290 295 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305 310 315 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
325 330 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
340 345 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
355 360 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
370 375 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly

405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu

610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
675 680 685

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
690 695 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705 710 715 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
725 730 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
740 745 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
755 760 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
770 775 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785 790 795 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
805 810 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu

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            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
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Ser Asn Ile Met Asn Phe Phe Lys Thr Glu Ile Thr Leu Ala Asn
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Gly Glu Ile Arg Lys Arg Pro Leu Ile Glu Thr Asn Gly Glu Thr
1055 1060 1065

Gly Glu Ile Val Trp Asp Lys Gly Arg Asp Phe Ala Thr Val Arg
1070 1075 1080

Lys Val Leu Ser Met Pro Gln Val Asn Ile Val Lys Lys Thr Glu
1085 1090 1095

Val Gln Thr Gly Gly Phe Ser Lys Glu Ser Ile Leu Pro Lys Arg
1100 1105 1110

Asn Ser Asp Lys Leu Ile Ala Arg Lys Lys Asp Trp Asp Pro Lys
1115 1120 1125

Lys Tyr Gly Gly Phe Asp Ser Pro Thr Val Ala Tyr Ser Val Leu
1130 1135 1140

Val Val Ala Lys Val Glu Lys Gly Lys Ser Lys Lys Leu Lys Ser
1145 1150 1155

Val Lys Glu Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Ser Phe
1160 1165 1170

Glu Lys Asn Pro Ile Asp Phe Leu Glu Ala Lys Gly Tyr Lys Glu
1175 1180 1185

Val Lys Lys Asp Leu Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe
1190 1195 1200

Glu Leu Glu Asn Gly Arg Lys Arg Met Leu Ala Ser Ala Gly Glu
1205 1210 1215

Leu Gln Lys Gly Asn Glu Leu Ala Leu Pro Ser Lys Tyr Val Asn

1220 1225 1230

Phe Leu Tyr Leu Ala Ser His Tyr Glu Lys Leu Lys Gly Ser Pro
1235 1240 1245

Glu Asp Asn Glu Gln Lys Gln Leu Phe Val Glu Gln His Lys His
1250 1255 1260

Tyr Leu Asp Glu Ile Ile Glu Gln Ile Ser Glu Phe Ser Lys Arg
1265 1270 1275

Val Ile Leu Ala Asp Ala Asn Leu Asp Lys Val Leu Ser Ala Tyr
1280 1285 1290

Asn Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala Glu Asn Ile
1295 1300 1305

Ile His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro Ala Ala Phe
1310 1315 1320

Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg Tyr Thr Ser Thr
1325 1330 1335

Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser Ile Thr Gly
1340 1345 1350

Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly Gly Asp
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            20                  25                  30

Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45

Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
    50                  55                  60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65                  70                  75                  80

Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
                85                  90                  95

Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110

Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140

Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220
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Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430
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Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640
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Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845
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Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035

Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050
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Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
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Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080

Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095

Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110

Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125

Lys Tyr  Gly Gly Phe Asp Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                1225                1230

Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                1240                1245
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Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
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Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                1270                1275


Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                1285                1290


Asn Lys  His Arg Asp Lys Pro  Ile Arg Glu Gln Ala  Glu Asn Ile
    1295                1300                1305


Ile His  Leu Phe Thr Leu Thr  Asn Leu Gly Ala Pro  Ala Ala Phe
    1310                1315                1320


Lys Tyr  Phe Asp Thr Thr Ile  Asp Arg Lys Arg Tyr  Thr Ser Thr
    1325                1330                1335


Lys Glu  Val Leu Asp Ala Thr  Leu Ile His Gln Ser  Ile Thr Gly
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Leu Tyr  Glu Thr Arg Ile Asp  Leu Ser Gln Leu Gly  Gly Asp
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<213> Streptococcus pyogenes

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Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Gly Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Ile Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Arg Val Asp Ala
        195                 200                 205
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Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn
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Leu Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe
                245                 250                 255

Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp
        275                 280                 285

Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp
    290                 295                 300

Ile Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys
                325                 330                 335

Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe
            340                 345                 350

Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser
        355                 360                 365

Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp
    370                 375                 380

Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415
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Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe
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Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
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Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp
    450                 455                 460

Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr
                485                 490                 495

Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln
    530                 535                 540

Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr
545                 550                 555                 560

Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp
                565                 570                 575

Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly
            580                 585                 590

Ala Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp
        595                 600                 605

Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr
    610                 615                 620
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Leu Phe Glu Asp Arg Gly Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala
625                 630                 635                 640

His Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe
        675                 680                 685

Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe
    690                 695                 700

Lys Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu
705                 710                 715                 720

His Glu Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly
                725                 730                 735

Ile Leu Gln Thr Val Lys Ile Val Asp Glu Leu Val Lys Val Met Gly
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830
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Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp
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Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
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Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
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His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
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Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
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Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
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Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035
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Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
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Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
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Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
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Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
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Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
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Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
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Lys Tyr  Gly Gly Phe Asp Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
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Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
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Phe Leu Tyr Leu Ala Ser His Tyr Glu Lys Leu Lys Gly Ser Pro
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Glu Asp Asn Glu Gln Lys Gln Leu Phe Val Glu Gln His Lys His
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Tyr Leu Asp Glu Ile Ile Glu Gln Ile Ser Glu Phe Ser Lys Arg
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Val Ile Leu Ala Asp Ala Asn Leu Asp Lys Val Leu Ser Ala Tyr
1280 1285 1290

Asn Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala Glu Asn Ile
1295 1300 1305

Ile His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro Ala Ala Phe
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Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg Tyr Thr Ser Thr
1325 1330 1335

Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser Ile Thr Gly
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Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile

35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
115 120 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
130 135 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
165 170 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
180 185 190

Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala
195 200 205

Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn
210 215 220

Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn
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Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe

245 250 255

Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp
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Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp
275 280 285

Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp
290 295 300

Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys
325 330 335

Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe
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Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser
355 360 365

Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp
370 375 380

Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe
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Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
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Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp

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Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu
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Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr
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Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
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Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln
    530                 535                 540

Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr
545                 550                 555                 560

Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp
                565                 570                 575

Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly
            580                 585                 590

Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp
        595                 600                 605

Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr
    610                 615                 620

Leu Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala
625                 630                 635                 640

His Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr
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Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp
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Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe
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Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe
690 695 700

Lys Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu
705 710 715 720

His Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly
725 730 735

Ile Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly
740 745 750

Arg His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
755 760 765

Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile
770 775 780

Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro
785 790 795 800

Val Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg
820 825 830

Leu Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys
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Asp Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg
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Gly Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys

865 870 875 880

Asn Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys
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Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp
900 905 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
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Lys His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp
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Glu Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser
945 950 955 960

Lys Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg
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Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
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Val Gly Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe
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Val Tyr Gly Asp Tyr Lys Val Tyr Asp Val Arg Lys Met Ile Ala
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Lys Ser Glu Gln Glu Ile Gly Lys Ala Thr Ala Lys Tyr Phe Phe
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Tyr Ser Asn Ile Met Asn Phe Phe Lys Thr Glu Ile Thr Leu Ala
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Asn Gly Glu Ile Arg Lys Arg Pro Leu Ile Glu Thr Asn Gly Glu
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Thr Gly Glu Ile Val Trp Asp Lys Gly Arg Asp Phe Ala Thr Val

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Glu Val Gln Thr Gly Gly Phe Ser Lys Glu Ser Ile Leu Pro Lys
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Arg Asn Ser Asp Lys Leu Ile Ala Arg Lys Lys Asp Trp Asp Pro
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Lys Lys Tyr Gly Gly Phe Asp Ser Pro Thr Val Ala Tyr Ser Val
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Leu Val Val Ala Lys Val Glu Lys Gly Lys Ser Lys Lys Leu Lys
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Ser Val Lys Glu Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Ser
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Glu Val Lys Lys Asp Leu Ile Ile Lys Leu Pro Lys Tyr Ser Leu
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Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Leu Ala Ser Ala Gly
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Glu Leu Gln Lys Gly Asn Glu Leu Ala Leu Pro Ser Lys Tyr Val
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Asn Phe Leu Tyr Leu Ala Ser His Tyr Glu Lys Leu Lys Gly Ser
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Pro Glu Asp Asn Glu Gln Lys Gln Leu Phe Val Glu Gln His Lys
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His Tyr Leu Asp Glu Ile Ile Glu Gln Ile Ser Glu Phe Ser Lys

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Tyr Asn Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala Glu Asn
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Ile Ile His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro Ala Ala
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ccaatacgtg aacaagcaga aaatattatt catttattta cgttgacgaa tcttggagct 3960

cccgctgctt ttaaatattt tgatacaaca attgatcgta aacgatatac gtctacaaaa 4020

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<213> Streptococcus pyogenes

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Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
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Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr

115 120 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
130 135 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
165 170 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
180 185 190

Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala
195 200 205

Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn
210 215 220

Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn
225 230 235 240

Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe
245 250 255

Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp
260 265 270

Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp
275 280 285

Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp
290 295 300

Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys

325 330 335

Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe
340 345 350

Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser
355 360 365

Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp
370 375 380

Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe
420 425 430

Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp
450 455 460

Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu
465 470 475 480

Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr
485 490 495

Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln

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    530                 535                 540

Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr
545                 550                 555                 560

Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp
                565                 570                 575

Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly
            580                 585                 590

Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp
        595                 600                 605

Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr
    610                 615                 620

Leu Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala
625                 630                 635                 640

His Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe
        675                 680                 685

Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe
    690                 695                 700

Lys Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu
705                 710                 715                 720

His Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly
                725                 730                 735

Ile Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly
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            740                 745                 750

Arg His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile
    770                 775                 780

Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg
            820                 825                 830

Leu Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys
        835                 840                 845

Asp Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys
865                 870                 875                 880

Asn Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp
    930                 935                 940

Glu Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser
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945 950 955 960

Lys Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Val Gly Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Lys Val Tyr Asp Val Arg Lys Met Ile Ala
1010 1015 1020

Lys Ser Glu Gln Glu Ile Gly Lys Ala Thr Ala Lys Tyr Phe Phe
1025 1030 1035

Tyr Ser Asn Ile Met Asn Phe Phe Lys Thr Glu Ile Thr Leu Ala
1040 1045 1050

Asn Gly Glu Ile Arg Lys Arg Pro Leu Ile Glu Thr Asn Gly Glu
1055 1060 1065

Thr Gly Glu Ile Val Trp Asp Lys Gly Arg Asp Phe Ala Thr Val
1070 1075 1080

Arg Lys Val Leu Ser Met Pro Gln Val Asn Ile Val Lys Lys Thr
1085 1090 1095

Glu Val Gln Thr Gly Gly Phe Ser Lys Glu Ser Ile Leu Pro Lys
1100 1105 1110

Arg Asn Ser Asp Lys Leu Ile Ala Arg Lys Lys Asp Trp Asp Pro
1115 1120 1125

Lys Lys Tyr Gly Gly Phe Asp Ser Pro Thr Val Ala Tyr Ser Val
1130 1135 1140

Leu Val Val Ala Lys Val Glu Lys Gly Lys Ser Lys Lys Leu Lys

1145 1150 1155

Ser Val Lys Glu Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Ser
1160 1165 1170

Phe Glu Lys Asn Pro Ile Asp Phe Leu Glu Ala Lys Gly Tyr Lys
1175 1180 1185

Glu Val Lys Lys Asp Leu Ile Ile Lys Leu Pro Lys Tyr Ser Leu
1190 1195 1200

Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Leu Ala Ser Ala Gly
1205 1210 1215

Glu Leu Gln Lys Gly Asn Glu Leu Ala Leu Pro Ser Lys Tyr Val
1220 1225 1230

Asn Phe Leu Tyr Leu Ala Ser His Tyr Glu Lys Leu Lys Gly Ser
1235 1240 1245

Pro Glu Asp Asn Glu Gln Lys Gln Leu Phe Val Glu Gln His Lys
1250 1255 1260

His Tyr Leu Asp Glu Ile Ile Glu Gln Ile Ser Glu Phe Ser Lys
1265 1270 1275

Arg Val Ile Leu Ala Asp Ala Asn Leu Asp Lys Val Leu Ser Ala
1280 1285 1290

Tyr Asn Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala Glu Asn
1295 1300 1305

Ile Ile His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro Ala Ala
1310 1315 1320

Phe Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg Tyr Thr Ser
1325 1330 1335

Thr Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser Ile Thr

1340 1345 1350

Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly Gly Asp
1355 1360 1365

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<212> PRT
<213> Artificial Sequence

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Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
115 120 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
130 135 140

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Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala
        195                 200                 205

Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe
                245                 250                 255

Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp
        275                 280                 285

Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp
    290                 295                 300

Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys
                325                 330                 335

Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe
            340                 345                 350
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Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser
        355                 360                 365

Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp
    370                 375                 380

Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe
            420                 425                 430

Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp
    450                 455                 460

Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr
                485                 490                 495

Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln
    530                 535                 540

Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr
545                 550                 555                 560
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Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp
                565                 570                 575

Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly
            580                 585                 590

Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp
        595                 600                 605

Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr
    610                 615                 620

Leu Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala
625                 630                 635                 640

His Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe
        675                 680                 685

Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe
    690                 695                 700

Lys Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu
705                 710                 715                 720

His Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly
                725                 730                 735

Ile Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly
            740                 745                 750

Arg His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765
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Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile
    770                 775                 780

Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg
            820                 825                 830

Leu Ser Asp Tyr Asp Val Asp Ala Ile Val Pro Gln Ser Phe Leu Lys
        835                 840                 845

Asp Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys
865                 870                 875                 880

Asn Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp
    930                 935                 940

Glu Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser
945                 950                 955                 960

Lys Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg
                965                 970                 975
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Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Val Gly Thr Ala Leu Ile Lys Lys  Tyr Pro Lys Leu Glu  Ser Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Lys Val  Tyr Asp Val Arg Lys  Met Ile Ala
    1010                1015                1020

Lys Ser  Glu Gln Glu Ile Gly  Lys Ala Thr Ala Lys  Tyr Phe Phe
    1025                1030                1035

Tyr Ser  Asn Ile Met Asn Phe  Phe Lys Thr Glu Ile  Thr Leu Ala
    1040                1045                1050

Asn Gly  Glu Ile Arg Lys Arg  Pro Leu Ile Glu Thr  Asn Gly Glu
    1055                1060                1065

Thr Gly  Glu Ile Val Trp Asp  Lys Gly Arg Asp Phe  Ala Thr Val
    1070                1075                1080

Arg Lys  Val Leu Ser Met Pro  Gln Val Asn Ile Val  Lys Lys Thr
    1085                1090                1095

Glu Val  Gln Thr Gly Gly Phe  Ser Lys Glu Ser Ile  Leu Pro Lys
    1100                1105                1110

Arg Asn  Ser Asp Lys Leu Ile  Ala Arg Lys Lys Asp  Trp Asp Pro
    1115                1120                1125

Lys Lys  Tyr Gly Gly Phe Asp  Ser Pro Thr Val Ala  Tyr Ser Val
    1130                1135                1140

Leu Val  Val Ala Lys Val Glu  Lys Gly Lys Ser Lys  Lys Leu Lys
    1145                1150                1155

Ser Val  Lys Glu Leu Leu Gly  Ile Thr Ile Met Glu  Arg Ser Ser
    1160                1165                1170
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Phe Glu  Lys Asn Pro Ile Asp  Phe Leu Glu Ala Lys  Gly Tyr Lys
    1175                1180                1185

Glu Val  Lys Lys Asp Leu Ile  Ile Lys Leu Pro Lys  Tyr Ser Leu
    1190                1195                1200

Phe Glu  Leu Glu Asn Gly Arg  Lys Arg Met Leu Ala  Ser Ala Gly
    1205                1210                1215

Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu Pro Ser  Lys Tyr Val
    1220                1225                1230

Asn Phe  Leu Tyr Leu Ala Ser  His Tyr Glu Lys Leu  Lys Gly Ser
    1235                1240                1245

Pro Glu  Asp Asn Glu Gln Lys  Gln Leu Phe Val Glu  Gln His Lys
    1250                1255                1260

His Tyr  Leu Asp Glu Ile Ile  Glu Gln Ile Ser Glu  Phe Ser Lys
    1265                1270                1275

Arg Val  Ile Leu Ala Asp Ala  Asn Leu Asp Lys Val  Leu Ser Ala
    1280                1285                1290

Tyr Asn  Lys His Arg Asp Lys  Pro Ile Arg Glu Gln  Ala Glu Asn
    1295                1300                1305

Ile Ile  His Leu Phe Thr Leu  Thr Asn Leu Gly Ala  Pro Ala Ala
    1310                1315                1320

Phe Lys  Tyr Phe Asp Thr Thr  Ile Asp Arg Lys Arg  Tyr Thr Ser
    1325                1330                1335

Thr Lys  Glu Val Leu Asp Ala  Thr Leu Ile His Gln  Ser Ile Thr
    1340                1345                1350

Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser Gln Leu  Gly Gly Asp
    1355                1360                1365
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Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125


His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140


Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160
```

```
Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala
        195                 200                 205

Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe
                245                 250                 255

Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp
        275                 280                 285

Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp
    290                 295                 300

Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys
                325                 330                 335

Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe
            340                 345                 350

Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser
        355                 360                 365
```

```
Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp
    370                 375                 380

Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe
            420                 425                 430

Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp
    450                 455                 460

Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr
                485                 490                 495

Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln
    530                 535                 540

Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr
545                 550                 555                 560

Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp
                565                 570                 575
```

```
Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly
            580                 585                 590

Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp
        595                 600                 605

Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr
    610                 615                 620

Leu Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala
625                 630                 635                 640

His Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe
        675                 680                 685

Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe
    690                 695                 700

Lys Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu
705                 710                 715                 720

His Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly
                725                 730                 735

Ile Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly
            740                 745                 750

Arg His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile
    770                 775                 780
```

```
Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg
            820                 825                 830

Leu Ser Asp Tyr Asp Val Asp Ala Ile Val Pro Gln Ser Phe Leu Lys
        835                 840                 845

Asp Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys
865                 870                 875                 880

Asn Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp
    930                 935                 940

Glu Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser
945                 950                 955                 960

Lys Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990
```

```
Val Gly Thr Ala Leu Ile Lys Lys  Tyr Pro Lys Leu Glu  Ser Glu Phe
        995                 1000                1005


Val Tyr  Gly Asp Tyr Lys Val  Tyr Asp Val Arg Lys  Met Ile Ala
    1010                1015                1020


Lys Ser  Glu Gln Glu Ile Gly  Lys Ala Thr Ala Lys  Tyr Phe Phe
    1025                1030                1035


Tyr Ser  Asn Ile Met Asn Phe  Phe Lys Thr Glu Ile  Thr Leu Ala
    1040                1045                1050


Asn Gly  Glu Ile Arg Lys Arg  Pro Leu Ile Glu Thr  Asn Gly Glu
    1055                1060                1065


Thr Gly  Glu Ile Val Trp Asp  Lys Gly Arg Asp Phe  Ala Thr Val
    1070                1075                1080


Arg Lys  Val Leu Ser Met Pro  Gln Val Asn Ile Val  Lys Lys Thr
    1085                1090                1095


Glu Val  Gln Thr Gly Gly Phe  Ser Lys Glu Ser Ile  Leu Pro Lys
    1100                1105                1110


Arg Asn  Ser Asp Lys Leu Ile  Ala Arg Lys Lys Asp  Trp Asp Pro
    1115                1120                1125


Lys Lys  Tyr Gly Gly Phe Asp  Ser Pro Thr Val Ala  Tyr Ser Val
    1130                1135                1140


Leu Val  Val Ala Lys Val Glu  Lys Gly Lys Ser Lys  Lys Leu Lys
    1145                1150                1155


Ser Val  Lys Glu Leu Leu Gly  Ile Thr Ile Met Glu  Arg Ser Ser
    1160                1165                1170


Phe Glu  Lys Asn Pro Ile Asp  Phe Leu Glu Ala Lys  Gly Tyr Lys
    1175                1180                1185
```

```
Glu Val  Lys Lys Asp Leu Ile  Ile Lys Leu Pro Lys  Tyr Ser Leu
    1190                1195                1200


Phe Glu  Leu Glu Asn Gly Arg  Lys Arg Met Leu Ala  Ser Ala Gly
    1205                1210                1215


Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu Pro Ser  Lys Tyr Val
    1220                1225                1230


Asn Phe  Leu Tyr Leu Ala Ser  His Tyr Glu Lys Leu  Lys Gly Ser
    1235                1240                1245


Pro Glu  Asp Asn Glu Gln Lys  Gln Leu Phe Val Glu  Gln His Lys
    1250                1255                1260


His Tyr  Leu Asp Glu Ile Ile  Glu Gln Ile Ser Glu  Phe Ser Lys
    1265                1270                1275


Arg Val  Ile Leu Ala Asp Ala  Asn Leu Asp Lys Val  Leu Ser Ala
    1280                1285                1290


Tyr Asn  Lys His Arg Asp Lys  Pro Ile Arg Glu Gln  Ala Glu Asn
    1295                1300                1305


Ile Ile  His Leu Phe Thr Leu  Thr Asn Leu Gly Ala  Pro Ala Ala
    1310                1315                1320


Phe Lys  Tyr Phe Asp Thr Thr  Ile Asp Arg Lys Arg  Tyr Thr Ser
    1325                1330                1335


Thr Lys  Glu Val Leu Asp Ala  Thr Leu Ile His Gln  Ser Ile Thr
    1340                1345                1350


Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser Gln Leu  Gly Gly Asp
    1355                1360                1365
```

<210> 55
<211> 1052
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 55

```
Lys Arg Asn Tyr Ile Leu Gly Leu Asp Ile Gly Ile Thr Ser Val Gly
1               5                  10                  15


Tyr Gly Ile Ile Asp Tyr Glu Thr Arg Asp Val Ile Asp Ala Gly Val
            20                  25                  30


Arg Leu Phe Lys Glu Ala Asn Val Glu Asn Asn Glu Gly Arg Arg Ser
        35                  40                  45


Lys Arg Gly Ala Arg Arg Leu Lys Arg Arg Arg Arg His Arg Ile Gln
    50                  55                  60


Arg Val Lys Lys Leu Leu Phe Asp Tyr Asn Leu Leu Thr Asp His Ser
65                  70                  75                  80


Glu Leu Ser Gly Ile Asn Pro Tyr Glu Ala Arg Val Lys Gly Leu Ser
                85                  90                  95


Gln Lys Leu Ser Glu Glu Glu Phe Ser Ala Ala Leu Leu His Leu Ala
            100                 105                 110


Lys Arg Arg Gly Val His Asn Val Asn Glu Val Glu Glu Asp Thr Gly
        115                 120                 125


Asn Glu Leu Ser Thr Lys Glu Gln Ile Ser Arg Asn Ser Lys Ala Leu
    130                 135                 140


Glu Glu Lys Tyr Val Ala Glu Leu Gln Leu Glu Arg Leu Lys Lys Asp
145                 150                 155                 160


Gly Glu Val Arg Gly Ser Ile Asn Arg Phe Lys Thr Ser Asp Tyr Val
                165                 170                 175


Lys Glu Ala Lys Gln Leu Leu Lys Val Gln Lys Ala Tyr His Gln Leu
            180                 185                 190
```

```
Asp Gln Ser Phe Ile Asp Thr Tyr Ile Asp Leu Leu Glu Thr Arg Arg
        195                 200                 205

Thr Tyr Tyr Glu Gly Pro Gly Glu Gly Ser Pro Phe Gly Trp Lys Asp
    210                 215                 220

Ile Lys Glu Trp Tyr Glu Met Leu Met Gly His Cys Thr Tyr Phe Pro
225                 230                 235                 240

Glu Glu Leu Arg Ser Val Lys Tyr Ala Tyr Asn Ala Asp Leu Tyr Asn
                245                 250                 255

Ala Leu Asn Asp Leu Asn Asn Leu Val Ile Thr Arg Asp Glu Asn Glu
            260                 265                 270

Lys Leu Glu Tyr Tyr Glu Lys Phe Gln Ile Ile Glu Asn Val Phe Lys
        275                 280                 285

Gln Lys Lys Lys Pro Thr Leu Lys Gln Ile Ala Lys Glu Ile Leu Val
    290                 295                 300

Asn Glu Glu Asp Ile Lys Gly Tyr Arg Val Thr Ser Thr Gly Lys Pro
305                 310                 315                 320

Glu Phe Thr Asn Leu Lys Val Tyr His Asp Ile Lys Asp Ile Thr Ala
                325                 330                 335

Arg Lys Glu Ile Ile Glu Asn Ala Glu Leu Leu Asp Gln Ile Ala Lys
            340                 345                 350

Ile Leu Thr Ile Tyr Gln Ser Ser Glu Asp Ile Gln Glu Glu Leu Thr
        355                 360                 365

Asn Leu Asn Ser Glu Leu Thr Gln Glu Glu Ile Glu Gln Ile Ser Asn
    370                 375                 380

Leu Lys Gly Tyr Thr Gly Thr His Asn Leu Ser Leu Lys Ala Ile Asn
385                 390                 395                 400
```

```
Leu Ile Leu Asp Glu Leu Trp His Thr Asn Asp Asn Gln Ile Ala Ile
                405                 410                 415

Phe Asn Arg Leu Lys Leu Val Pro Lys Lys Val Asp Leu Ser Gln Gln
            420                 425                 430

Lys Glu Ile Pro Thr Thr Leu Val Asp Asp Phe Ile Leu Ser Pro Val
        435                 440                 445

Val Lys Arg Ser Phe Ile Gln Ser Ile Lys Val Ile Asn Ala Ile Ile
    450                 455                 460

Lys Lys Tyr Gly Leu Pro Asn Asp Ile Ile Ile Glu Leu Ala Arg Glu
465                 470                 475                 480

Lys Asn Ser Lys Asp Ala Gln Lys Met Ile Asn Glu Met Gln Lys Arg
                485                 490                 495

Asn Arg Gln Thr Asn Glu Arg Ile Glu Glu Ile Ile Arg Thr Thr Gly
            500                 505                 510

Lys Glu Asn Ala Lys Tyr Leu Ile Glu Lys Ile Lys Leu His Asp Met
        515                 520                 525

Gln Glu Gly Lys Cys Leu Tyr Ser Leu Glu Ala Ile Pro Leu Glu Asp
    530                 535                 540

Leu Leu Asn Asn Pro Phe Asn Tyr Glu Val Asp His Ile Ile Pro Arg
545                 550                 555                 560

Ser Val Ser Phe Asp Asn Ser Phe Asn Asn Lys Val Leu Val Lys Gln
                565                 570                 575

Glu Glu Asn Ser Lys Lys Gly Asn Arg Thr Pro Phe Gln Tyr Leu Ser
            580                 585                 590

Ser Ser Asp Ser Lys Ile Ser Tyr Glu Thr Phe Lys Lys His Ile Leu
        595                 600                 605
```

```
Asn Leu Ala Lys Gly Lys Gly Arg Ile Ser Lys Thr Lys Lys Glu Tyr
    610                 615                 620

Leu Leu Glu Glu Arg Asp Ile Asn Arg Phe Ser Val Gln Lys Asp Phe
625                 630                 635                 640

Ile Asn Arg Asn Leu Val Asp Thr Arg Tyr Ala Thr Arg Gly Leu Met
                645                 650                 655

Asn Leu Leu Arg Ser Tyr Phe Arg Val Asn Asn Leu Asp Val Lys Val
            660                 665                 670

Lys Ser Ile Asn Gly Gly Phe Thr Ser Phe Leu Arg Arg Lys Trp Lys
        675                 680                 685

Phe Lys Lys Glu Arg Asn Lys Gly Tyr Lys His His Ala Glu Asp Ala
    690                 695                 700

Leu Ile Ile Ala Asn Ala Asp Phe Ile Phe Lys Glu Trp Lys Lys Leu
705                 710                 715                 720

Asp Lys Ala Lys Lys Val Met Glu Asn Gln Met Phe Glu Glu Lys Gln
                725                 730                 735

Ala Glu Ser Met Pro Glu Ile Glu Thr Glu Gln Glu Tyr Lys Glu Ile
            740                 745                 750

Phe Ile Thr Pro His Gln Ile Lys His Ile Lys Asp Phe Lys Asp Tyr
        755                 760                 765

Lys Tyr Ser His Arg Val Asp Lys Lys Pro Asn Arg Glu Leu Ile Asn
    770                 775                 780

Asp Thr Leu Tyr Ser Thr Arg Lys Asp Asp Lys Gly Asn Thr Leu Ile
785                 790                 795                 800

Val Asn Asn Leu Asn Gly Leu Tyr Asp Lys Asp Asn Asp Lys Leu Lys
                805                 810                 815
```

```
Lys Leu Ile Asn Lys Ser Pro Glu Lys Leu Leu Met Tyr His His Asp
            820                 825                 830

Pro Gln Thr Tyr Gln Lys Leu Lys Leu Ile Met Glu Gln Tyr Gly Asp
        835                 840                 845

Glu Lys Asn Pro Leu Tyr Lys Tyr Tyr Glu Glu Thr Gly Asn Tyr Leu
    850                 855                 860

Thr Lys Tyr Ser Lys Lys Asp Asn Gly Pro Val Ile Lys Lys Ile Lys
865                 870                 875                 880

Tyr Tyr Gly Asn Lys Leu Asn Ala His Leu Asp Ile Thr Asp Asp Tyr
                885                 890                 895

Pro Asn Ser Arg Asn Lys Val Val Lys Leu Ser Leu Lys Pro Tyr Arg
            900                 905                 910

Phe Asp Val Tyr Leu Asp Asn Gly Val Tyr Lys Phe Val Thr Val Lys
        915                 920                 925

Asn Leu Asp Val Ile Lys Lys Glu Asn Tyr Tyr Glu Val Asn Ser Lys
    930                 935                 940

Cys Tyr Glu Glu Ala Lys Lys Leu Lys Lys Ile Ser Asn Gln Ala Glu
945                 950                 955                 960

Phe Ile Ala Ser Phe Tyr Asn Asn Asp Leu Ile Lys Ile Asn Gly Glu
                965                 970                 975

Leu Tyr Arg Val Ile Gly Val Asn Asn Asp Leu Leu Asn Arg Ile Glu
            980                 985                 990

Val Asn Met Ile Asp Ile Thr Tyr  Arg Glu Tyr Leu Glu  Asn Met Asn
        995                 1000                1005

Asp Lys  Arg Pro Pro Arg Ile  Ile Lys Thr Ile Ala  Ser Lys Thr
    1010                1015                1020
```

Gln Ser Ile Lys Lys Tyr Ser Thr Asp Ile Leu Gly Asn Leu Tyr
1025 1030 1035

Glu Val Lys Ser Lys Lys His Pro Gln Ile Ile Lys Lys Gly
1040 1045 1050

<210> 56
<211> 1052
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 56

Lys Arg Asn Tyr Ile Leu Gly Leu Asp Ile Gly Ile Thr Ser Val Gly
1 5 10 15

Tyr Gly Ile Ile Asp Tyr Glu Thr Arg Asp Val Ile Asp Ala Gly Val
20 25 30

Arg Leu Phe Lys Glu Ala Asn Val Glu Asn Asn Glu Gly Arg Arg Ser
35 40 45

Lys Arg Gly Ala Arg Arg Leu Lys Arg Arg Arg Arg His Arg Ile Gln
50 55 60

Arg Val Lys Lys Leu Leu Phe Asp Tyr Asn Leu Leu Thr Asp His Ser
65 70 75 80

Glu Leu Ser Gly Ile Asn Pro Tyr Glu Ala Arg Val Lys Gly Leu Ser
85 90 95

Gln Lys Leu Ser Glu Glu Glu Phe Ser Ala Ala Leu Leu His Leu Ala
100 105 110

Lys Arg Arg Gly Val His Asn Val Asn Glu Val Glu Glu Asp Thr Gly
115 120 125

```
Asn Glu Leu Ser Thr Lys Glu Gln Ile Ser Arg Asn Ser Lys Ala Leu
    130                 135                 140

Glu Glu Lys Tyr Val Ala Glu Leu Gln Leu Glu Arg Leu Lys Lys Asp
145                 150                 155                 160

Gly Glu Val Arg Gly Ser Ile Asn Arg Phe Lys Thr Ser Asp Tyr Val
                165                 170                 175

Lys Glu Ala Lys Gln Leu Leu Lys Val Gln Lys Ala Tyr His Gln Leu
            180                 185                 190

Asp Gln Ser Phe Ile Asp Thr Tyr Ile Asp Leu Leu Glu Thr Arg Arg
        195                 200                 205

Thr Tyr Tyr Glu Gly Pro Gly Glu Gly Ser Pro Phe Gly Trp Lys Asp
    210                 215                 220

Ile Lys Glu Trp Tyr Glu Met Leu Met Gly His Cys Thr Tyr Phe Pro
225                 230                 235                 240

Glu Glu Leu Arg Ser Val Lys Tyr Ala Tyr Asn Ala Asp Leu Tyr Asn
                245                 250                 255

Ala Leu Asn Asp Leu Asn Asn Leu Val Ile Thr Arg Asp Glu Asn Glu
            260                 265                 270

Lys Leu Glu Tyr Tyr Glu Lys Phe Gln Ile Ile Glu Asn Val Phe Lys
        275                 280                 285

Gln Lys Lys Lys Pro Thr Leu Lys Gln Ile Ala Lys Glu Ile Leu Val
    290                 295                 300

Asn Glu Glu Asp Ile Lys Gly Tyr Arg Val Thr Ser Thr Gly Lys Pro
305                 310                 315                 320

Glu Phe Thr Asn Leu Lys Val Tyr His Asp Ile Lys Asp Ile Thr Ala
                325                 330                 335
```

```
Arg Lys Glu Ile Ile Glu Asn Ala Glu Leu Leu Asp Gln Ile Ala Lys
            340                 345                 350

Ile Leu Thr Ile Tyr Gln Ser Ser Glu Asp Ile Gln Glu Glu Leu Thr
        355                 360                 365

Asn Leu Asn Ser Glu Leu Thr Gln Glu Glu Ile Glu Gln Ile Ser Asn
    370                 375                 380

Leu Lys Gly Tyr Thr Gly Thr His Asn Leu Ser Leu Lys Ala Ile Asn
385                 390                 395                 400

Leu Ile Leu Asp Glu Leu Trp His Thr Asn Asp Asn Gln Ile Ala Ile
                405                 410                 415

Phe Asn Arg Leu Lys Leu Val Pro Lys Lys Val Asp Leu Ser Gln Gln
            420                 425                 430

Lys Glu Ile Pro Thr Thr Leu Val Asp Asp Phe Ile Leu Ser Pro Val
        435                 440                 445

Val Lys Arg Ser Phe Ile Gln Ser Ile Lys Val Ile Asn Ala Ile Ile
    450                 455                 460

Lys Lys Tyr Gly Leu Pro Asn Asp Ile Ile Ile Glu Leu Ala Arg Glu
465                 470                 475                 480

Lys Asn Ser Lys Asp Ala Gln Lys Met Ile Asn Glu Met Gln Lys Arg
                485                 490                 495

Asn Arg Gln Thr Asn Glu Arg Ile Glu Glu Ile Ile Arg Thr Thr Gly
            500                 505                 510

Lys Glu Asn Ala Lys Tyr Leu Ile Glu Lys Ile Lys Leu His Asp Met
        515                 520                 525

Gln Glu Gly Lys Cys Leu Tyr Ser Leu Glu Ala Ile Pro Leu Glu Asp
    530                 535                 540
```

```
Leu Leu Asn Asn Pro Phe Asn Tyr Glu Val Asp His Ile Ile Pro Arg
545                 550                 555                 560

Ser Val Ser Phe Asp Asn Ser Phe Asn Asn Lys Val Leu Val Lys Gln
                565                 570                 575

Glu Glu Ala Ser Lys Lys Gly Asn Arg Thr Pro Phe Gln Tyr Leu Ser
            580                 585                 590

Ser Ser Asp Ser Lys Ile Ser Tyr Glu Thr Phe Lys Lys His Ile Leu
        595                 600                 605

Asn Leu Ala Lys Gly Lys Gly Arg Ile Ser Lys Thr Lys Lys Glu Tyr
    610                 615                 620

Leu Leu Glu Glu Arg Asp Ile Asn Arg Phe Ser Val Gln Lys Asp Phe
625                 630                 635                 640

Ile Asn Arg Asn Leu Val Asp Thr Arg Tyr Ala Thr Arg Gly Leu Met
                645                 650                 655

Asn Leu Leu Arg Ser Tyr Phe Arg Val Asn Asn Leu Asp Val Lys Val
            660                 665                 670

Lys Ser Ile Asn Gly Gly Phe Thr Ser Phe Leu Arg Arg Lys Trp Lys
        675                 680                 685

Phe Lys Lys Glu Arg Asn Lys Gly Tyr Lys His His Ala Glu Asp Ala
    690                 695                 700

Leu Ile Ile Ala Asn Ala Asp Phe Ile Phe Lys Glu Trp Lys Lys Leu
705                 710                 715                 720

Asp Lys Ala Lys Lys Val Met Glu Asn Gln Met Phe Glu Glu Lys Gln
                725                 730                 735

Ala Glu Ser Met Pro Glu Ile Glu Thr Glu Gln Glu Tyr Lys Glu Ile
            740                 745                 750
```

```
Phe Ile Thr Pro His Gln Ile Lys His Ile Lys Asp Phe Lys Asp Tyr
        755                 760                 765

Lys Tyr Ser His Arg Val Asp Lys Lys Pro Asn Arg Glu Leu Ile Asn
    770                 775                 780

Asp Thr Leu Tyr Ser Thr Arg Lys Asp Asp Lys Gly Asn Thr Leu Ile
785                 790                 795                 800

Val Asn Asn Leu Asn Gly Leu Tyr Asp Lys Asp Asn Asp Lys Leu Lys
                805                 810                 815

Lys Leu Ile Asn Lys Ser Pro Glu Lys Leu Leu Met Tyr His His Asp
            820                 825                 830

Pro Gln Thr Tyr Gln Lys Leu Lys Leu Ile Met Glu Gln Tyr Gly Asp
        835                 840                 845

Glu Lys Asn Pro Leu Tyr Lys Tyr Tyr Glu Glu Thr Gly Asn Tyr Leu
    850                 855                 860

Thr Lys Tyr Ser Lys Lys Asp Asn Gly Pro Val Ile Lys Lys Ile Lys
865                 870                 875                 880

Tyr Tyr Gly Asn Lys Leu Asn Ala His Leu Asp Ile Thr Asp Asp Tyr
                885                 890                 895

Pro Asn Ser Arg Asn Lys Val Val Lys Leu Ser Leu Lys Pro Tyr Arg
            900                 905                 910

Phe Asp Val Tyr Leu Asp Asn Gly Val Tyr Lys Phe Val Thr Val Lys
        915                 920                 925

Asn Leu Asp Val Ile Lys Lys Glu Asn Tyr Tyr Glu Val Asn Ser Lys
    930                 935                 940

Cys Tyr Glu Glu Ala Lys Lys Leu Lys Lys Ile Ser Asn Gln Ala Glu
945                 950                 955                 960
```

```
Phe Ile Ala Ser Phe Tyr Asn Asn Asp Leu Ile Lys Ile Asn Gly Glu
                965                 970                 975


Leu Tyr Arg Val Ile Gly Val Asn Asn Asp Leu Leu Asn Arg Ile Glu
            980                 985                 990


Val Asn Met Ile Asp Ile Thr Tyr  Arg Glu Tyr Leu Glu  Asn Met Asn
        995                 1000                1005


Asp Lys  Arg Pro Pro Arg Ile  Ile Lys Thr Ile Ala  Ser Lys Thr
    1010                1015                1020


Gln Ser  Ile Lys Lys Tyr Ser  Thr Asp Ile Leu Gly  Asn Leu Tyr
    1025                1030                1035


Glu Val  Lys Ser Lys Lys His  Pro Gln Ile Ile Lys  Lys Gly
    1040                1045                1050
```

<210> 57
<211> 1052
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 57

```
Lys Arg Asn Tyr Ile Leu Gly Leu Asp Ile Gly Ile Thr Ser Val Gly
1               5                   10                  15


Tyr Gly Ile Ile Asp Tyr Glu Thr Arg Asp Val Ile Asp Ala Gly Val
            20                  25                  30


Arg Leu Phe Lys Glu Ala Asn Val Glu Asn Asn Glu Gly Arg Arg Ser
        35                  40                  45


Lys Arg Gly Ala Arg Arg Leu Lys Arg Arg Arg Arg His Arg Ile Gln
    50                  55                  60


Arg Val Lys Lys Leu Leu Phe Asp Tyr Asn Leu Leu Thr Asp His Ser
65                  70                  75                  80
```

```
Glu Leu Ser Gly Ile Asn Pro Tyr Glu Ala Arg Val Lys Gly Leu Ser
                85                  90                  95

Gln Lys Leu Ser Glu Glu Glu Phe Ser Ala Ala Leu Leu His Leu Ala
            100                 105                 110

Lys Arg Arg Gly Val His Asn Val Asn Glu Val Glu Glu Asp Thr Gly
        115                 120                 125

Asn Glu Leu Ser Thr Lys Glu Gln Ile Ser Arg Asn Ser Lys Ala Leu
    130                 135                 140

Glu Glu Lys Tyr Val Ala Glu Leu Gln Leu Glu Arg Leu Lys Lys Asp
145                 150                 155                 160

Gly Glu Val Arg Gly Ser Ile Asn Arg Phe Lys Thr Ser Asp Tyr Val
                165                 170                 175

Lys Glu Ala Lys Gln Leu Leu Lys Val Gln Lys Ala Tyr His Gln Leu
            180                 185                 190

Asp Gln Ser Phe Ile Asp Thr Tyr Ile Asp Leu Leu Glu Thr Arg Arg
        195                 200                 205

Thr Tyr Tyr Glu Gly Pro Gly Glu Gly Ser Pro Phe Gly Trp Lys Asp
    210                 215                 220

Ile Lys Glu Trp Tyr Glu Met Leu Met Gly His Cys Thr Tyr Phe Pro
225                 230                 235                 240

Glu Glu Leu Arg Ser Val Lys Tyr Ala Tyr Asn Ala Asp Leu Tyr Asn
                245                 250                 255

Ala Leu Asn Asp Leu Asn Asn Leu Val Ile Thr Arg Asp Glu Asn Glu
            260                 265                 270

Lys Leu Glu Tyr Tyr Glu Lys Phe Gln Ile Ile Glu Asn Val Phe Lys
        275                 280                 285
```

```
Gln Lys Lys Lys Pro Thr Leu Lys Gln Ile Ala Lys Glu Ile Leu Val
    290                 295                 300

Asn Glu Glu Asp Ile Lys Gly Tyr Arg Val Thr Ser Thr Gly Lys Pro
305                 310                 315                 320

Glu Phe Thr Asn Leu Lys Val Tyr His Asp Ile Lys Asp Ile Thr Ala
                325                 330                 335

Arg Lys Glu Ile Ile Glu Asn Ala Glu Leu Leu Asp Gln Ile Ala Lys
            340                 345                 350

Ile Leu Thr Ile Tyr Gln Ser Ser Glu Asp Ile Gln Glu Glu Leu Thr
        355                 360                 365

Asn Leu Asn Ser Glu Leu Thr Gln Glu Glu Ile Glu Gln Ile Ser Asn
    370                 375                 380

Leu Lys Gly Tyr Thr Gly Thr His Asn Leu Ser Leu Lys Ala Ile Asn
385                 390                 395                 400

Leu Ile Leu Asp Glu Leu Trp His Thr Asn Asp Asn Gln Ile Ala Ile
                405                 410                 415

Phe Asn Arg Leu Lys Leu Val Pro Lys Lys Val Asp Leu Ser Gln Gln
            420                 425                 430

Lys Glu Ile Pro Thr Thr Leu Val Asp Asp Phe Ile Leu Ser Pro Val
        435                 440                 445

Val Lys Arg Ser Phe Ile Gln Ser Ile Lys Val Ile Asn Ala Ile Ile
    450                 455                 460

Lys Lys Tyr Gly Leu Pro Asn Asp Ile Ile Ile Glu Leu Ala Arg Glu
465                 470                 475                 480

Lys Asn Ser Lys Asp Ala Gln Lys Met Ile Asn Glu Met Gln Lys Arg
                485                 490                 495
```

```
Asn Arg Gln Thr Asn Glu Arg Ile Glu Glu Ile Ile Arg Thr Thr Gly
            500                 505                 510

Lys Glu Asn Ala Lys Tyr Leu Ile Glu Lys Ile Lys Leu His Asp Met
        515                 520                 525

Gln Glu Gly Lys Cys Leu Tyr Ser Leu Glu Ala Ile Pro Leu Glu Asp
    530                 535                 540

Leu Leu Asn Asn Pro Phe Asn Tyr Glu Val Asp His Ile Ile Pro Arg
545                 550                 555                 560

Ser Val Ser Phe Asp Asn Ser Phe Asn Asn Lys Val Leu Val Lys Gln
                565                 570                 575

Glu Glu Ala Ser Lys Lys Gly Asn Arg Thr Pro Phe Gln Tyr Leu Ser
            580                 585                 590

Ser Ser Asp Ser Lys Ile Ser Tyr Glu Thr Phe Lys Lys His Ile Leu
        595                 600                 605

Asn Leu Ala Lys Gly Lys Gly Arg Ile Ser Lys Thr Lys Lys Glu Tyr
    610                 615                 620

Leu Leu Glu Glu Arg Asp Ile Asn Arg Phe Ser Val Gln Lys Asp Phe
625                 630                 635                 640

Ile Asn Arg Asn Leu Val Asp Thr Arg Tyr Ala Thr Arg Gly Leu Met
                645                 650                 655

Asn Leu Leu Arg Ser Tyr Phe Arg Val Asn Asn Leu Asp Val Lys Val
            660                 665                 670

Lys Ser Ile Asn Gly Gly Phe Thr Ser Phe Leu Arg Arg Lys Trp Lys
        675                 680                 685

Phe Lys Lys Glu Arg Asn Lys Gly Tyr Lys His His Ala Glu Asp Ala
    690                 695                 700
```

```
Leu Ile Ile Ala Asn Ala Asp Phe Ile Phe Lys Glu Trp Lys Lys Leu
705                 710                 715                 720

Asp Lys Ala Lys Lys Val Met Glu Asn Gln Met Phe Glu Glu Lys Gln
                725                 730                 735

Ala Glu Ser Met Pro Glu Ile Glu Thr Glu Gln Glu Tyr Lys Glu Ile
            740                 745                 750

Phe Ile Thr Pro His Gln Ile Lys His Ile Lys Asp Phe Lys Asp Tyr
        755                 760                 765

Lys Tyr Ser His Arg Val Asp Lys Lys Pro Asn Arg Lys Leu Ile Asn
    770                 775                 780

Asp Thr Leu Tyr Ser Thr Arg Lys Asp Asp Lys Gly Asn Thr Leu Ile
785                 790                 795                 800

Val Asn Asn Leu Asn Gly Leu Tyr Asp Lys Asp Asn Asp Lys Leu Lys
                805                 810                 815

Lys Leu Ile Asn Lys Ser Pro Glu Lys Leu Leu Met Tyr His His Asp
            820                 825                 830

Pro Gln Thr Tyr Gln Lys Leu Lys Leu Ile Met Glu Gln Tyr Gly Asp
        835                 840                 845

Glu Lys Asn Pro Leu Tyr Lys Tyr Tyr Glu Glu Thr Gly Asn Tyr Leu
    850                 855                 860

Thr Lys Tyr Ser Lys Lys Asp Asn Gly Pro Val Ile Lys Lys Ile Lys
865                 870                 875                 880

Tyr Tyr Gly Asn Lys Leu Asn Ala His Leu Asp Ile Thr Asp Asp Tyr
                885                 890                 895

Pro Asn Ser Arg Asn Lys Val Val Lys Leu Ser Leu Lys Pro Tyr Arg
            900                 905                 910
```

```
Phe Asp Val Tyr Leu Asp Asn Gly Val Tyr Lys Phe Val Thr Val Lys
        915                 920                 925

Asn Leu Asp Val Ile Lys Lys Glu Asn Tyr Tyr Glu Val Asn Ser Lys
    930                 935                 940

Cys Tyr Glu Glu Ala Lys Lys Leu Lys Lys Ile Ser Asn Gln Ala Glu
945                 950                 955                 960

Phe Ile Ala Ser Phe Tyr Lys Asn Asp Leu Ile Lys Ile Asn Gly Glu
                965                 970                 975

Leu Tyr Arg Val Ile Gly Val Asn Asn Asp Leu Leu Asn Arg Ile Glu
            980                 985                 990

Val Asn Met Ile Asp Ile Thr Tyr  Arg Glu Tyr Leu Glu  Asn Met Asn
        995                 1000                1005

Asp Lys  Arg Pro Pro His Ile  Ile Lys Thr Ile Ala  Ser Lys Thr
    1010                1015                1020

Gln Ser  Ile Lys Lys Tyr Ser  Thr Asp Ile Leu Gly  Asn Leu Tyr
    1025                1030                1035

Glu Val  Lys Ser Lys Lys His  Pro Gln Ile Ile Lys  Lys Gly
    1040                1045                1050
```

<210> 58
<211> 1367
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 58

```
Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                   10                  15
```

```
Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
            20                  25                  30

Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45

Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
    50                  55                  60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65                  70                  75                  80

Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
                85                  90                  95

Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110

Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140

Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220
```

```
Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430
```

```
Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640
```

```
Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845
```

```
Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035

Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050
```

```
Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
    1055                1060                1065

Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080

Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095

Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110

Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125

Lys Tyr  Gly Gly Phe Asp Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                1225                1230

Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                1240                1245
```

```
Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
    1250                1255                1260


Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                1270                1275


Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                1285                1290


Asn Lys  His Arg Asp Lys Pro  Ile Arg Glu Gln Ala  Glu Asn Ile
    1295                1300                1305


Ile His  Leu Phe Thr Leu Thr  Asn Leu Gly Ala Pro  Ala Ala Phe
    1310                1315                1320


Lys Tyr  Phe Asp Thr Thr Ile  Asp Arg Lys Arg Tyr  Thr Ser Thr
    1325                1330                1335


Lys Glu  Val Leu Asp Ala Thr  Leu Ile His Gln Ser  Ile Thr Gly
    1340                1345                1350


Leu Tyr  Glu Thr Arg Ile Asp  Leu Ser Gln Leu Gly  Gly Asp
    1355                1360                1365


<210>  59
<211>  1367
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  59

Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly
1               5                   10                  15


Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
            20                  25                  30


Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45
```

```
Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
    50                  55                  60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65                  70                  75                  80

Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
                85                  90                  95

Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110

Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140

Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255
```

```
Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460
```

```
Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670
```

```
Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880
```

```
Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035

Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050

Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
    1055                1060                1065

Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080
```

```
Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095

Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110

Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125

Lys Tyr  Gly Gly Phe Asp Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                1225                1230

Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                1240                1245

Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
    1250                1255                1260

Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                1270                1275
```

```
Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                1285                1290


Asn Lys  His Arg Asp Lys Pro  Ile Arg Glu Gln Ala  Glu Asn Ile
    1295                1300                1305


Ile His  Leu Phe Thr Leu Thr  Asn Leu Gly Ala Pro  Ala Ala Phe
    1310                1315                1320


Lys Tyr  Phe Asp Thr Thr Ile  Asp Arg Lys Arg Tyr  Thr Ser Thr
    1325                1330                1335


Lys Glu  Val Leu Asp Ala Thr  Leu Ile His Gln Ser  Ile Thr Gly
    1340                1345                1350


Leu Tyr  Glu Thr Arg Ile Asp  Leu Ser Gln Leu Gly  Gly Asp
    1355                1360                1365


<210>  60
<211>  1367
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  60

Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15


Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
            20                  25                  30


Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45


Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
    50                  55                  60
```

```
Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65                  70                  75                  80

Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
                85                  90                  95

Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110

Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140

Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270
```

```
Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480
```

```
Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685
```

```
Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895
```

```
Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035

Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050

Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
    1055                1060                1065

Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080

Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095
```

```
Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110

Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125

Lys Tyr  Gly Gly Phe Glu Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                1225                1230

Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                1240                1245

Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
    1250                1255                1260

Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                1270                1275

Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                1285                1290
```

Asn Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala Glu Asn Ile
1295 1300 1305

Ile His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro Ala Ala Phe
1310 1315 1320

Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Gln Tyr Arg Ser Thr
1325 1330 1335

Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser Ile Thr Gly
1340 1345 1350

Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly Gly Asp
1355 1360 1365

<210> 61
<211> 1367
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 61

Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly
1 5 10 15

Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
20 25 30

Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
35 40 45

Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
50 55 60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65 70 75 80

Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
85 90 95

```
Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110

Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140

Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300
```

```
Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510
```

```
Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720
```

```
Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925
```

```
His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035

Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050

Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
    1055                1060                1065

Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080

Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095

Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110

Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125
```

```
Lys Tyr  Gly Gly Phe Val Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                1225                1230

Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                1240                1245

Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
    1250                1255                1260

Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                1270                1275

Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                1285                1290

Asn Lys  His Arg Asp Lys Pro  Ile Arg Glu Gln Ala  Glu Asn Ile
    1295                1300                1305

Ile His  Leu Phe Thr Leu Thr  Asn Leu Gly Ala Pro  Ala Ala Phe
    1310                1315                1320
```

```
Lys Tyr  Phe Asp Thr Thr Ile  Asp Arg Lys Gln Tyr  Arg Ser Thr
    1325                1330                1335


Lys Glu  Val Leu Asp Ala Thr  Leu Ile His Gln Ser  Ile Thr Gly
    1340                1345                1350


Leu Tyr  Glu Thr Arg Ile Asp  Leu Ser Gln Leu Gly  Gly Asp
    1355                1360                1365


<210>  62
<211>  1367
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  62

Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly
1               5                   10                  15


Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
            20                  25                  30


Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45


Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
    50                  55                  60


Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65                  70                  75                  80


Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
                85                  90                  95


Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
            100                 105                 110
```

```
Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
        115                 120                 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
    130                 135                 140

Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320
```

```
Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525
```

```
Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735
```

```
Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940
```

```
Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960


Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975


Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990


Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005


Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020


Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035


Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050


Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
    1055                1060                1065


Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080


Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095


Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110


Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125


Lys Tyr  Gly Gly Phe Val Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140
```

```
Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170

Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Arg Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                1225                1230

Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                1240                1245

Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
    1250                1255                1260

Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                1270                1275

Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                1285                1290

Asn Lys  His Arg Asp Lys Pro  Ile Arg Glu Gln Ala  Glu Asn Ile
    1295                1300                1305

Ile His  Leu Phe Thr Leu Thr  Asn Leu Gly Ala Pro  Ala Ala Phe
    1310                1315                1320

Lys Tyr  Phe Asp Thr Thr Ile  Asp Arg Lys Glu Tyr  Arg Ser Thr
    1325                1330                1335
```

Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser Ile Thr Gly
1340 1345 1350

Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly Gly Asp
1355 1360 1365

<210> 63
<211> 1367
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 63

Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly
1 5 10 15

Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys
20 25 30

Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly
35 40 45

Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys
50 55 60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr
65 70 75 80

Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe
85 90 95

Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His
100 105 110

Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His
115 120 125

Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser
130 135 140

```
Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp
                165                 170                 175

Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn
            180                 185                 190

Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350
```

```
Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Ala
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560
```

```
Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Ala Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Ser Asp Gly Phe Ala
        675                 680                 685

Asn Arg Asn Phe Met Ala Leu Ile His Asp Asp Ser Leu Thr Phe Lys
    690                 695                 700

Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
705                 710                 715                 720

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
            740                 745                 750

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765
```

```
Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
    770                 775                 780

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
785                 790                 795                 800

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
                805                 810                 815

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
            820                 825                 830

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
865                 870                 875                 880

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Ala Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
    930                 935                 940

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
945                 950                 955                 960

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
                965                 970                 975
```

```
Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Ile Lys Lys Tyr  Pro Lys Leu Glu Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Lys Val Tyr  Asp Val Arg Lys Met  Ile Ala Lys
    1010                1015                1020

Ser Glu  Gln Glu Ile Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr
    1025                1030                1035

Ser Asn  Ile Met Asn Phe Phe  Lys Thr Glu Ile Thr  Leu Ala Asn
    1040                1045                1050

Gly Glu  Ile Arg Lys Arg Pro  Leu Ile Glu Thr Asn  Gly Glu Thr
    1055                1060                1065

Gly Glu  Ile Val Trp Asp Lys  Gly Arg Asp Phe Ala  Thr Val Arg
    1070                1075                1080

Lys Val  Leu Ser Met Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu
    1085                1090                1095

Val Gln  Thr Gly Gly Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Arg
    1100                1105                1110

Asn Ser  Asp Lys Leu Ile Ala  Arg Lys Lys Asp Trp  Asp Pro Lys
    1115                1120                1125

Lys Tyr  Gly Gly Phe Asp Ser  Pro Thr Val Ala Tyr  Ser Val Leu
    1130                1135                1140

Val Val  Ala Lys Val Glu Lys  Gly Lys Ser Lys Lys  Leu Lys Ser
    1145                1150                1155

Val Lys  Glu Leu Leu Gly Ile  Thr Ile Met Glu Arg  Ser Ser Phe
    1160                1165                1170
```

```
Glu Lys  Asn Pro Ile Asp Phe  Leu Glu Ala Lys Gly  Tyr Lys Glu
    1175                1180                1185

Val Lys  Lys Asp Leu Ile Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Glu Asn Gly Arg Lys  Arg Met Leu Ala Ser  Ala Gly Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Leu  Ala Leu Pro Ser Lys  Tyr Val Asn
    1220                1225                1230

Phe Leu  Tyr Leu Ala Ser His  Tyr Glu Lys Leu Lys  Gly Ser Pro
    1235                1240                1245

Glu Asp  Asn Glu Gln Lys Gln  Leu Phe Val Glu Gln  His Lys His
    1250                1255                1260

Tyr Leu  Asp Glu Ile Ile Glu  Gln Ile Ser Glu Phe  Ser Lys Arg
    1265                1270                1275

Val Ile  Leu Ala Asp Ala Asn  Leu Asp Lys Val Leu  Ser Ala Tyr
    1280                1285                1290

Asn Lys  His Arg Asp Lys Pro  Ile Arg Glu Gln Ala  Glu Asn Ile
    1295                1300                1305

Ile His  Leu Phe Thr Leu Thr  Asn Leu Gly Ala Pro  Ala Ala Phe
    1310                1315                1320

Lys Tyr  Phe Asp Thr Thr Ile  Asp Arg Lys Arg Tyr  Thr Ser Thr
    1325                1330                1335

Lys Glu  Val Leu Asp Ala Thr  Leu Ile His Gln Ser  Ile Thr Gly
    1340                1345                1350

Leu Tyr  Glu Thr Arg Ile Asp  Leu Ser Gln Leu Gly  Gly Asp
    1355                1360                1365
```

<210> 64
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 64

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 65
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 65

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 66
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 66

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Gly Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

```
Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145                 150                 155                 160


Ala Gln Ser Ser Thr Asp
                165
```

<210> 67
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 67

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15


Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30


Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45


Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60


Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80


Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95


Arg Ile Gly Arg Val Val Phe Gly Ala Arg Val Ala Lys Thr Gly Ala
            100                 105                 110


Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125


Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140
```

```
Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145                 150                 155                 160


Ala Gln Ser Ser Thr Asp
                165
```

<210> 68
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 68

```
Ser Glu Val Glu Phe Ser Tyr Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15


Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30


Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45


Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60


Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80


Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95


Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110


Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Ser His Arg
        115                 120                 125
```

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 69
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 69

Ser Glu Val Glu Phe Ser Tyr Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Ser His Arg
115 120 125

```
Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Asp Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 70
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 70

```
Ser Glu Val Glu Phe Ser Tyr Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110
```

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Ser His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Gly Ile Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 71
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 71

Ser Glu Val Glu Phe Ser Tyr Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly Ala
100 105 110

```
Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Ser His Arg
        115                 120                 125


Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140


Ser Asp Phe Phe Arg Met Arg Arg Gln Val Ile Lys Ala Gln Lys Lys
145                 150                 155                 160


Ala Gln Ser Ser Thr Asp
                165


<210>  72
<211>  166
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  72

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15


Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30


Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45


Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60


Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80


Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95
```

```
Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 73
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 73

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95
```

```
Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 74
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 74

```
Ala Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Phe
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80
```

```
Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 75
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 75

```
Ser Glu Val Glu Phe Ser Tyr Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80
```

```
Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Thr Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Ser His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Ser Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 76
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 76

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Gly Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60
```

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val His Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Asp Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 77
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 77

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Gly Gly Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

```
Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80


Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95


Arg Ile Gly Arg Val Val Phe Gly Val His Asn Ala Lys Thr Gly Ala
            100                 105                 110


Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125


Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Asp Leu Leu
    130                 135                 140


Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160


Ala Gln Ser Ser Thr Asp
                165


<210>  78
<211>  166
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  78

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15


Leu Ala Lys Arg Ala Trp Asp Asp Gly Glu Val Pro Val Gly Ala Val
            20                  25                  30


Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45
```

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Lys Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Gly Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 79
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 79

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Gln Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

```
Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
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<210> 80
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 80

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Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Met Gly Glu Val Pro Val Gly Ala Val
            20                  25                  30
```

```
Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Pro Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Asp Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
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<210> 81
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 81

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Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Cys Glu Val Pro Val Gly Ala Val
            20                  25                  30
```

```
Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val His Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 82
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 82

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15
```

```
Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Leu Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 83
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 83

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15
```

```
Leu Ala Lys Arg Ala Trp Asp Glu Gly Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 84
<211> 178
<212> PRT
<213> E. coli

<400> 84

```
Met Arg Arg Ala Phe Ile Thr Gly Val Phe Phe Leu Ser Glu Val Glu
1               5                   10                  15
```

```
Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg
            20                  25                  30

Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val Leu Val His Asn
        35                  40                  45

Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile Gly Arg His Asp
    50                  55                  60

Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val
65                  70                  75                  80

Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr Val Thr Leu Glu
                85                  90                  95

Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg
            100                 105                 110

Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala Ala Gly Ser Leu
        115                 120                 125

Met Asp Val Leu His His Pro Gly Met Asn His Arg Val Glu Ile Thr
    130                 135                 140

Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu Ser Asp Phe Phe
145                 150                 155                 160

Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys Ala Gln Ser Ser
                165                 170                 175

Thr Asp
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<210> 85
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 85
tatatgcata tttattacat cgg 23

<210> 86
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 86
ccgtcatgtg ggtcctgaat tgg 23

<210> 87
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 87
acactgaaag actccaggtc agg 23

<210> 88
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 88
gtcagaagag atgtggtcaa tgg 23

<210> 89
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 89
tttaaagtga agcagcatct ggg 23

<210> 90
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 90
atttaaagtg aagcagcatc tgg 23

<210> 91
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 91
actccatgac agtgtaattt tgg 23

<210> 92
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 92
gcctggagaa gccatccagc agg 23

<210> 93
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 93
ctcagacaca ctcattgatg agg 23

<210> 94
<211> 24
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 94
gaggcactgc ccccaccatg agcg 24

<210> 95
<211> 85
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 95
tcataagcat tctgccgaca tggaagccgt cgcatacggt gtggtgcacc tggatggcca 60

gcggcatcag caccttgtcg ccttg 85

<210> 96
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 96

Glu Asn Leu Met Arg Gly Val His Phe Gly Asp Cys Val Thr His His
1 5 10 15

Val Gln Ile Ala Leu Pro Met Leu Val Lys Asp Gly Gln
20 25

<210> 97
<211> 86
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 97
tcattaagca ttctgccgac atggaagccg tcgcatacgg cgcggtgcac ctggatggcc 60

agcggcatca gcaccttgtc gccttg 86

<210> 98
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 98

Glu Asn Leu Met Arg Gly Val His Phe Gly Asp Cys Val Ala Arg His
1 5 10 15

Val Gln Ile Ala Leu Pro Met Leu Val Lys Asp Gly Gln
20 25

<210> 99
<211> 59
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 99
ccgtcgcata cggtgtggtg cacctggatg gccagcggca tcagcacctt gtcgccttg 59

<210> 100
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 100
caaatattat acgcaaggcg acaaggtgct gatgccgctg gccatccagg tgcaccacgc 60

cgtatgcgac ggcttccatg tcggcagaat gcttaa 96

<210> 101
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 101

Lys Tyr Tyr Thr Gln Gly Asp Lys Val Leu Met Pro Leu Ala Ile Gln
1 5 10 15

Val His His Ala Val Cys Asp Gly Phe His Val Gly Arg Met Leu Asn
20 25 30

<210> 102
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 102
caaatattat acgcaaggcg acaaggtgct gatgccgctg gccatccagg tgcactacgc 60

cgtatgcgac ggcttccatg tcggcagaat gcttaa 96

<210> 103
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 103

Lys Tyr Tyr Thr Gln Gly Asp Lys Val Leu Met Pro Leu Ala Ile Gln
1 5 10 15

Val His Tyr Ala Val Cys Asp Gly Phe His Val Gly Arg Met Leu Asn
20 25 30

<210> 104
<211> 86
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 104
caaatattat acgcaaggcg acaaggtgct gatgccgctg gccatccagg tgcaccacgc 60

cgtatgcgac ggctccagtc gccaaa 86

<210> 105
<211> 84
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<220>
<221> misc_feature
<222> (1)..(3)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (6)..(8)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (23)..(26)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (30)..(30)
<223> Xaa can be any naturally occurring amino acid

<220>
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<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (37)..(37)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (39)..(39)
<223> Xaa can be any naturally occurring amino acid

<220>

<221> misc_feature
<222> (41)..(41)
<223> Xaa can be any naturally occurring amino acid

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<222> (43)..(44)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (50)..(50)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (52)..(56)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (60)..(64)
<223> Xaa can be any naturally occurring amino acid

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<222> (66)..(66)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (68)..(70)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (72)..(73)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (76)..(77)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (80)..(82)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (84)..(84)

<223> Xaa can be any naturally occurring amino acid

<400> 105

Xaa Xaa Xaa Arg Leu Xaa Xaa Xaa Thr Leu Tyr Val Thr Leu Glu Pro
1   5   10   15

Cys Val Met Cys Ala Gly Xaa Xaa Xaa Xaa Ser Arg Ile Xaa Arg Val
            20   25   30

Val Xaa Gly Ala Xaa Asp Xaa Lys Xaa Gly Xaa Xaa Gly Ser Leu Met
        35   40   45

Asx Xaa Leu Xaa Xaa Xaa Xaa Xaa Asn His Arg Xaa Xaa Xaa Xaa Xaa
    50   55   60

Gly Xaa Leu Xaa Xaa Xaa Cys Xaa Xaa Leu Leu Xaa Xaa Phe Phe Xaa
65   70   75   80

Xaa Xaa Arg Xaa

<210> 106
<211> 84
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 106

Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr Val Thr Leu Glu Pro
1   5   10   15

Cys Val Met Cys Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val
            20   25   30

Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala Ala Gly Ser Leu Met
        35   40   45

Asp Val Leu His His Pro Gly Met Asn His Arg Val Glu Ile Thr Glu
    50   55   60

Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu Ser Asp Phe Phe Arg
65 70 75 80

Met Arg Arg Gln

<210> 107
<211> 84
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 107

Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu Tyr Val Thr Leu Glu Pro
1 5 10 15

Cys Val Met Cys Ala Gly Thr Ile Val Met Ser Arg Ile Pro Arg Val
20 25 30

Val Tyr Gly Ala Asp Asp Pro Lys Gly Gly Cys Ser Gly Ser Leu Met
35 40 45

Asn Leu Leu Gln Gln Ser Asn Phe Asn His Arg Ala Ile Val Asp Lys
50 55 60

Gly Val Leu Lys Glu Ala Cys Ser Thr Leu Leu Thr Thr Phe Phe Lys
65 70 75 80

Asn Leu Arg Ala

<210> 108
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 108

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val

1 5 10 15

Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
115 120 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
130 135 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
165 170 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
180 185 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
195 200 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu

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    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
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420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His

625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
690 695 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705 710 715 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
740 745 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
770 775 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785 790 795 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
805 810 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
820 825 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp

835 840 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
850 855 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865 870 875 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
885 890 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
900 905 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
915 920 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
930 935 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945 950 955 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
965 970 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
980 985 990

Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe Val Tyr
995 1000 1005

Gly Asp Tyr Lys Val Tyr Asp Val Ser Glu Gln Glu Ile Gly Lys
1010 1015 1020

Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro

1040 1045 1050

Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys
1055 1060 1065

Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln
1070 1075 1080

Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser
1085 1090 1095

Lys Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala
1100 1105 1110

Arg Lys Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser
1115 1120 1125

Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys
1130 1135 1140

Gly Lys Ser Lys Lys Leu Lys Ser Val Lys Glu Leu Leu Gly Ile
1145 1150 1155

Thr Ile Met Glu Arg Ser Ser Phe Glu Lys Asn Pro Ile Asp Phe
1160 1165 1170

Leu Glu Ala Lys Gly Tyr Lys Glu Val Lys Lys Asp Leu Ile Ile
1175 1180 1185

Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys
1190 1195 1200

Arg Met Leu Ala Ser Gly Glu Leu Gln Lys Gly Asn Glu Leu Ala
1205 1210 1215

Leu Pro Ser Lys Tyr Val Asn Phe Leu Tyr Leu Ala Ser His Tyr
1220 1225 1230

Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu

1235 1240 1245

Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln
1250 1255 1260

Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
1265 1270 1275

Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile
1280 1285 1290

Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn
1295 1300 1305

Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp
1355

<210> 109
<211> 1355
<212> PRT
<213> Streptococcus gallolyticus

<400> 109

Met Thr Lys Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser
1 5 10 15

Val Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys
20 25 30

Met Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu
35 40 45

```
Leu Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg
    50                  55                  60

Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu
65                  70                  75                  80

Arg Tyr Leu Gln Glu Ile Phe Ala Asn Glu Ile Ala Lys Val Asp Glu
                85                  90                  95

Ser Phe Phe Gln Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys
            100                 105                 110

Thr Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala
        115                 120                 125

Tyr His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala
    130                 135                 140

Asp Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala
145                 150                 155                 160

His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn
                165                 170                 175

Ala Glu Asn Thr Asp Val Gln Lys Ile Phe Ala Asp Phe Val Gly Val
            180                 185                 190

Tyr Asn Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp
        195                 200                 205

Val Ala Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu
    210                 215                 220

Asn Leu Ile Lys Tyr Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly
225                 230                 235                 240

Asn Leu Ile Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn
                245                 250                 255
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Phe Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala
        275                 280                 285

Asp Leu Phe Thr Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Lys Arg Tyr Val Glu His His Glu Asp Leu Glu Lys Leu
                325                 330                 335

Lys Glu Phe Ile Lys Ala Asn Lys Ser Glu Leu Tyr His Asp Ile Phe
            340                 345                 350

Lys Asp Lys Asn Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val
        355                 360                 365

Lys Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Ile Leu Ser Lys Ile
    370                 375                 380

Lys Ile Asp Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp
385                 390                 395                 400

Phe Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln
                405                 410                 415

Ile His Leu Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr
            420                 425                 430

Tyr Pro Phe Leu Lys Glu Lys Gln Asp Arg Ile Glu Lys Ile Leu Thr
        435                 440                 445

Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Val Arg Lys Asp Ser Arg
    450                 455                 460
```

```
Phe Ala Trp Ala Glu Tyr Arg Ser Asp Glu Lys Ile Thr Pro Trp Asn
465                 470                 475                 480

Phe Asp Lys Val Ile Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr
                485                 490                 495

Arg Met Thr Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro
            500                 505                 510

Lys His Ser His Val Tyr Glu Thr Tyr Ala Val Tyr Asn Glu Leu Thr
        515                 520                 525

Lys Ile Lys Tyr Val Asn Glu Gln Gly Lys Glu Ser Phe Phe Asp Ser
    530                 535                 540

Asn Met Lys Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys
545                 550                 555                 560

Val Thr Lys Glu Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Pro Glu
                565                 570                 575

Tyr Arg Ile Lys Asp Leu Ile Gly Leu Asp Lys Glu Asn Lys Ser Phe
            580                 585                 590

Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys
        595                 600                 605

Ala Phe Leu Asp Asp Lys Val Asn Glu Glu Val Ile Glu Asp Ile Ile
    610                 615                 620

Lys Thr Leu Thr Leu Phe Glu Asp Lys Asp Met Ile His Glu Arg Leu
625                 630                 635                 640

Gln Lys Tyr Ser Asp Ile Phe Thr Ala Asn Gln Leu Lys Lys Leu Glu
                645                 650                 655

Arg Arg His Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn
            660                 665                 670
```

```
Gly Ile Arg Asn Lys Glu Asn Asn Lys Thr Ile Leu Asp Tyr Leu Ile
        675                 680                 685

Asp Asp Gly Ser Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp
    690                 695                 700

Thr Leu Pro Phe Lys Gln Ile Ile Gln Lys Ser Gln Val Val Gly Asp
705                 710                 715                 720

Val Asp Asp Ile Glu Ala Val Val His Asp Leu Pro Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Lys Val Met Gly Gly Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Asn Arg Gly Arg Ser Gln Ser Gln Gln Arg Leu
    770                 775                 780

Lys Lys Leu Gln Asn Ser Leu Lys Pro Ser Tyr Ile Glu Asp Lys Val
785                 790                 795                 800

Glu Asn Ser His Leu Gln Asn Asp Gln Leu Phe Leu Tyr Tyr Ile Gln
                805                 810                 815

Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Asp Ile Asp His Leu
            820                 825                 830

Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asp Val Pro Ser Leu Asp Ile Val Arg Ala Arg Lys Ala
865                 870                 875                 880
```

```
Glu Trp Val Arg Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ala Arg Phe Asn Thr Glu His Asp Glu
    930                 935                 940

Asn Asp Lys Val Ile Arg Asp Val Lys Val Ile Thr Leu Lys Ser Asn
945                 950                 955                 960

Leu Val Ser Gln Phe Arg Lys Asp Phe Glu Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Leu Lys Lys Tyr  Pro Lys Leu Ala Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Glu Tyr Lys Lys Tyr  Asp Ile Ser Ser Asp  Lys Ala Thr
    1010                1015                1020

Ala Lys  Tyr Phe Phe Tyr Ser  Asn Leu Met Asn Phe  Phe Lys Thr
    1025                1030                1035

Lys Val  Lys Tyr Ala Asp Gly  Thr Val Phe Glu Arg  Pro Ile Ile
    1040                1045                1050

Glu Thr  Asn Ala Asp Gly Glu  Ile Ala Trp Asn Lys  Gln Ile Asp
    1055                1060                1065

Phe Glu  Lys Val Arg Lys Val  Leu Ser Tyr Pro Gln  Val Asn Ile
    1070                1075                1080
```

```
Val Lys  Lys Val Glu Thr Gln  Thr Gly Gly Phe Ser  Lys Glu Ser
    1085                1090                1095

Ile Leu  Pro Lys Gly Asp Ser  Asp Lys Leu Ile Pro  Arg Lys Thr
    1100                1105                1110

Lys Lys  Val Tyr Trp Asp Thr  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Phe Val Val Ala Asp  Val Glu Lys
    1130                1135                1140

Gly Lys  Ala Lys Lys Leu Lys  Thr Val Lys Glu Leu  Val Gly Ile
    1145                1150                1155

Ser Ile  Met Glu Arg Ser Phe  Phe Glu Glu Asn Pro  Val Glu Phe
    1160                1165                1170

Leu Glu  Asn Lys Gly Tyr His  Asn Ile Arg Glu Asp  Lys Leu Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Phe Glu Gly  Gly Arg Arg
    1190                1195                1200

Arg Leu  Leu Ala Ser Ala Ser  Glu Leu Gln Lys Gly  Asn Glu Met
    1205                1210                1215

Val Leu  Pro Gly Tyr Leu Val  Glu Leu Leu Tyr His  Ala His Arg
    1220                1225                1230

Ala Asp  Asn Phe Asn Ser Thr  Glu Tyr Leu Asn Tyr  Val Ser Glu
    1235                1240                1245

His Lys  Lys Glu Phe Glu Lys  Val Leu Ser Cys Val  Glu Asp Phe
    1250                1255                1260

Ala Asn  Leu Tyr Val Asp Val  Glu Lys Asn Leu Ser  Lys Ile Arg
    1265                1270                1275
```

```
Ala Val  Ala Asp Ser Met Asp  Asn Phe Ser Ile Glu  Glu Ile Ser
    1280                1285                1290


Asn Ser  Phe Ile Asn Leu Leu  Thr Leu Thr Ala Leu  Gly Ala Pro
    1295                1300                1305


Ala Asp  Phe Asn Phe Leu Gly  Glu Lys Ile Pro Arg  Lys Arg Tyr
    1310                1315                1320


Thr Ser  Thr Lys Glu Cys Leu  Asn Ala Thr Leu Ile  His Gln Ser
    1325                1330                1335


Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Lys Leu Gly
    1340                1345                1350


Glu Glu
    1355
```

<210> 110
<211> 1359
<212> PRT
<213> Streptococcus mitis

<400> 110

```
Lys Lys Gly Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                   10                  15


Phe Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met Lys
            20                  25                  30


Val Leu Gly Asn Thr Asp Lys Arg Phe Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45


Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Ala Arg Arg Leu Lys
    50                  55                  60


Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg Tyr
65                  70                  75                  80
```

```
Leu Gln Glu Ile Phe Ser Glu Glu Met Ser Lys Val Asp Ser Ser Phe
                85                  90                  95

Phe His Arg Leu Asp Asp Ser Phe Leu Ile Pro Glu Asp Lys Arg Glu
            100                 105                 110

Ser Lys Tyr Pro Ile Phe Ala Thr Leu Thr Glu Glu Lys Glu Tyr His
        115                 120                 125

Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp Ser
    130                 135                 140

Lys Glu Lys Thr Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ala Phe Asp Ile Lys
                165                 170                 175

Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr Asp
            180                 185                 190

Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val Glu
        195                 200                 205

Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg Val
    210                 215                 220

Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu Phe
225                 230                 235                 240

Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe Asp
                245                 250                 255

Leu Glu Asp Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp Glu
            260                 265                 270

Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Thr Asp Leu
        275                 280                 285
```

```
Phe Val Ser Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly Ile
    290                 295                 300

Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Glu Arg Tyr Glu Asn His Gln Asn Asp Leu Ala Ala Leu Lys Gln
                325                 330                 335

Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser Asp
            340                 345                 350

Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr Gln
        355                 360                 365

Glu Thr Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu Gly
    370                 375                 380

Thr Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gln
                405                 410                 415

Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu Tyr Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp Leu
    450                 455                 460

Thr Arg Asn Ser Asp Glu Ala Ile Arg Pro Trp Asn Phe Glu Glu Ile
465                 470                 475                 480

Val Asp Lys Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr Asn
                485                 490                 495
```

```
Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys Phe
        515                 520                 525

Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln Lys
    530                 535                 540

Lys Gln Ile Val Asn Gln Leu Phe Lys Glu Asn Arg Lys Val Thr Glu
545                 550                 555                 560

Lys Asp Ile Ile His Tyr Leu His Asn Val Asp Gly Tyr Asp Gly Ile
                565                 570                 575

Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asp Ala
        595                 600                 605

Lys Asn Glu Ala Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile Phe
    610                 615                 620

Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Ser Leu
625                 630                 635                 640

Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Cys Asp Lys Gln
            660                 665                 670

Thr Gly Asn Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Lys Ile Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys Glu
    690                 695                 700
```

```
Ile Ile Gln Lys Ala Gln Val Ile Gly Lys Thr Asp Asp Val Lys Gln
705                 710                 715                 720

Val Val Gln Glu Leu Ser Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Ala
            740                 745                 750

Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Ala
        755                 760                 765

Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp Ser
    770                 775                 780

Leu Lys Ile Leu Ala Ser Asn Ile Leu Lys Glu Asn Pro Thr Asp Asn
785                 790                 795                 800

Asn Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Lys Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asn Gln Leu Ser Ser
            820                 825                 830

Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser
        835                 840                 845

Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Ile Glu Val Val Gln Lys Arg Lys Ala Phe Trp
865                 870                 875                 880

Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val Gly
            900                 905                 910
```

```
Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ala Arg Tyr Asn Thr Glu Val Asn Glu Lys Asp
    930                 935                 940

Lys Lys Asn Arg Thr Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val
945                 950                 955                 960

Ser Asn Phe Arg Lys Glu Phe Arg Leu Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys
            980                 985                 990

Ala Ile Leu Lys Lys Tyr Pro Lys  Leu Glu Pro Glu Phe  Val Tyr Gly
        995                 1000                1005

Glu Tyr  Gln Lys Tyr Asp Leu  Ser Lys Asp Pro Lys  Glu Val Glu
    1010                1015                1020

Lys Ala  Thr Glu Lys Tyr Phe  Phe Tyr Ser Asn Leu  Leu Asn Phe
    1025                1030                1035

Phe Lys  Glu Glu Val His Tyr  Ala Asp Gly Thr Ile  Val Lys Arg
    1040                1045                1050

Glu Asn  Ile Glu Tyr Ser Lys  Asp Thr Gly Glu Ile  Ala Trp Asn
    1055                1060                1065

Lys Glu  Lys Asp Phe Ala Ile  Ile Lys Lys Val Leu  Ser Leu Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Arg Glu Val Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Pro  Lys Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110
```

```
Pro Arg  Lys Thr Lys Asp Ile  Leu Leu Asp Thr Thr  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Val Ile  Ala Tyr Ser Ile Leu  Leu Ile Ala
    1130                1135                1140

Asp Ile  Glu Lys Gly Lys Ala  Lys Lys Leu Lys Thr  Val Lys Thr
    1145                1150                1155

Leu Val  Gly Ile Thr Ile Met  Glu Lys Ala Ala Phe  Glu Glu Asn
    1160                1165                1170

Pro Ile  Thr Phe Leu Glu Asn  Lys Gly Tyr His Asn  Val Arg Lys
    1175                1180                1185

Glu Asn  Ile Leu Cys Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Lys Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Ile Val Leu Pro  Val Tyr Leu Thr Thr  Leu Leu Tyr
    1220                1225                1230

His Ser  Lys Asn Val His Lys  Leu Asp Glu Pro Gly  His Leu Glu
    1235                1240                1245

Tyr Ile  Gln Lys His Arg Asn  Glu Phe Lys Asp Leu  Leu Asn Leu
    1250                1255                1260

Val Ser  Glu Phe Ser Gln Lys  Tyr Val Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Glu Lys  Ile Lys Ser Leu Tyr  Ala Asp Asn Glu Gln  Ala Asp Ile
    1280                1285                1290

Glu Ile  Leu Ala Asn Ser Phe  Ile Asn Leu Leu Thr  Phe Thr Ala
    1295                1300                1305
```

```
Leu Gly  Ala Pro Ala Ala Phe  Lys Phe Phe Gly Lys  Asp Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Thr Val  Ser Glu Ile Leu Asn  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Trp  Ile Asp Leu
    1340                1345                1350


Ser Lys  Leu Gly Glu Asp
    1355
```

<210> 111
<211> 986
<212> PRT
<213> Staphylococcus Aureus

<400> 111

```
Met Lys Arg Asn Tyr Ile Leu Gly Leu Asp Ile Gly Ile Thr Ser Val
1               5                   10                  15


Gly Tyr Gly Ile Ile Asp Tyr Glu Thr Arg Asp Val Ile Asp Ala Gly
            20                  25                  30


Val Arg Leu Phe Lys Glu Ala Asn Val Glu Asn Asn Glu Gly Arg Arg
        35                  40                  45


Ser Lys Arg Gly Ala Arg Arg Leu Lys Arg Arg Arg Arg His Arg Ile
    50                  55                  60


Gln Arg Val Lys Lys Leu Leu Phe Asp Tyr Asn Leu Leu Thr Asp His
65                  70                  75                  80


Ser Glu Leu Ser Gly Asn Pro Tyr Glu Ala Arg Val Lys Gly Leu Ser
                85                  90                  95


Gln Lys Leu Ser Glu Glu Glu Phe Ser Ala Ala Leu Leu His Leu Ala
            100                 105                 110
```

```
Lys Arg Arg Gly Val His Asn Val Asn Glu Val Glu Glu Asp Thr Gly
        115                 120                 125

Asn Glu Leu Ser Thr Lys Glu Gln Ile Ser Arg Asn Ser Lys Leu Glu
    130                 135                 140

Glu Lys Tyr Val Ala Glu Leu Gln Leu Glu Arg Leu Lys Lys Asp Gly
145                 150                 155                 160

Glu Val Arg Gly Ser Ile Asn Arg Lys Thr Ser Asp Tyr Val Lys Glu
                165                 170                 175

Ala Lys Gln Leu Leu Lys Val Gln Lys Ala Tyr His Gln Leu Asp Gln
            180                 185                 190

Ser Phe Ile Asp Thr Tyr Ile Asp Leu Leu Glu Thr Arg Arg Thr Tyr
        195                 200                 205

Tyr Glu Gly Pro Gly Glu Gly Ser Pro Phe Gly Trp Lys Asp Ile Lys
    210                 215                 220

Glu Trp Tyr Glu Met Leu Met Gly His Cys Thr Tyr Phe Pro Glu Glu
225                 230                 235                 240

Leu Arg Ser Val Lys Tyr Ala Tyr Asn Ala Asp Leu Tyr Asn Ala Leu
                245                 250                 255

Asn Asp Leu Asn Asn Leu Val Ile Thr Arg Asp Glu Asn Glu Lys Leu
            260                 265                 270

Glu Tyr Tyr Glu Lys Phe Gln Ile Ile Glu Asn Val Phe Lys Gln Lys
        275                 280                 285

Lys Lys Pro Thr Leu Lys Gln Ile Ala Lys Glu Ile Leu Val Asn Glu
    290                 295                 300

Glu Asp Ile Lys Gly Tyr Arg Val Thr Ser Thr Gly Lys Pro Glu Phe
305                 310                 315                 320
```

```
Thr Asn Leu Lys Val Tyr His Asp Ile Lys Asp Ile Thr Ala Arg Lys
                325                 330                 335

Glu Asn Ala Glu Leu Leu Asp Gln Ile Ala Lys Ile Leu Thr Ile Tyr
            340                 345                 350

Gln Ser Ser Glu Asp Ile Gln Glu Glu Leu Thr Asn Leu Asn Ser Glu
        355                 360                 365

Leu Thr Gln Glu Glu Ile Glu Gln Ile Ser Asn Leu Lys Gly Tyr Thr
    370                 375                 380

Gly Thr His Asn Leu Ser Leu Lys Ala Ile Asn Leu Ile Leu Asp Glu
385                 390                 395                 400

Leu Trp Thr Asn Asp Asn Gln Ile Ala Ile Phe Asn Arg Leu Lys Leu
                405                 410                 415

Val Pro Lys Lys Val Asp Leu Ser Gln Gln Lys Glu Ile Pro Thr Thr
            420                 425                 430

Leu Val Asp Asp Phe Ile Leu Ser Pro Val Val Lys Arg Ser Phe Ile
        435                 440                 445

Gln Ser Ile Lys Val Ile Asn Ala Ile Ile Lys Lys Tyr Gly Leu Pro
    450                 455                 460

Asn Asp Ile Ile Ile Glu Leu Ala Arg Glu Lys Asn Ser Lys Asp Ala
465                 470                 475                 480

Gln Lys Met Ile Asn Glu Met Gln Lys Gln Thr Asn Glu Glu Ile Ile
                485                 490                 495

Arg Thr Thr Gly Lys Glu Asn Ala Lys Tyr Leu Ile Glu Lys Ile Lys
            500                 505                 510

Leu His Asp Met Gln Glu Gly Lys Cys Leu Tyr Ser Leu Glu Ala Ile
        515                 520                 525
```

```
Pro Leu Glu Asp Leu Leu Asn Asn Pro Phe Asn Tyr Glu Val Asp His
    530                 535                 540

Ile Ile Pro Arg Ser Val Ser Phe Asp Asn Ser Phe Asn Asn Lys Val
545                 550                 555                 560

Leu Val Lys Gln Glu Glu Ala Ser Lys Lys Gly Asn Arg Thr Pro Phe
                565                 570                 575

Gln Tyr Leu Ser Ser Ser Asp Ser Lys Ile Ser Tyr Glu Thr Phe Lys
            580                 585                 590

Lys His Ile Leu Asn Leu Ala Lys Gly Lys Gly Arg Ile Ser Lys Thr
        595                 600                 605

Lys Lys Glu Tyr Leu Leu Glu Glu Arg Asp Gln Lys Asp Phe Ile Asn
    610                 615                 620

Arg Asn Leu Val Asp Thr Arg Tyr Ala Thr Arg Gly Leu Met Asn Leu
625                 630                 635                 640

Leu Arg Ser Tyr Phe Arg Val Asn Asn Leu Asp Val Lys Val Lys Ser
                645                 650                 655

Ile Asn Gly Gly Phe Thr Ser Phe Leu Arg Arg Lys Trp Lys Phe Lys
            660                 665                 670

Lys Glu Arg Asn Lys Gly Tyr Lys His His Ala Glu Asp Ala Leu Ile
        675                 680                 685

Ile Ala Asn Ala Asp Phe Ile Phe Lys Glu Trp Lys Lys Leu Asp Lys
    690                 695                 700

Asn Gln Met Phe Glu Glu Lys Glu Thr Glu Gln Glu Tyr Lys Glu Ile
705                 710                 715                 720

Phe Ile Thr Pro His Gln Ile Lys His Ile Lys Asp Phe Lys Asp Tyr
                725                 730                 735
```

```
Lys Tyr Ser His Arg Val Asp Lys Lys Pro Asn Arg Glu Val Asn Asn
            740                 745                 750

Leu Asn Gly Leu Tyr Asp Lys Asp Asn Asp Lys Leu Lys Lys Leu Ile
        755                 760                 765

Asn Lys Ser Pro Glu Lys Leu Leu Met Tyr His His Asp Pro Gln Thr
    770                 775                 780

Tyr Gln Lys Lys Leu Ile Met Glu Gln Tyr Gly Asp Glu Lys Asn Leu
785                 790                 795                 800

Tyr Lys Tyr Tyr Glu Glu Thr Gly Asn Tyr Leu Thr Lys Tyr Ser Lys
                805                 810                 815

Lys Asp Asn Gly Pro Val Ile Lys Lys Ile Lys Tyr Tyr Gly Asn Lys
            820                 825                 830

Leu Asn Ala His Leu Asp Ile Thr Asp Asp Tyr Pro Asn Ser Val Lys
        835                 840                 845

Leu Ser Leu Lys Pro Tyr Arg Phe Asp Val Tyr Leu Asp Asn Gly Val
    850                 855                 860

Tyr Lys Phe Val Thr Val Lys Asn Leu Asp Val Ile Lys Lys Glu Asn
865                 870                 875                 880

Tyr Tyr Glu Val Asn Ser Lys Ala Tyr Glu Glu Ala Lys Lys Lys Lys
                885                 890                 895

Ile Ser Asn Gln Ala Glu Phe Ile Ala Ser Phe Tyr Asn Asn Asp Leu
            900                 905                 910

Ile Lys Ile Asn Gly Glu Leu Tyr Arg Val Ile Gly Val Asn Asn Asp
        915                 920                 925

Leu Leu Asn Arg Ile Glu Val Asn Met Ile Asp Ile Thr Tyr Arg Glu
    930                 935                 940
```

```
Tyr Leu Glu Asn Met Asn Asp Lys Arg Pro Pro Arg Ile Ile Lys Thr
945                 950                 955                 960


Ile Ala Ser Lys Thr Gln Ser Ile Lys Lys Leu Tyr Glu Val Lys Ser
                965                 970                 975


Lys Lys His Pro Gln Ile Ile Lys Lys Gly
            980                 985


<210>  112
<211>  1044
<212>  PRT
<213>  Streptococcus pyogenes

<400>  112

Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu
1               5                   10                  15


Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys
            20                  25                  30


Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp
        35                  40                  45


Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu
    50                  55                  60


Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu
65                  70                  75                  80


Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His
                85                  90                  95


Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp
            100                 105                 110


Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu
        115                 120                 125


Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser
```

```
    130                 135                 140

Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp
145                 150                 155                 160

Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile
                165                 170                 175

Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu
            180                 185                 190

Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu
        195                 200                 205

Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu
    210                 215                 220

Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn
225                 230                 235                 240

Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile
                245                 250                 255

Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn
            260                 265                 270

Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys
        275                 280                 285

Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val
    290                 295                 300

Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu
305                 310                 315                 320

Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys
                325                 330                 335

Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn
```

340 345 350

Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys
355 360 365

Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser
370 375 380

Leu Thr Phe Lys Glu Asp Leu Gln Lys Ala Gln Val Ser Gly Gln Gly
385 390 395 400

Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile
405 410 415

Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys
420 425 430

Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg
435 440 445

Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met
450 455 460

Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys
465 470 475 480

Glu Tyr Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu
485 490 495

Tyr Tyr Leu Gln Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp
500 505 510

Ile Asn Arg Leu Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser
515 520 525

Phe Leu Lys Asp Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp
530 535 540

Lys Asn Arg Gly Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys

545 550 555 560

Lys Met Lys Asn Tyr Trp Lys Gln Leu Leu Asn Ala Lys Leu Ile Thr
565 570 575

Gln Arg Lys Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser
580 585 590

Glu Leu Asp Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg
595 600 605

Gln Ile Thr Lys His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr
610 615 620

Lys Tyr Asp Glu Asn Asp Lys Leu Ile Arg Glu Val Arg Val Ile Thr
625 630 635 640

Leu Lys Ser Lys Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr
645 650 655

Lys Val Arg Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu
660 665 670

Asn Ala Val Val Gly Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu
675 680 685

Ser Glu Phe Val Tyr Gly Asp Tyr Lys Val Tyr Asp Ile Ser Glu Gln
690 695 700

Glu Ile Gly Lys Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn Ile Met
705 710 715 720

Asn Phe Phe Lys Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys
725 730 735

Arg Pro Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp
740 745 750

Lys Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln

```
        755                 760                 765

Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser Lys
    770                 775                 780

Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala Arg Lys
785                 790                 795                 800

Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser Pro Thr Val
                805                 810                 815

Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys Gly Lys Ser Lys
            820                 825                 830

Lys Leu Lys Ser Val Lys Glu Leu Val Gly Ile Thr Ile Met Glu Arg
        835                 840                 845

Ser Ser Phe Glu Lys Asp Pro Val Asp Phe Leu Glu Ala Lys Gly Tyr
    850                 855                 860

Lys Glu Val Arg Lys Asp Leu Ile Ile Lys Leu Pro Lys Tyr Ser Leu
865                 870                 875                 880

Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Leu Ala Ser Gly Glu Leu
                885                 890                 895

Gln Lys Gly Asn Glu Leu Ala Leu Pro Ser Lys Tyr Val Asn Phe Leu
            900                 905                 910

Tyr Leu Ala Ser His Tyr Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn
        915                 920                 925

Glu Gln Lys Gln Leu Phe Val Glu Gln His Lys His Tyr Leu Asp Glu
    930                 935                 940

Ile Ile Glu Gln Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp
945                 950                 955                 960

Ala Asn Leu Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys
```

965 970 975

Pro Ile Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr
980 985 990

Asn Leu Gly Ala Pro Ala Ala Phe Lys Cys Phe Asp Thr Thr Ile Gly
995 1000 1005

Arg Asn Arg Tyr Lys Ser Ile Lys Glu Val Leu Asp Ala Thr Leu
1010 1015 1020

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1025 1030 1035

Ser Gln Leu Gly Gly Asp
1040

<210> 113
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 113

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

```
Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300
```

```
Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510
```

```
Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720
```

```
His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925
```

```
Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125
```

```
Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320
```

```
Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 114
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 114

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Leu
            20                  25                  30


Lys Gly Leu Gly Asn Thr Asp Arg His Gly Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125
```

```
His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Val Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Thr Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335
```

```
Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro Tyr Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540
```

```
Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750
```

```
Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Val
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Arg Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960
```

```
Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155
```

```
Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asp Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320

Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335

Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350
```

Ser Gln Leu Gly Gly Asp
    1355

<210> 115
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 115

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20   25   30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35   40   45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65   70   75   80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85   90   95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100   105   110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115   120   125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130   135   140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145   150   155   160

```
Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Leu Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365
```

```
Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575
```

```
Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780
```

```
Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asn Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990
```

```
Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005


Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020


Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035


Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050


Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065


Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080


Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095


Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110


Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125


Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140


Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155


Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170


Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Val
    1175                1180                1185
```

```
Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200


Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215


Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230


Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245


Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260


Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Phe
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355


<210>  116
<211>  1359
<212>  PRT
<213>  Streptococcus pyogenes
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<400> 116

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Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
```

195 200 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
210 215 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225 230 235 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
245 250 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
260 265 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
275 280 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
290 295 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305 310 315 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
325 330 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
340 345 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
355 360 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
370 375 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly

405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu

```
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
```

```
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
```

```
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
```

1220 1225 1230

Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu
1235 1240 1245

Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln
1250 1255 1260

Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
1265 1270 1275

Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile
1280 1285 1290

Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn
1295 1300 1305

Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp
1355

<210> 117
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 117

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

```
Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Ile Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240
```

```
Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Leu Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445
```

```
Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655
```

```
Val Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860
```

```
Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065
```

```
Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260
```

```
Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                 1270                 1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                 1285                 1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                 1300                 1305


Leu Gly  Ala Pro Thr Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                 1315                 1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Phe
    1325                 1330                 1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                 1345                 1350


Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 118
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 118

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Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Ile Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270
```

```
Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480
```

```
Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685
```

```
Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Leu Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Thr Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Lys Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895
```

```
Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Arg Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Ile Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095
```

```
Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Val Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asp Pro  Val Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290
```

```
Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                 1300                 1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Cys Phe Asp Thr  Thr Ile Gly
    1310                 1315                 1320


Arg Asn  Arg Tyr Lys Ser Ile  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                 1330                 1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                 1345                 1350


Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 119
<211> 1358
<212> PRT
<213> Streptococcus pyogenes

<400> 119

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Gly Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95
```

```
Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Ile Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300
```

```
Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320


Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335


Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350


Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365


Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380


Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400


Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415


Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430


Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445


Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460


Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480


Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495


Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510
```

```
Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Ala
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Gly Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720
```

```
Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925
```

```
Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1085                1090                1095

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1100                1105                1110

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1115                1120                1125
```

```
Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1130                1135                1140

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1145                1150                1155

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1160                1165                1170

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1175                1180                1185

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1190                1195                1200

Met Leu  Ala Ser Gly Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                1210                1215

Pro Ser  Lys Tyr Val Asn Phe  Leu Tyr Leu Ala Ser  His Tyr Glu
    1220                1225                1230

Lys Leu  Lys Gly Ser Pro Glu  Asp Asn Glu Gln Lys  Gln Leu Phe
    1235                1240                1245

Val Glu  Gln His Lys His Tyr  Leu Asp Glu Ile Ile  Glu Gln Ile
    1250                1255                1260

Ser Glu  Phe Ser Lys Arg Val  Ile Leu Ala Asp Ala  Asn Leu Asp
    1265                1270                1275

Lys Val  Leu Ser Ala Tyr Asn  Lys His Arg Asp Lys  Pro Ile Arg
    1280                1285                1290

Glu Gln  Ala Glu Asn Ile Ile  His Leu Phe Thr Leu  Thr Asn Leu
    1295                1300                1305

Gly Ala  Pro Ala Ala Phe Lys  Tyr Phe Asp Thr Thr  Ile Asp Arg
    1310                1315                1320
```

Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu Ile
1325 1330 1335

His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser
1340 1345 1350

Gln Leu Gly Gly Asp
1355

<210> 120
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 120

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
115 120 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp

130 135 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
165 170 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
180 185 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
195 200 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
210 215 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225 230 235 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
245 250 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
260 265 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
275 280 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
290 295 300

Leu Arg Leu Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305 310 315 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
325 330 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp

340 345 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
355 360 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
370 375 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val

545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
690 695 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705 710 715 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
740 745 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr

```
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
```

965 970 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
980 985 990

Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe Val Tyr
995 1000 1005

Gly Asp Tyr Lys Val Tyr Asp Val Ser Glu Gln Glu Ile Gly Lys
1010 1015 1020

Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro
1040 1045 1050

Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys
1055 1060 1065

Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln
1070 1075 1080

Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser
1085 1090 1095

Lys Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala
1100 1105 1110

Arg Lys Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser
1115 1120 1125

Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys
1130 1135 1140

Gly Lys Ser Lys Lys Leu Lys Ser Val Lys Glu Leu Leu Gly Leu
1145 1150 1155

Thr Ile Met Glu Arg Ser Ser Phe Glu Lys Asn Pro Ile Asp Phe

```
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320

Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335

Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350

Ser Gln  Leu Gly Gly Asp
```

1355

<210> 121
<211> 1358
<212> PRT
<213> Streptococcus pyogenes

<400> 121

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Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Leu
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Gly Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Val Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175
```

```
Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380
```

```
Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro Tyr Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Thr Ser Leu Gly Thr
            580                 585                 590
```

```
Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Lys Tyr Ala Asn
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800
```

```
Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005
```

```
Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1085                1090                1095

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1100                1105                1110

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1115                1120                1125

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1130                1135                1140

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1145                1150                1155

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1160                1165                1170

Glu Ala  Lys Gly Tyr Lys Glu  Val Arg Lys Asp Leu  Ile Ile Lys
    1175                1180                1185

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1190                1195                1200
```

```
Met Leu  Ala Ser Gly Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                 1210                 1215

Pro Ser  Lys Tyr Val Asn Phe  Leu Tyr Leu Ala Ser  His Tyr Glu
    1220                 1225                 1230

Lys Leu  Lys Gly Ser Pro Glu  Asp Asn Glu Gln Lys  Gln Leu Phe
    1235                 1240                 1245

Val Glu  Gln His Lys His Tyr  Leu Asp Glu Ile Ile  Glu Gln Ile
    1250                 1255                 1260

Ser Glu  Phe Ser Lys Arg Val  Ile Leu Ala Asp Ala  Asn Leu Asp
    1265                 1270                 1275

Lys Val  Leu Ser Ala Tyr Asn  Lys His Arg Asp Lys  Pro Ile Arg
    1280                 1285                 1290

Glu Gln  Ala Lys Asn Ile Ile  His Leu Phe Thr Leu  Thr Asn Leu
    1295                 1300                 1305

Gly Ala  Pro Ala Ala Phe Lys  Tyr Phe Asp Thr Thr  Ile Glu Arg
    1310                 1315                 1320

Asn Arg  Tyr Lys Ser Ile Lys  Glu Val Leu Asp Ala  Thr Leu Ile
    1325                 1330                 1335

His Gln  Ser Ile Thr Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser
    1340                 1345                 1350

Gln Leu  Gly Gly Asp
    1355
```

<210> 122
<211> 1358
<212> PRT
<213> Streptococcus pyogenes

<400> 122

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Leu
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Gly Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Val Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205
```

```
Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro Tyr Gln Ile His Leu Gly
                405                 410                 415
```

```
Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Thr Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620
```

```
Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Lys Tyr Ala Asn
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830
```

```
Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035
```

```
Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1085                1090                1095

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1100                1105                1110

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1115                1120                1125

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1130                1135                1140

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1145                1150                1155

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1160                1165                1170

Glu Ala  Lys Gly Tyr Lys Glu  Val Arg Lys Asp Leu  Ile Ile Lys
    1175                1180                1185

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1190                1195                1200

Met Leu  Ala Ser Gly Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                1210                1215

Pro Ser  Lys Tyr Val Asn Phe  Leu Tyr Leu Ala Ser  His Tyr Glu
    1220                1225                1230
```

```
Lys Leu  Lys Gly Ser Pro Glu  Asp Asn Glu Gln Lys  Gln Leu Phe
    1235                 1240                 1245


Val Glu  Gln His Lys His Tyr  Leu Asp Glu Ile Ile  Glu Gln Ile
    1250                 1255                 1260


Ser Glu  Phe Ser Lys Arg Val  Ile Leu Ala Asp Ala  Asn Leu Asp
    1265                 1270                 1275


Lys Val  Leu Ser Ala Tyr Asn  Lys His Arg Asp Lys  Pro Ile Arg
    1280                 1285                 1290


Glu Gln  Ala Lys Asn Ile Ile  His Leu Phe Thr Leu  Thr Asn Leu
    1295                 1300                 1305


Gly Ala  Pro Ala Ala Phe Lys  Tyr Phe Asp Thr Thr  Ile Glu Arg
    1310                 1315                 1320


Asn Arg  Tyr Lys Ser Ile Lys  Glu Val Leu Asp Ala  Thr Leu Ile
    1325                 1330                 1335


His Gln  Ser Ile Thr Gly Leu  Tyr Glu Ile Arg Ile  Asp Leu Ser
    1340                 1345                 1350


Gln Leu  Gly Gly Asp
    1355


<210>  123
<211>  1359
<212>  PRT
<213>  Streptococcus pyogenes

<400>  123

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30
```

```
Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240
```

```
Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Ser Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445
```

```
Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655
```

```
Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Leu Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860
```

```
Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880


Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895


Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910


Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925


Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940


Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960


Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975


Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990


Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005


Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020


Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035


Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050


Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065
```

```
Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260
```

```
Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Gly
    1310                1315                1320


Arg Asn  Arg Tyr Lys Ser Ile  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355


<210>  124
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<212>  PRT
<213>  Streptococcus pyogenes

<400>  124

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Gly Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
```

```
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Val Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
```

```
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Thr Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro Tyr Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
```

485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu

```
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
```

900 905 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
915 920 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
930 935 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945 950 955 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
965 970 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
980 985 990

Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe Val Tyr
995 1000 1005

Gly Asp Tyr Lys Val Tyr Asp Val Ser Glu Gln Glu Ile Gly Lys
1010 1015 1020

Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro
1040 1045 1050

Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys
1055 1060 1065

Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln
1070 1075 1080

Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser
1085 1090 1095

Lys Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala

1100 1105 1110

Arg Lys Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser
1115 1120 1125

Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys
1130 1135 1140

Gly Lys Ser Lys Lys Leu Lys Ser Val Lys Glu Leu Leu Gly Ile
1145 1150 1155

Thr Ile Met Glu Arg Ser Ser Phe Glu Lys Asn Pro Ile Asp Phe
1160 1165 1170

Leu Glu Ala Lys Gly Tyr Lys Glu Val Arg Lys Asp Leu Ile Ile
1175 1180 1185

Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys
1190 1195 1200

Arg Met Leu Ala Ser Gly Glu Leu Gln Lys Gly Asn Glu Leu Ala
1205 1210 1215

Leu Pro Ser Lys Tyr Val Asn Phe Leu Tyr Leu Ala Ser His Tyr
1220 1225 1230

Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu
1235 1240 1245

Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln
1250 1255 1260

Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
1265 1270 1275

Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile
1280 1285 1290

Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn

1295 1300 1305

Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp
1355

<210> 125
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 125

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

```
His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320
```

```
Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525
```

```
Val Thr Glu Gly Met Arg Lys Pro Glu Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735
```

```
Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Lys Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940
```

```
Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140
```

```
Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305

Phe Gly  Ala Pro Ala Ala Phe  Ile Tyr Phe Asp Thr  Thr Ile Gly
    1310                1315                1320

Arg Asn  Arg Tyr Lys Ser Ile  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335
```

```
Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 126
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 126

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Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Ile Ala Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125


His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140
```

```
Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350
```

```
Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560
```

```
Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Leu Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765
```

```
Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Lys Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Arg Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975
```

```
Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990


Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005


Gly Asp  Tyr Lys Val Tyr Asp  Ile Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020


Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035


Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050


Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065


Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080


Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095


Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110


Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125


Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140


Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Val Gly Ile
    1145                1150                1155


Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asp Pro  Val Asp Phe
    1160                1165                1170
```

```
Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Gly
    1310                1315                1320

Arg Asn  Arg Tyr Lys Ser Ile  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335

Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350

Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 127
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 127

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Ile Ala Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125


His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140


Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160


Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gly Leu Asn Pro
                165                 170                 175
```

```
Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380
```

```
Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400


Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415


Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430


Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445


Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460


Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480


Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495


Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510


Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525


Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540


Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560


Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575


Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590
```

```
Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605


Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620


Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640


Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655


Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670


Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685


Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700


Asp Leu Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720


His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735


Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750


Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765


Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780


Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800
```

```
Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Lys Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Arg Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005
```

```
Gly Asp  Tyr Lys Val Tyr Asp  Ile Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Val Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asp Pro  Val Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200
```

```
Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                 1210                 1215


Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                 1225                 1230


Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                 1240                 1245


Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                 1255                 1260


Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                 1270                 1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                 1285                 1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                 1300                 1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Gly
    1310                 1315                 1320


Arg Asn  Arg Tyr Lys Ser Ile  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                 1330                 1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                 1345                 1350


Ser Gln  Leu Gly Gly Asp
    1355


<210>  128
<211>  1359
<212>  PRT
<213>  Streptococcus pyogenes

<400>  128

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
```

```
1               5                   10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Asn Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
```

210 215 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225 230 235 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
245 250 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
260 265 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
275 280 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
290 295 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305 310 315 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
325 330 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
340 345 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
355 360 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
370 375 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu

420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His

625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
690 695 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705 710 715 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
740 745 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
770 775 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785 790 795 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
805 810 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
820 825 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp

```
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
```

1040 1045 1050

Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys
1055 1060 1065

Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln
1070 1075 1080

Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser
1085 1090 1095

Lys Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala
1100 1105 1110

Arg Lys Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser
1115 1120 1125

Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys
1130 1135 1140

Gly Lys Ser Lys Lys Leu Lys Ser Val Lys Glu Leu Leu Gly Ile
1145 1150 1155

Thr Ile Met Glu Arg Ser Ser Phe Glu Lys Asn Pro Ile Asp Phe
1160 1165 1170

Leu Glu Ala Lys Gly Tyr Lys Glu Val Lys Lys Asp Leu Ile Ile
1175 1180 1185

Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys
1190 1195 1200

Arg Met Leu Ala Ser Gly Glu Leu Gln Lys Gly Asn Glu Leu Ala
1205 1210 1215

Leu Pro Ser Lys Tyr Val Asn Phe Leu Tyr Leu Ala Ser His Tyr
1220 1225 1230

Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu

1235 1240 1245

Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln
1250 1255 1260

Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
1265 1270 1275

Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile
1280 1285 1290

Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn
1295 1300 1305

Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp
1355

<210> 129
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 129

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

```
Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Leu Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255
```

```
Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460
```

```
Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Lys Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670
```

```
Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880
```

```
Trp Lys Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Arg Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080
```

```
Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275
```

```
Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 130
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 130

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Ile Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80
```

```
Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285
```

```
Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Leu Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Lys Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495
```

```
Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700
```

```
Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910
```

```
Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110
```

```
Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305
```

```
Leu Gly  Ala Pro Thr Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Phe
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355


<210>  131
<211>  1184
<212>  PRT
<213>  Streptococcus pyogenes

<400>  131

Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr
1               5                   10                  15


Tyr Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala
            20                  25                  30


Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn
        35                  40                  45


Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn
    50                  55                  60


Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe
65                  70                  75                  80


Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp
                85                  90                  95


Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp
            100                 105                 110
```

```
Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp
        115                 120                 125

Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser
    130                 135                 140

Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys
145                 150                 155                 160

Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe
                165                 170                 175

Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser
            180                 185                 190

Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp
        195                 200                 205

Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg
    210                 215                 220

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
225                 230                 235                 240

Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe
                245                 250                 255

Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
            260                 265                 270

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp
        275                 280                 285

Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu
    290                 295                 300

Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr
305                 310                 315                 320
```

```
Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
                325                 330                 335

Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
            340                 345                 350

Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln
        355                 360                 365

Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr
    370                 375                 380

Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp
385                 390                 395                 400

Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly
                405                 410                 415

Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp
            420                 425                 430

Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr
        435                 440                 445

Leu Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala
    450                 455                 460

His Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr
465                 470                 475                 480

Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp
                485                 490                 495

Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala
            500                 505                 510

Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys
        515                 520                 525
```

```
Glu Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His
    530                 535                 540

Glu His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
545                 550                 555                 560

Leu Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg
                565                 570                 575

His Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
            580                 585                 590

Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu
        595                 600                 605

Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val
    610                 615                 620

Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln
625                 630                 635                 640

Asn Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu
                645                 650                 655

Ser Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp
            660                 665                 670

Asp Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly
        675                 680                 685

Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn
    690                 695                 700

Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe
705                 710                 715                 720

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys
                725                 730                 735
```

```
Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
            740                 745                 750

His Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu
        755                 760                 765

Asn Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys
    770                 775                 780

Leu Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu
785                 790                 795                 800

Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
                805                 810                 815

Gly Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe Val
            820                 825                 830

Tyr Gly Asp Tyr Lys Val Tyr Asp Val Ser Glu Gln Glu Ile Gly Lys
        835                 840                 845

Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe Lys
    850                 855                 860

Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro Leu Ile
865                 870                 875                 880

Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys Gly Arg Asp
                885                 890                 895

Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln Val Asn Ile Val
            900                 905                 910

Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser Lys Glu Ser Ile Leu
        915                 920                 925

Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala Arg Lys Lys Asp Trp Asp
    930                 935                 940
```

```
Pro Lys Lys Tyr Gly Gly Phe Asp Ser Pro Thr Val Ala Tyr Ser Val
945                 950                 955                 960


Leu Val Val Ala Lys Val Glu Lys Gly Lys Ser Lys Lys Leu Lys Ser
                965                 970                 975


Val Lys Glu Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Ser Phe Glu
            980                 985                 990


Lys Asn Pro Ile Asp Phe Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys
        995                 1000                1005


Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu
    1010                1015                1020


Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys
    1025                1030                1035


Gly Asn  Glu Leu Ala Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr
    1040                1045                1050


Leu Ala  Ser His Tyr Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn
    1055                1060                1065


Glu Gln  Lys Gln Leu Phe Val  Glu Gln His Lys His  Tyr Leu Asp
    1070                1075                1080


Glu Ile  Ile Glu Gln Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu
    1085                1090                1095


Ala Asp  Ala Asn Leu Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His
    1100                1105                1110


Arg Asp  Lys Pro Ile Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu
    1115                1120                1125


Phe Thr  Leu Thr Asn Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe
    1130                1135                1140
```

```
Asp Thr  Thr Ile Asp Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val
    1145                1150                1155


Leu Asp  Ala Thr Leu Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu
    1160                1165                1170


Thr Arg  Ile Asp Leu Ser Gln  Leu Gly Gly Asp
    1175                1180


<210>  132
<211>  1359
<212>  PRT
<213>  Streptococcus pyogenes

<400>  132

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125


His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
```

```
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Thr Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
```

340 345 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
355 360 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
370 375 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val

545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
690 695 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705 710 715 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
740 745 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr

```
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
```

965 970 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
980 985 990

Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe Val Tyr
995 1000 1005

Gly Asp Tyr Lys Val Tyr Asp Val Ser Glu Gln Glu Ile Gly Lys
1010 1015 1020

Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro
1040 1045 1050

Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys
1055 1060 1065

Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln
1070 1075 1080

Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser
1085 1090 1095

Lys Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala
1100 1105 1110

Arg Lys Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser
1115 1120 1125

Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys
1130 1135 1140

Gly Lys Ser Lys Lys Leu Lys Ser Val Lys Glu Leu Leu Gly Ile
1145 1150 1155

Thr Ile Met Glu Arg Ser Ser Phe Glu Lys Asn Pro Ile Asp Phe

1160 1165 1170

Leu Glu Ala Lys Gly Tyr Lys Glu Val Arg Lys Asp Leu Ile Ile
1175 1180 1185

Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys
1190 1195 1200

Arg Met Leu Ala Ser Gly Glu Leu Gln Lys Gly Asn Glu Leu Ala
1205 1210 1215

Leu Pro Ser Lys Tyr Val Asn Phe Leu Tyr Leu Ala Ser His Tyr
1220 1225 1230

Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu
1235 1240 1245

Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln
1250 1255 1260

Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
1265 1270 1275

Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile
1280 1285 1290

Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn
1295 1300 1305

Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp

1355

<210> 133
<211> 1358
<212> PRT
<213> Streptococcus pyogenes

<400> 133

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
115 120 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
130 135 140

Ser Thr Asp Lys Val Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
165 170 175

```
Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Thr Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380
```

```
Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro Tyr Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Thr Ser Leu Gly Thr
            580                 585                 590
```

```
Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Lys Tyr Ala Asn
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800
```

```
Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005
```

```
Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1085                1090                1095

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1100                1105                1110

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1115                1120                1125

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1130                1135                1140

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1145                1150                1155

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1160                1165                1170

Glu Ala  Lys Gly Tyr Lys Glu  Val Arg Lys Asp Leu  Ile Ile Lys
    1175                1180                1185

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1190                1195                1200
```

```
Met Leu  Ala Ser Gly Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                 1210                 1215

Pro Ser  Lys Tyr Val Asn Phe  Leu Tyr Leu Ala Ser  His Tyr Glu
    1220                 1225                 1230

Lys Leu  Lys Gly Ser Pro Glu  Asp Asn Glu Gln Lys  Gln Leu Phe
    1235                 1240                 1245

Val Glu  Gln His Lys His Tyr  Leu Asp Glu Ile Ile  Glu Gln Ile
    1250                 1255                 1260

Ser Glu  Phe Ser Lys Arg Val  Ile Leu Ala Asp Ala  Asn Leu Asp
    1265                 1270                 1275

Lys Val  Leu Ser Ala Tyr Asn  Lys His Arg Asp Lys  Pro Ile Arg
    1280                 1285                 1290

Glu Gln  Ala Lys Asn Ile Ile  His Leu Phe Thr Leu  Thr Asn Leu
    1295                 1300                 1305

Gly Ala  Pro Ala Ala Phe Lys  Tyr Phe Asp Thr Thr  Ile Glu Arg
    1310                 1315                 1320

Asn Arg  Tyr Lys Ser Ile Lys  Glu Val Leu Asp Ala  Thr Leu Ile
    1325                 1330                 1335

His Gln  Ser Ile Thr Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser
    1340                 1345                 1350

Gln Leu  Gly Gly Asp
    1355
```

<210> 134
<211> 1359
<212> PRT
<213> Streptococcus pyogenes

<400> 134

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205
```

```
Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415
```

```
Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620
```

```
Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Asp Ile Leu Lys Glu Tyr Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830
```

```
Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Lys Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035
```

```
Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230
```

```
Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245


Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260


Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Gly
    1310                1315                1320


Arg Asn  Arg Tyr Lys Ser Ile  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355


<210>  135
<211>  1270
<212>  PRT
<213>  Streptococcus pyogenes

<400>  135

Met Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe
1               5                  10                  15


Leu Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn
            20                  25                  30
```

```
Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His
        35                  40                  45

Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu
    50                  55                  60

Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu
65                  70                  75                  80

Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe
                85                  90                  95

Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Ile Asn
            100                 105                 110

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
        115                 120                 125

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
    130                 135                 140

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
145                 150                 155                 160

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
                165                 170                 175

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
            180                 185                 190

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
        195                 200                 205

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
    210                 215                 220

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
225                 230                 235                 240
```

```
Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
                245                 250                 255

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
            260                 265                 270

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
        275                 280                 285

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
    290                 295                 300

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
305                 310                 315                 320

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
                325                 330                 335

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
            340                 345                 350

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
        355                 360                 365

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
    370                 375                 380

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
385                 390                 395                 400

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
                405                 410                 415

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
            420                 425                 430

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
        435                 440                 445
```

```
Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
    450                 455                 460

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
465                 470                 475                 480

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
                485                 490                 495

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
            500                 505                 510

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
        515                 520                 525

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
    530                 535                 540

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
545                 550                 555                 560

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
                565                 570                 575

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
            580                 585                 590

Leu Lys Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp
        595                 600                 605

Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser Gly
    610                 615                 620

Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser Pro
625                 630                 635                 640

Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu Leu
                645                 650                 655
```

```
Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu Met
            660                 665                 670

Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg Glu
        675                 680                 685

Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln Ile
    690                 695                 700

Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys Leu
705                 710                 715                 720

Tyr Leu Tyr Tyr Leu Gln Asn Gly Arg Asp Met Tyr Val Asp Gln Glu
                725                 730                 735

Leu Asp Ile Asn Arg Leu Ser Asp Tyr Asp Val Asp His Ile Val Pro
            740                 745                 750

Gln Ser Phe Leu Lys Asp Asp Ser Ile Asp Asn Lys Val Leu Thr Arg
        755                 760                 765

Ser Asp Lys Asn Arg Gly Lys Ser Asp Asn Val Pro Ser Glu Glu Val
    770                 775                 780

Val Lys Lys Met Lys Asn Tyr Trp Arg Gln Leu Leu Asn Ala Lys Leu
785                 790                 795                 800

Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly
                805                 810                 815

Leu Ser Glu Leu Asp Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu
            820                 825                 830

Thr Arg Gln Ile Thr Lys His Val Ala Gln Ile Leu Asp Ser Arg Met
        835                 840                 845

Asn Thr Lys Tyr Asp Glu Asn Asp Lys Leu Ile Arg Glu Val Lys Val
    850                 855                 860
```

```
Ile Thr Leu Lys Ser Lys Leu Val Ser Asp Phe Arg Lys Asp Phe Gln
865                 870                 875                 880


Phe Tyr Lys Val Arg Glu Ile Asn Asn Tyr His His Ala His Asp Ala
                885                 890                 895


Tyr Leu Asn Ala Val Val Gly Thr Ala Leu Ile Lys Lys Tyr Pro Lys
            900                 905                 910


Leu Glu Ser Glu Phe Val Tyr Gly Asp Tyr Lys Val Tyr Asp Val Ser
        915                 920                 925


Glu Gln Glu Ile Gly Lys Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn
    930                 935                 940


Ile Met Asn Phe Phe Lys Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile
945                 950                 955                 960


Arg Lys Arg Pro Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val
                965                 970                 975


Trp Asp Lys Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met
            980                 985                 990


Pro Gln Val Asn Ile Val Lys Lys  Thr Glu Val Gln Thr  Gly Gly Phe
        995                 1000                1005


Ser Lys  Glu Ser Ile Leu Pro  Lys Arg Asn Ser Asp  Lys Leu Ile
    1010                1015                1020


Ala Arg  Lys Lys Asp Trp Asp  Pro Lys Lys Tyr Gly  Gly Phe Asp
    1025                1030                1035


Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val Val Ala  Lys Val Glu
    1040                1045                1050


Lys Gly  Lys Ser Lys Lys Leu  Lys Ser Val Lys Glu  Leu Leu Gly
    1055                1060                1065
```

```
Ile Thr  Ile Met Glu Arg Ser  Ser Phe Glu Lys Asn  Pro Ile Asp
    1070                1075                1080

Phe Leu  Glu Ala Lys Gly Tyr  Lys Glu Val Lys Lys  Asp Leu Ile
    1085                1090                1095

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Leu Glu  Asn Gly Arg
    1100                1105                1110

Lys Arg  Met Leu Ala Ser Gly  Glu Leu Gln Lys Gly  Asn Glu Leu
    1115                1120                1125

Ala Leu  Pro Ser Lys Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His
    1130                1135                1140

Tyr Glu  Lys Leu Lys Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln
    1145                1150                1155

Leu Phe  Val Glu Gln His Lys  His Tyr Leu Asp Glu  Ile Ile Glu
    1160                1165                1170

Gln Ile  Ser Glu Phe Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn
    1175                1180                1185

Leu Asp  Lys Val Leu Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro
    1190                1195                1200

Ile Arg  Glu Gln Ala Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr
    1205                1210                1215

Asn Leu  Gly Ala Pro Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile
    1220                1225                1230

Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr
    1235                1240                1245

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1250                1255                1260
```

Leu Ser Gln Leu Gly Gly Asp
    1265   1270

<210> 136
<211> 536
<212> PRT
<213> Streptococcus pyogenes

<400> 136

Gln Glu Leu Asp Ile Asn Arg Leu Ser Gly Tyr Asp Val Asp His Ile
1   5   10   15

Val Pro Gln Ser Phe Leu Lys Asp Asp Ser Ile Asp Asn Lys Val Leu
            20   25   30

Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser Asp Asn Val Pro Ser Glu
        35   40   45

Glu Val Val Lys Lys Met Lys Asn Tyr Trp Arg Gln Leu Leu Asn Ala
    50   55   60

Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr Lys Ala Glu Arg
65   70   75   80

Gly Gly Leu Ser Glu Leu Asp Lys Val Gly Phe Ile Lys Arg Gln Leu
                85   90   95

Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln Ile Leu Asp Ser
            100   105   110

Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp Lys Leu Ile Arg Glu Val
        115   120   125

Arg Val Ile Thr Leu Lys Ser Lys Leu Val Ser Asp Phe Arg Lys Asp
    130   135   140

Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn Asn Tyr His His Ala His
145   150   155   160

Asp Ala Tyr Leu Asn Ala Val Val Gly Thr Ala Leu Ile Lys Lys Tyr

```
                165                 170                 175

Pro Lys Leu Glu Ser Glu Phe Val Tyr Gly Asp Tyr Lys Val Tyr Asp
            180                 185                 190

Val Ser Glu Gln Glu Ile Gly Lys Ala Thr Ala Lys Tyr Phe Phe Tyr
        195                 200                 205

Ser Asn Ile Met Asn Phe Phe Lys Thr Glu Ile Thr Leu Ala Asn Gly
    210                 215                 220

Glu Ile Arg Lys Arg Pro Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu
225                 230                 235                 240

Ile Val Trp Asp Lys Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu
                245                 250                 255

Ser Met Pro Gln Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly
            260                 265                 270

Gly Phe Ser Lys Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu
        275                 280                 285

Ile Ala Arg Lys Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp
    290                 295                 300

Ser Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys
305                 310                 315                 320

Gly Lys Ser Lys Lys Leu Lys Ser Val Lys Glu Leu Leu Gly Ile Thr
                325                 330                 335

Ile Met Glu Arg Ser Ser Phe Glu Lys Asp Pro Ile Asp Phe Leu Glu
            340                 345                 350

Ala Lys Gly Tyr Lys Glu Val Arg Lys Asp Leu Ile Ile Lys Leu Pro
        355                 360                 365

Lys Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Leu Ala
```

370 375 380

Ser Gly Glu Leu Gln Lys Gly Asn Glu Leu Ala Leu Pro Ser Lys Tyr
385 390 395 400

Val Asn Phe Leu Tyr Leu Ala Ser His Tyr Glu Lys Leu Lys Gly Ser
405 410 415

Pro Glu Asp Asn Glu Gln Lys Gln Leu Phe Val Glu Gln His Lys His
420 425 430

Tyr Leu Asp Glu Ile Ile Glu Gln Ile Ser Glu Phe Ser Lys Arg Val
435 440 445

Ile Leu Ala Asp Ala Asn Leu Asp Lys Val Leu Ser Ala Tyr Asn Lys
450 455 460

His Arg Asp Lys Pro Ile Arg Glu Gln Ala Glu Asn Ile Ile His Leu
465 470 475 480

Phe Thr Leu Thr Asn Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp
485 490 495

Thr Thr Ile Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp
500 505 510

Ala Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile
515 520 525

Asp Leu Ser Gln Leu Gly Gly Asp
530 535

<210> 137
<211> 305
<212> PRT
<213> Streptococcus pyogenes

<400> 137

Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys Gly Arg
1 5 10 15

```
Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln Val Asn Ile
            20                  25                  30

Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser Lys Glu Ser Ile
        35                  40                  45

Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala Arg Lys Lys Asp Trp
    50                  55                  60

Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser Pro Thr Val Ala Tyr Ser
65                  70                  75                  80

Val Leu Val Val Ala Lys Val Glu Lys Gly Lys Ser Lys Lys Leu Lys
                85                  90                  95

Ser Val Lys Glu Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Ser Phe
            100                 105                 110

Glu Lys Asp Pro Ile Asp Phe Leu Glu Ala Lys Gly Tyr Lys Glu Val
        115                 120                 125

Arg Lys Asp Leu Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu
    130                 135                 140

Glu Asn Gly Arg Lys Arg Met Leu Ala Ser Gly Glu Leu Gln Lys Gly
145                 150                 155                 160

Asn Glu Leu Ala Leu Pro Ser Lys Tyr Val Asn Phe Leu Tyr Leu Ala
                165                 170                 175

Ser His Tyr Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys
            180                 185                 190

Gln Leu Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu
        195                 200                 205

Gln Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
    210                 215                 220
```

```
Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile Arg
225                 230                 235                 240


Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn Leu Gly
                245                 250                 255


Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg
            260                 265                 270


Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser
        275                 280                 285


Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly Gly
    290                 295                 300


Asp
305


<210>  138
<211>  1359
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  138

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Ile Ala Glu Ala Thr Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270
```

```
Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Leu Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480
```

```
Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685
```

```
Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895
```

```
Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095
```

```
Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Arg Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290
```

```
Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Thr Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Phe
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 139
<211> 1341
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 139

```
Met Asp Gln Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Asn Lys Val Asp Glu Asn
                85                  90                  95
```

```
Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Asp Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Ile Ala Ala Glu Val Lys Tyr
        115                 120                 125

His Asp Asp Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ile Ser Gln Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gln Leu Lys Ala
                165                 170                 175

Glu Asn Thr Asn Val Gln Ala Leu Phe Lys Asp Phe Val Glu Val Tyr
            180                 185                 190

Asp Lys Thr Val Glu Glu Ser His Leu Ser Glu Met Thr Val Asp Ala
        195                 200                 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Ile Ala His Tyr Pro Ala Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Gly Leu Leu Gly Glu Ile Gly Asp Glu Tyr Ala Asp
        275                 280                 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300
```

```
Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Val Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Leu Lys
                325                 330                 335

Asp Phe Ile Lys Val Asn Ala Pro Asp Gln Tyr Asn Ala Ile Phe Lys
            340                 345                 350

Asp Lys Asn Lys Lys Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Gly Ile Leu Leu Gln Ile Asn
    370                 375                 380

Gly Ser Gly Asp Phe Leu Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Glu Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Gly Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465                 470                 475                 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510
```

```
Leu Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Val Asn Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ser Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Ser Phe Leu
        595                 600                 605

Asp Asp Lys Ala Asn Glu Lys Thr Ile Glu Asp Ile Ile Gln Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asn Lys Glu Asn Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Arg Ala Gln Ile Ile Gly Asp Val Asp Asp
705                 710                 715                 720
```

```
Ile Ala Asn Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Asn Pro Ala Asn Ile Ile Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Met Thr Asp Lys Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Val Asn Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815

Met Tyr Thr Gly Glu Thr Leu Asp Ile Asn Asn Leu Ser Gln Tyr Asp
            820                 825                 830

Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Leu Asp
        835                 840                 845

Asn Arg Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser Asp Asp
    850                 855                 860

Val Pro Ser Ile Glu Val Val His Glu Met Lys Ser Phe Trp Ser Lys
865                 870                 875                 880

Leu Leu Ser Val Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr
                885                 890                 895

Lys Ala Glu Arg Gly Gly Leu Thr Glu Glu Asp Lys Ala Gly Phe Ile
            900                 905                 910

Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925
```

```
Ile Leu Asp Glu Arg Phe Asn Thr Glu Phe Asp Gly Asn Lys Arg Arg
    930                 935                 940

Ile Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Asn
945                 950                 955                 960

Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr
                965                 970                 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Asn Ala Leu
            980                 985                 990

Leu Leu Lys Tyr Pro Gln Leu Glu  Pro Glu Phe Val Tyr  Gly Glu Tyr
        995                 1000                1005

Pro Lys  Tyr Asn Ser Tyr Arg  Ser Arg Lys Ser Ala  Thr Glu Lys
    1010                1015                1020

Phe Leu  Phe Tyr Ser Asn Ile  Leu Arg Phe Phe Lys  Lys Glu Asp
    1025                1030                1035

Ile Gln  Thr Asn Glu Asp Gly  Glu Ile Ala Trp Asn  Lys Glu Lys
    1040                1045                1050

His Ile  Lys Ile Leu Arg Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1055                1060                1065

Ile Val  Lys Lys Thr Glu Glu  Gln Thr Gly Gly Phe  Ser Lys Glu
    1070                1075                1080

Ser Ile  Leu Pro Lys Gly Glu  Ser Asp Lys Leu Ile  Pro Arg Lys
    1085                1090                1095

Thr Lys  Asn Ser Tyr Trp Asn  Pro Lys Lys Tyr Gly  Gly Phe Asp
    1100                1105                1110

Ser Pro  Val Val Ala Tyr Ser  Ile Leu Val Phe Ala  Asp Val Glu
    1115                1120                1125
```

```
Lys Gly  Lys Ser Lys Lys Leu  Arg Lys Val Gln Asp  Met Val Gly
    1130                1135                1140

Ile Thr  Ile Met Glu Lys Lys  Arg Phe Glu Lys His  Pro Val Asp
    1145                1150                1155

Phe Leu  Glu Gln Arg Gly Tyr  Arg Asn Val Arg Leu  Glu Lys Ile
    1160                1165                1170

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Leu Glu  Asn Lys Arg
    1175                1180                1185

Arg Arg  Leu Leu Ala Ser Ala  Arg Glu Leu Gln Lys  Gly Asn Glu
    1190                1195                1200

Leu Val  Ile Pro Gln Arg Phe  Thr Thr Leu Leu Tyr  His Ser Tyr
    1205                1210                1215

Gln Ile  Glu Lys Asn Tyr Glu  Pro Glu His Arg Glu  Tyr Val Glu
    1220                1225                1230

Lys His  Lys Asp Glu Phe Lys  Glu Leu Leu Glu Tyr  Ile Ser Val
    1235                1240                1245

Phe Ser  Arg Lys Tyr Val Leu  Ala Asp Asn Asn Leu  Thr Lys Ile
    1250                1255                1260

Glu Met  Leu Phe Ser Lys Asn  Lys Asp Ala Glu Val  Ser Ser Leu
    1265                1270                1275

Ala Lys  Ser Phe Ile Ser Leu  Leu Thr Phe Thr Ala  Phe Gly Ala
    1280                1285                1290

Pro Ala  Ala Phe Asn Phe Phe  Gly Glu Asn Ile Asp  Arg Lys Arg
    1295                1300                1305

Tyr Thr  Ser Val Thr Glu Cys  Leu Asn Ala Thr Leu  Ile His Gln
    1310                1315                1320
```

```
Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Lys Leu
    1325                1330                1335


Gly Glu  Asp
    1340
```

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<211> 1356
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 140

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Met Thr Lys Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser
1               5                   10                  15


Val Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys
            20                  25                  30


Met Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu
        35                  40                  45


Leu Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg
    50                  55                  60


Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu
65                  70                  75                  80


Arg Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Thr Lys Val Asp Glu
                85                  90                  95


Ser Phe Phe Gln Arg Leu Asp Glu Ser Phe Leu Arg Trp Asp Asp Asp
            100                 105                 110


Asn Lys Lys Leu Gly Arg Tyr Pro Ile Phe Gly Asn Lys Ala Asp Val
        115                 120                 125
```

```
Val Lys Tyr His Gln Glu Phe Pro Thr Ile Tyr His Leu Arg Lys His
    130                 135                 140

Leu Ala Asp Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala
145                 150                 155                 160

Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu
                165                 170                 175

Leu Asn Ala Glu Asn Thr Asp Val Gln Lys Ile Phe Ala Asp Phe Val
            180                 185                 190

Gly Val Tyr Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr
        195                 200                 205

Val Asp Ala Ala Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg
    210                 215                 220

Leu Glu Asn Leu Ile Lys Tyr Tyr Pro Thr Glu Lys Lys Asn Thr Leu
225                 230                 235                 240

Phe Gly Asn Leu Ile Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys
                245                 250                 255

Met Asn Phe Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp
            260                 265                 270

Ser Tyr Glu Glu Asp Leu Gly Glu Leu Leu Gly Lys Ile Gly Asp Asp
        275                 280                 285

Tyr Ala Asp Leu Phe Thr Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu
    290                 295                 300

Leu Ser Gly Ile Leu Ile Val Asp Asp Asn Ser Thr Lys Ala Pro Leu
305                 310                 315                 320

Ser Ala Ser Met Ile Lys Arg Tyr Val Glu His Gln Glu Asp Leu Glu
                325                 330                 335
```

```
Lys Leu Lys Glu Phe Ile Lys Ala Asn Lys Ser Glu Leu Tyr His Asp
            340                 345                 350

Ile Phe Lys Asp Lys Asn Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn
        355                 360                 365

Gly Val Lys Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser
    370                 375                 380

Lys Ile Ala Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp
385                 390                 395                 400

Phe Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln
                405                 410                 415

Ile His Leu Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr
            420                 425                 430

Tyr Pro Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr
        435                 440                 445

Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asp Ser Arg
    450                 455                 460

Phe Ser Trp Ala Glu Tyr His Ser Asp Glu Lys Ile Thr Pro Trp Asn
465                 470                 475                 480

Phe Asp Lys Val Ile Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr
                485                 490                 495

Arg Met Thr Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro
            500                 505                 510

Lys His Ser His Val Tyr Glu Thr Tyr Ala Val Tyr Asn Glu Leu Thr
        515                 520                 525

Lys Ile Lys Tyr Val Asn Glu Gln Gly Lys Asp Ser Phe Phe Asp Ser
    530                 535                 540
```

```
Asn Met Lys Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys
545                 550                 555                 560

Val Thr Lys Glu Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Pro Glu
                565                 570                 575

Tyr Arg Ile Lys Asp Leu Ile Gly Leu Asp Lys Glu Asn Lys Ser Phe
            580                 585                 590

Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys
        595                 600                 605

Ala Phe Leu Asp Asp Lys Val Asn Glu Glu Val Ile Glu Asp Ile Ile
    610                 615                 620

Lys Thr Leu Thr Leu Phe Glu Asp Lys Asp Met Ile His Glu Arg Leu
625                 630                 635                 640

Gln Lys Tyr Ser Asp Ile Phe Thr Ala Asp Gln Leu Lys Lys Leu Glu
                645                 650                 655

Arg Arg His Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn
            660                 665                 670

Gly Ile Arg Asn Lys Glu Asn Asn Lys Thr Ile Leu Asp Tyr Leu Ile
        675                 680                 685

Asp Asp Gly Ser Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp
    690                 695                 700

Thr Leu Pro Phe Lys Gln Ile Ile Gln Lys Ser Gln Val Val Gly Asp
705                 710                 715                 720

Val Asp Asp Ile Glu Ala Val Val His Asp Leu Pro Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val
            740                 745                 750
```

```
Lys Val Met Gly Asp Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Asn Arg Gly Arg Ser Gln Ser Gln Gln Arg Leu
    770                 775                 780

Lys Lys Leu Gln Asn Ser Leu Lys Pro Ser Tyr Ile Glu Asp Lys Val
785                 790                 795                 800

Glu Asn Ser His Leu Gln Asn Asp Gln Leu Phe Leu Tyr Tyr Ile Gln
                805                 810                 815

Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Asp Ile Asp His Leu
            820                 825                 830

Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asp Val Pro Ser Leu Asp Ile Val Arg Ala Arg Lys Ala
865                 870                 875                 880

Glu Trp Val Arg Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ala Arg Phe Asn Thr Glu Ser Asp Glu
    930                 935                 940

Asn Asp Lys Val Ile Arg Asp Val Lys Val Ile Thr Leu Lys Ser Asn
945                 950                 955                 960
```

```
Leu Val Ser Gln Phe Arg Lys Asp Phe Glu Phe Tyr Lys Val Arg Glu
               965                 970                 975

Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
           980                 985                 990

Gly Thr Ala Leu Leu Lys Lys Tyr  Pro Lys Leu Ala Ser  Glu Phe Val
        995                1000                1005

Tyr Gly  Glu Tyr Lys Lys Tyr  Asp Ile Ser Ser Asp  Lys Ala Thr
    1010                1015                1020

Ala Lys  Tyr Phe Phe Tyr Ser  Asn Leu Met Asn Phe  Phe Lys Arg
    1025                1030                1035

Val Ile  Arg Tyr Ser Asn Gly  Lys Val Ile Val Arg  Pro Val Val
    1040                1045                1050

Glu Tyr  Ser Lys Asp Thr Glu  Asp Ile Ala Trp Asp  Lys Lys Ser
    1055                1060                1065

Asn Phe  Arg Thr Ile Cys Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1070                1075                1080

Ile Val  Lys Lys Val Glu Thr  Gln Thr Gly Gly Phe  Ser Lys Glu
    1085                1090                1095

Ser Ile  Leu Pro Lys Gly Asp  Ser Asp Lys Leu Ile  Pro Arg Lys
    1100                1105                1110

Thr Lys  Lys Ala Tyr Trp Asp  Thr Lys Lys Tyr Gly  Gly Phe Asp
    1115                1120                1125

Ser Pro  Thr Val Ala Tyr Ser  Val Phe Val Val Ala  Asp Val Glu
    1130                1135                1140

Lys Gly  Lys Ala Lys Lys Leu  Lys Thr Val Lys Glu  Leu Val Gly
    1145                1150                1155
```

```
Ile Ser  Ile Met Glu Arg Ser  Phe Phe Glu Glu Asn  Pro Val Glu
    1160                1165                1170

Phe Leu  Glu Asn Lys Gly Tyr  His Asn Ile Arg Glu  Asp Lys Leu
    1175                1180                1185

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Phe Glu  Gly Gly Lys
    1190                1195                1200

Arg Arg  Leu Leu Ala Ser Ala  Ser Glu Leu Gln Lys  Gly Asn Glu
    1205                1210                1215

Met Val  Ile Pro Gly His Leu  Val Lys Leu Leu Tyr  His Ala Gln
    1220                1225                1230

Arg Ile  Asn Ser Phe Asn Ser  Thr Lys Tyr Leu Asp  Tyr Val Ser
    1235                1240                1245

Ala His  Lys Lys Glu Phe Glu  Lys Val Leu Ser Cys  Val Glu Asp
    1250                1255                1260

Phe Ala  Asn Leu Tyr Val Asp  Val Glu Lys Asn Leu  Ser Lys Ile
    1265                1270                1275

Arg Ala  Val Ala Asp Ser Met  Asp Asn Phe Ser Ile  Glu Glu Ile
    1280                1285                1290

Ser Asn  Ser Phe Ile Asn Leu  Leu Thr Leu Thr Ala  Leu Gly Ala
    1295                1300                1305

Pro Ala  Asp Phe Asn Phe Leu  Gly Glu Lys Ile Pro  Arg Lys Arg
    1310                1315                1320

Tyr Thr  Ser Thr Lys Glu Cys  Leu Asn Ala Thr Leu  Ile His Gln
    1325                1330                1335

Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Lys Ile
    1340                1345                1350
```

Gly Glu Glu
    1355

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<213> Streptococcus agalactiae

<400> 141

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Ile
            20   25   30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35   40   45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65   70   75   80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85   90   95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100   105   110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Tyr Tyr
        115   120   125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130   135   140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145   150   155   160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp

```
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asp Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Val
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
```

```
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
```

580 585 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
595 600 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Asp Ile Tyr Lys Asp
625 630 635 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
660 665 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
675 680 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
690 695 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705 710 715 720

Glu Val Ile Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
725 730 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
740 745 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
770 775 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp

785 790 795 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865 870 875 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
900 905 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
915 920 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
930 935 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Val Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu

995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg
1010 1015 1020

Lys Ala Thr Glu Lys Leu Phe Phe Tyr Ser Asn Ile Met Asn Phe
1025 1030 1035

Phe Lys Thr Lys Val Thr Leu Ala Asp Gly Thr Val Val Val Lys
1040 1045 1050

Asp Asp Ile Glu Val Asn Asn Asp Thr Gly Glu Ile Val Trp Asp
1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Val Asn Ile Val Lys Lys Thr Glu Ile Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Ala His Gly Asn Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Lys Asp Ile Tyr Leu Asp Pro Lys Lys Tyr Gly
1115 1120 1125

Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Val Leu Val Val Ala
1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Thr
1175 1180 1185

Asp Lys Leu Ile Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu

1190 1195 1200

Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Gly Glu Leu Gln Lys
1205 1210 1215

Gly Asn Glu Leu Ala Leu Pro Thr Gln Phe Met Lys Phe Leu Tyr
1220 1225 1230

Leu Ala Ser Arg Tyr Asn Glu Ser Lys Gly Lys Pro Glu Glu Ile
1235 1240 1245

Glu Lys Lys Gln Glu Phe Val Asn Gln His Val Ser Tyr Phe Asp
1250 1255 1260

Asp Ile Phe Gln Ile Ile Asn Asp Phe Ser Lys Arg Val Ile Leu
1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Arg Leu Tyr Gln Asp Asn
1280 1285 1290

Lys Glu Asn Ile Pro Val Asp Glu Leu Ala Asn Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe
1310 1315 1320

Phe Asp Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu
1325 1330 1335

Val Leu Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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<211> 1365
<212> PRT
<213> Streptococcus agalactiae

<400> 142

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Gln Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Val Asp
        195                 200                 205
```

```
Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415
```

```
Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620
```

```
Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830
```

```
Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Leu Tyr Arg  Arg Lys Lys Leu Ser  Lys Ile Val
    1010                1015                1020

Arg Ala  Thr Arg Lys Met Phe  Phe Tyr Ser Asn Leu  Met Asn Met
    1025                1030                1035
```

```
Phe Lys  Arg Val Val Arg Leu  Ala Asp Gly Ser Ile  Val Val Arg
    1040                1045                1050

Pro Val  Ile Glu Thr Gly Arg  Tyr Met Gly Lys Thr  Ala Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Lys Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230
```

```
Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Ser  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  143
<211>  1365
<212>  PRT
<213>  Streptococcus agalactiae

<400>  143

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30
```

```
Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Ile Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240
```

```
Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445
```

```
Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655
```

```
His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860
```

```
Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065
```

```
Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260
```

```
Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  144
<211>  1369
<212>  PRT
<213>  Streptococcus agalactiae

<400>  144

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Ile Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270
```

```
Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480
```

```
Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685
```

```
Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895
```

```
Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095
```

```
Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Thr Ile Asp
    1205                1210                1215

Arg Leu  Gln Lys Gly Asn Glu  Leu Ala Leu Pro Thr  Gln Phe Met
    1220                1225                1230

Lys Phe  Leu Tyr Leu Ala Ser  Arg Tyr Asn Glu Ser  Lys Gly Lys
    1235                1240                1245

Pro Glu  Glu Ile Glu Lys Lys  Gln Glu Phe Val Asn  Gln His Val
    1250                1255                1260

Ser Tyr  Phe Asp Asp Ile Leu  Gln Leu Ile Asn Asp  Phe Ser Lys
    1265                1270                1275

Arg Val  Ile Leu Ala Asp Ala  Asn Leu Glu Lys Ile  Asn Lys Leu
    1280                1285                1290
```

```
Tyr Gln  Asp Asn Lys Glu Asn  Ile Ser Val Asp Glu  Leu Ala Asn
    1295                1300                1305


Asn Ile  Ile Asn Leu Phe Thr  Phe Thr Ser Leu Gly  Ala Pro Ala
    1310                1315                1320


Ala Phe  Lys Phe Phe Asp Lys  Ile Val Asp Arg Lys  Arg Tyr Thr
    1325                1330                1335


Ser Thr  Lys Glu Val Leu Asn  Ser Thr Leu Ile His  Gln Ser Ile
    1340                1345                1350


Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu Gly Lys  Leu Gly Glu
    1355                1360                1365


Asp
```

<210> 145
<211> 1363
<212> PRT
<213> Streptococcus agalactiae

<400> 145

```
Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
```

```
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
```

```
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
```

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            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Ile Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
```

705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865 870 875 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Lys
900 905 910

Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys

```
        915                 920                 925

His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu Asp Ser
    930                 935                 940

Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys Ser Asn
945                 950                 955                 960

Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile Arg Glu
                965                 970                 975

Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Ala Lys Ala Ile Leu Thr Lys Tyr  Pro Gln Leu Glu Pro  Glu Phe Val
        995                 1000                1005

Tyr Gly  Asp Tyr Pro Lys Tyr  Asn Ser Tyr Lys Thr  Arg Lys Ala
    1010                1015                1020

Thr Glu  Lys Leu Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Lys  Val Thr Leu Ala Asp  Gly Thr Val Val Val  Lys Asp Asp
    1040                1045                1050

Ile Glu  Val Asn Asn Asp Thr  Gly Glu Ile Val Trp  Asp Lys Lys
    1055                1060                1065

Lys His  Phe Ala Thr Val Arg  Lys Val Leu Ser Tyr  Pro Gln Asn
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Ile Gln Thr Gly Gly  Phe Ser Lys
    1085                1090                1095

Glu Ser  Ile Leu Ala His Gly  Asn Ser Asp Lys Leu  Ile Pro Arg
    1100                1105                1110

Lys Thr  Lys Asp Ile Tyr Leu  Asp Pro Lys Lys Tyr  Gly Gly Phe
```

```
    1115                1120                1125

Asp Ser  Pro Ile Val Ala Tyr  Ser Val Leu Val Val  Ala Asp Ile
    1130                1135                1140

Lys Lys  Gly Lys Ala Gln Lys  Leu Lys Thr Val Thr  Glu Leu Leu
    1145                1150                1155

Gly Ile  Thr Ile Met Glu Arg  Ser Arg Phe Glu Lys  Asn Pro Ser
    1160                1165                1170

Ala Phe  Leu Glu Ser Lys Gly  Tyr Leu Asn Ile Arg  Ala Asp Lys
    1175                1180                1185

Leu Ile  Ile Leu Pro Lys Tyr  Ser Leu Phe Glu Leu  Glu Asn Gly
    1190                1195                1200

Arg Arg  Arg Leu Leu Ala Ser  Ala Gly Glu Leu Gln  Lys Gly Asn
    1205                1210                1215

Glu Leu  Ala Leu Pro Thr Gln  Phe Met Lys Phe Leu  Tyr Leu Ala
    1220                1225                1230

Ser Arg  Tyr Asn Glu Ser Lys  Gly Lys Pro Glu Glu  Ile Glu Lys
    1235                1240                1245

Lys Gln  Glu Phe Val Asn Gln  His Val Ser Tyr Phe  Asp Asp Ile
    1250                1255                1260

Leu Gln  Leu Ile Asn Asp Phe  Ser Lys Arg Val Ile  Leu Ala Asp
    1265                1270                1275

Ala Asn  Leu Glu Lys Ile Asn  Lys Leu Tyr Gln Asp  Asn Lys Glu
    1280                1285                1290

Asn Ile  Ser Val Asp Glu Leu  Ala Asn Asn Ile Ile  Asn Leu Phe
    1295                1300                1305

Thr Phe  Thr Ser Leu Gly Ala  Pro Ala Ala Phe Lys  Phe Phe Asp
```

1310 1315 1320

Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu
1325 1330 1335

Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr
1340 1345 1350

Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360

<210> 146
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<212> PRT
<213> Streptococcus agalactiae

<400> 146

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
115 120 125

```
His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335
```

```
Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540
```

```
Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750
```

```
Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asp Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960
```

```
Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
               965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
           980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155
```

```
Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350
```

```
Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  147
<211>  1365
<212>  PRT
<213>  Streptococcus agalactiae

<400>  147

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125


His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140


Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160
```

```
Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365
```

```
Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575
```

```
Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780
```

```
Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990
```

```
Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005


Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020


Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035


Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050


Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065


Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080


Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095


Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110


Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125


Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140


Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155


Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170


Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185
```

```
Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200


Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215


Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230


Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  148
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<212>  PRT
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<213> Streptococcus agalactiae

<400> 148

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190
```

```
Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400
```

```
Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605
```

```
Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815
```

```
Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020
```

```
Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215
```

```
Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230


Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Gly Asp
    1355                1360                1365


<210>  149
<211>  1365
<212>  PRT
<213>  Streptococcus agalactiae

<400>  149

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
```

```
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
```

```
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
```

```
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
```

645 650 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
660 665 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
675 680 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
690 695 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn

```
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
```

1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Asn Asn Ile Val Lys Lys Thr Glu Ile Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Ala His Gly Asn Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Lys Asp Ile Tyr Leu Asp Pro Lys Lys Tyr Gly
1115 1120 1125

Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Val Leu Val Val Ala
1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Asp
1175 1180 1185

Asp Lys Leu Met Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu
1190 1195 1200

Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Gly Glu Leu Gln Lys
1205 1210 1215

Gly Asn Glu Leu Ala Leu Pro Thr Gln Phe Met Lys Phe Leu Tyr
1220 1225 1230

Leu Ala Ser Arg Tyr Asn Glu Ser Lys Gly Lys Pro Glu Glu Ile
1235 1240 1245

Glu Lys Lys Gln Glu Phe Val Asn Gln His Val Ser Tyr Phe Asp

```
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  150
<211>  1365
<212>  PRT
<213>  Streptococcus agalactiae

<400>  150

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270
```

```
Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480
```

```
Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685
```

```
Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Val Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895
```

```
Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095
```

```
Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290
```

```
Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                 1300                 1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                 1315                 1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350

Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                 1360                 1365
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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95
```

```
Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Arg Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300
```

```
Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510
```

```
Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720
```

```
Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925
```

```
Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125
```

```
Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140


Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155


Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170


Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185


Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200


Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215


Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230


Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320
```

```
Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                 1360                 1365


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<400>  152

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125
```

```
His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Ser Phe Glu Asn Asn His Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Tyr Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335
```

```
Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Val
    530                 535                 540
```

```
Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560


Lys Lys Gln Leu Leu Asp Phe Leu Ala Lys Glu Phe Glu Glu Phe Arg
                565                 570                 575


Ile Val Asp Val Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590


Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605


Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620


Ile Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640


Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655


His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670


Arg Asp Arg Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
        675                 680                 685


Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700


Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ser Gly Ser His Ser Asp
705                 710                 715                 720


Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735


Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750
```

```
Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Glu Asp Gly Val Lys Asn Leu Ala Ser Asp Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Ile Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Pro Asp
            900                 905                 910

Asp Lys Ala Gly Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Lys Val
    930                 935                 940

Asp Asp Asn Asn Lys Pro Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960
```

```
Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
               965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
           980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Glu Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Glu Thr Gly Glu Ile  Ala Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Val Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Ser Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Leu Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Lys Glu
    1145                1150                1155
```

```
Leu Ile  Gly Ile Thr Ile Met  Glu Arg Glu Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Thr
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Ile Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Ser Asp Asn
    1280                1285                1290

Lys Asp  Asn Thr Pro Val Asp  Glu Leu Ala Lys Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ser Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asp Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350
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Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
115 120 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
130 135 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp

```
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln His Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
```

```
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
```

580 585 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
595 600 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625 630 635 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
660 665 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
675 680 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
690 695 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705 710 715 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
725 730 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
740 745 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
770 775 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp

785 790 795 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Val Glu Ile Val Lys Asp Cys
865 870 875 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
900 905 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
915 920 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
930 935 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu

995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg
1010 1015 1020

Lys Ala Thr Glu Lys Leu Phe Phe Tyr Ser Asn Ile Met Asn Phe
1025 1030 1035

Phe Lys Thr Lys Val Thr Leu Ala Asp Gly Thr Val Val Val Lys
1040 1045 1050

Asp Asp Ile Glu Val Asn Asn Asp Thr Gly Glu Ile Val Trp Asp
1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Val Asn Ile Val Lys Lys Thr Glu Ile Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Ala His Gly Asn Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Lys Asp Ile Tyr Leu Asp Pro Lys Lys Tyr Gly
1115 1120 1125

Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Val Leu Val Val Ala
1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Asp
1175 1180 1185

Asp Lys Leu Met Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu

```
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350

Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205
```

```
Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415
```

```
Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
            580                 585                 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
        595                 600                 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
    610                 615                 620
```

```
Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625                 630                 635                 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Glu Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
            660                 665                 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
    690                 695                 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Leu Asp Asn Leu Lys
705                 710                 715                 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830
```

```
Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035
```

```
Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Val Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Thr
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230
```

```
Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Gly
    1355                1360                1365


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<400>  155

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30
```

```
Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240
```

```
Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445
```

```
Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
            580                 585                 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
        595                 600                 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625                 630                 635                 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
                645                 650                 655
```

```
Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
            660                 665                 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
    690                 695                 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Leu Asp Asn Leu Lys
705                 710                 715                 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860
```

```
Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065
```

```
Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Val Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Thr
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260
```

```
Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                 1270                 1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                 1285                 1290


Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                 1300                 1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                 1315                 1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Gly
    1355                 1360                 1365


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<213>  Streptococcus agalactiae

<400>  156

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270
```

```
Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480
```

```
Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
            580                 585                 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
        595                 600                 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625                 630                 635                 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
            660                 665                 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
        675                 680                 685
```

```
Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
    690                 695                 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705                 710                 715                 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Lys Gly Leu Ser Arg Leu Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Val Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895
```

```
Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095
```

```
Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Asp Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290
```

```
Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


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<213>  Streptococcus agalactiae

<400>  157

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
```

```
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
```

305 310 315 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
325 330 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
340 345 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
355 360 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
370 375 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385 390 395 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
405 410 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
420 425 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
435 440 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
450 455 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465 470 475 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
485 490 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
500 505 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val

515 520 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
530 535 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545 550 555 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
565 570 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
580 585 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
595 600 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625 630 635 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
660 665 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
675 680 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
690 695 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705 710 715 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile

```
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Val Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
```

```
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
```

1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Asp
1175 1180 1185

Asp Lys Leu Met Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu
1190 1195 1200

Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Gly Glu Leu Gln Lys
1205 1210 1215

Gly Asn Glu Leu Ala Leu Pro Thr Gln Phe Met Lys Phe Leu Tyr
1220 1225 1230

Leu Ala Ser Arg Tyr Asn Glu Leu Lys Gly Lys Pro Glu Glu Ile
1235 1240 1245

Glu Gln Lys Gln Glu Phe Val Val Gln His Val Ser Tyr Phe Asp
1250 1255 1260

Asp Ile Leu Gln Ile Ile Asn Asp Phe Ser Asn Arg Val Ile Leu
1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Lys Leu Tyr Gln Asp Asn
1280 1285 1290

Lys Glu Asn Ile Pro Val Asp Glu Leu Ala Asn Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe
1310 1315 1320

Phe Asp Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu

1325 1330 1335

Val Leu Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
115 120 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
130 135 140

```
Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350
```

```
Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560
```

```
Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
            580                 585                 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
        595                 600                 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625                 630                 635                 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
            660                 665                 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
    690                 695                 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705                 710                 715                 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765
```

```
Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Val Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975
```

```
Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Lys Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170
```

```
Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Lys Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350

Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
        115                 120                 125


His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140


Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160


Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175
```

```
Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380
```

```
Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Leu Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
            580                 585                 590
```

```
Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
        595                 600                 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625                 630                 635                 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
            660                 665                 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
    690                 695                 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705                 710                 715                 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800
```

```
Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Val Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005
```

```
Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asp  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200
```

```
Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                 1210                 1215


Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                 1225                 1230


Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                 1240                 1245


Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                 1255                 1260


Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                 1270                 1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                 1285                 1290


Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                 1300                 1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                 1315                 1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                 1360                 1365


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<212>  PRT
<213>  Streptococcus agalactiae


<220>
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<222> (117)..(117)
<223> Xaa can be any naturally occurring amino acid

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Xaa Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125


His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140


Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160


Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175


Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190
```

```
Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400
```

```
Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605
```

```
Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815
```

```
Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020
```

```
Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215
```

```
Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                 1225                 1230


Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                 1240                 1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                 1255                 1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                 1270                 1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                 1285                 1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                 1300                 1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                 1315                 1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                 1360                 1365


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<212>  PRT
<213>  Streptococcus agalactiae

<400>  161

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
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Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ser Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220
```

```
Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430
```

```
Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640
```

```
Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845
```

```
Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050
```

```
Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245
```

```
Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  162
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<212>  PRT
<213>  Streptococcus agalactiae

<400>  162

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Cys Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asn Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255
```

```
Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460
```

```
Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670
```

```
Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
        675                 680                 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880
```

```
Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
               885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
               965                 970                 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080
```

```
Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Phe Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275
```

```
Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
```

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<213> Streptococcus agalactiae

<400> 163

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
```

```
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
```

```
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
```

500 505 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
515 520 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
530 535 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545 550 555 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
565 570 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
580 585 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
595 600 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
610 615 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625 630 635 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
645 650 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
660 665 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
675 680 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
690 695 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp

705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865 870 875 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
900 905 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile

915 920 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
930 935 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu
995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg
1010 1015 1020

Lys Ala Thr Glu Lys Leu Phe Phe Tyr Ser Asn Ile Met Asn Phe
1025 1030 1035

Phe Lys Thr Lys Val Thr Leu Ala Asp Gly Thr Val Val Val Lys
1040 1045 1050

Asp Asp Ile Glu Val Asn Asn Asp Thr Gly Glu Ile Val Trp Asp
1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Val Asn Ile Val Lys Lys Thr Glu Ile Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Ala His Gly Asn Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Lys Asp Ile Tyr Leu Asp Pro Lys Lys Tyr Gly

1115 1120 1125

Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Val Leu Val Val Ala
1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Phe Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Asp
1175 1180 1185

Asp Lys Leu Met Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu
1190 1195 1200

Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Gly Glu Leu Gln Lys
1205 1210 1215

Gly Asn Glu Leu Ala Leu Pro Thr Gln Tyr Met Lys Phe Leu Tyr
1220 1225 1230

Leu Ala Ser Arg Tyr Asn Glu Leu Lys Gly Lys Pro Glu Glu Ile
1235 1240 1245

Glu Gln Lys Gln Glu Phe Val Val Gln His Val Ser Tyr Phe Asp
1250 1255 1260

Asp Ile Leu Gln Ile Ile Asn Asp Phe Ser Asn Arg Val Ile Leu
1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Lys Leu Tyr Gln Asp Asn
1280 1285 1290

Lys Glu Asn Ile Ser Val Asp Glu Leu Ala Asn Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe

1310 1315 1320

Phe Asp Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu
1325 1330 1335

Val Leu Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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<212> PRT
<213> Streptococcus agalactiae

<400> 164

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
115 120 125

```
His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335
```

```
Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540
```

```
Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
        675                 680                 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750
```

```
Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Thr Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960
```

```
Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
               965                 970                 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
           980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Arg Glu
        995                1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155
```

```
Leu Leu  Gly Ile Thr Ile Met  Glu Arg Phe Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350
```

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
    1355   1360   1365

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<212> PRT
<213> Streptococcus agalactiae

<400> 165

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20   25   30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35   40   45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65   70   75   80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85   90   95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100   105   110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115   120   125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130   135   140

Lys Lys Glu Lys Ala Asn Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145   150   155   160

```
Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365
```

```
Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575
```

```
Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
        675                 680                 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
    770                 775                 780
```

```
Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990
```

```
Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005


Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020


Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035


Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050


Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065


Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080


Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095


Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110


Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125


Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140


Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155


Leu Leu  Gly Ile Thr Ile Met  Glu Arg Phe Arg Phe  Glu Lys Asn
    1160                1165                1170


Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185
```

```
Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200


Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215


Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230


Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Phe Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
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<213> Streptococcus agalactiae

<400> 166

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asn Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190
```

```
Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400
```

```
Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605
```

```
Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
        675                 680                 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815
```

```
Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020
```

```
Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Phe Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215
```

```
Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230


Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


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<213>  Streptococcus agalactiae

<400>  167

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
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            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Ser Phe Glu Asn Asn His Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
```

```
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg
```

```
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Val
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Gln Leu Leu Asp Phe Leu Ala Lys Glu Phe Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Ile Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
```

645 650 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
660 665 670

Arg Asp Arg Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
675 680 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
690 695 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ser Gly Ser His Ser Asp
705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Glu Asp Gly Val Lys Asn Leu Ala Ser Asp Ile Leu Lys Glu Tyr
785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn

```
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Ile Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Pro Asp
            900                 905                 910

Asp Lys Ala Gly Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Lys Val
    930                 935                 940

Asp Asp Asn Asn Lys Pro Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Glu Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Glu Thr Gly Glu Ile  Ala Trp Asp
```

```
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Val Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Ser Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Leu Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Lys Glu
    1145                1150                1155

Leu Ile  Gly Ile Thr Ile Met  Glu Arg Glu Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Thr
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
```

1250 1255 1260

Asp Ile Leu Gln Leu Ile Asn Asp Phe Ser Lys Arg Val Ile Leu
1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Lys Leu Tyr Ser Asp Asn
1280 1285 1290

Lys Asp Asn Thr Pro Val Asp Glu Leu Ala Lys Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe
1310 1315 1320

Phe Asp Lys Ser Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu
1325 1330 1335

Val Leu Asp Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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<212> PRT
<213> Streptococcus agalactiae

<400> 168

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270
```

```
Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480
```

```
Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
            580                 585                 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
        595                 600                 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625                 630                 635                 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
            660                 665                 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
        675                 680                 685
```

```
Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
    690                 695                 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705                 710                 715                 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Lys Gly Leu Ser Arg Leu Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp Leu Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Val Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895
```

```
Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095
```

```
Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Asp Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290
```

```
Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350

Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
```

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<213> Streptococcus agalactiae

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95
```

```
Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Phe Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Ile Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300
```

```
Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510
```

```
Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Lys Ser Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720
```

```
Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Lys Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925
```

```
Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125
```

```
Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140


Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155


Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170


Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185


Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200


Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215


Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230


Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320
```

```
Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                 1360                 1365


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<213>  Streptococcus agalactiae

<400>  170

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125
```

```
His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Phe Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335
```

```
Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540
```

```
Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560


Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575


Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590


Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605


Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620


Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640


Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655


His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670


Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685


Gly Lys Ser Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700


Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720


Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735


Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750
```

```
Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Lys Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960
```

```
Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
               965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
           980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155
```

```
Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350
```

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
    1355   1360   1365

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<400> 171

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20   25   30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35   40   45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65   70   75   80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85   90   95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100   105   110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115   120   125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130   135   140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145   150   155   160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp

```
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
```

```
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
```

580 585 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
595 600 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
610 615 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625 630 635 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
645 650 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
660 665 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
675 680 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
690 695 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr

785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865 870 875 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
900 905 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
915 920 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
930 935 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu

995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg
1010 1015 1020

Lys Ala Thr Glu Lys Leu Phe Phe Tyr Ser Asn Ile Met Asn Phe
1025 1030 1035

Phe Lys Thr Lys Val Thr Leu Ala Asp Gly Thr Val Val Val Lys
1040 1045 1050

Asp Asp Ile Glu Val Asn Asn Asp Thr Gly Glu Ile Val Trp Asp
1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Asn Asn Ile Val Lys Lys Thr Glu Ile Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Ala His Gly Asn Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Lys Asp Ile Tyr Leu Asp Pro Lys Lys Tyr Gly
1115 1120 1125

Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Val Leu Val Val Ala
1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Ala
1175 1180 1185

Asp Lys Leu Ile Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu

1190 1195 1200

Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Gly Glu Leu Gln Lys
1205 1210 1215

Gly Asn Glu Leu Ala Leu Pro Thr Gln Phe Met Lys Phe Leu Tyr
1220 1225 1230

Leu Ala Ser Arg Tyr Asn Glu Ser Lys Gly Lys Pro Glu Glu Ile
1235 1240 1245

Glu Lys Lys Gln Glu Phe Val Asn Gln His Val Ser Tyr Phe Asp
1250 1255 1260

Asp Ile Leu Gln Leu Ile Asn Asp Phe Ser Lys Arg Val Ile Leu
1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Lys Leu Tyr Gln Asp Asn
1280 1285 1290

Lys Glu Asn Ile Ser Val Asp Glu Leu Ala Asn Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe
1310 1315 1320

Phe Asp Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu
1325 1330 1335

Val Leu Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205
```

```
Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Ala Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415
```

```
Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620
```

```
Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
        675                 680                 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830
```

```
Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035
```

```
Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Phe Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230
```

```
Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


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<213>  Streptococcus agalactiae

<400>  173

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30
```

```
Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240
```

```
Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445
```

```
Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655
```

```
His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860
```

```
Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065
```

```
Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Ala Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260
```

```
Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                 1270                 1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                 1285                 1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                 1300                 1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                 1315                 1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                 1360                 1365


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<213>  Streptococcus agalactiae

<400>  174

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270
```

```
Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Ser Leu Ser Asp
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480
```

```
Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685
```

```
Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895
```

```
Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095
```

```
Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290
```

```
Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  175
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<212>  PRT
<213>  Streptococcus agalactiae

<400>  175

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
```

100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
115 120 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
130 135 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
165 170 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
180 185 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
195 200 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
210 215 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225 230 235 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
245 250 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
260 265 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
275 280 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
290 295 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala

305 310 315 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
325 330 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
340 345 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
355 360 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
370 375 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385 390 395 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
405 410 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
420 425 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
435 440 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
450 455 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465 470 475 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
485 490 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
500 505 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val

```
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
```

```
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Ile Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
```

```
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
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1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Ala
1175 1180 1185

Asp Lys Leu Ile Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu
1190 1195 1200

Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Gly Glu Leu Gln Lys
1205 1210 1215

Gly Asn Glu Leu Ala Leu Pro Thr Gln Phe Met Lys Phe Leu Tyr
1220 1225 1230

Leu Ala Ser Arg Tyr Asn Glu Ser Lys Gly Lys Pro Glu Glu Ile
1235 1240 1245

Glu Lys Lys Gln Glu Phe Val Asn Gln His Val Ser Tyr Phe Asp
1250 1255 1260

Asp Ile Leu Gln Leu Ile Asn Asp Phe Ser Lys Arg Val Ile Leu
1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Lys Leu Tyr Gln Asp Asn
1280 1285 1290

Lys Glu Asn Ile Ser Val Asp Glu Leu Ala Asn Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe
1310 1315 1320

Phe Asp Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu

1325 1330 1335

Val Leu Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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<213> Streptococcus agalactiae

<400> 176

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
115 120 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
130 135 140

```
Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350
```

```
Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560
```

```
Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765
```

```
Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Val Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975
```

```
Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170
```

```
Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350

Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
```

<210> 177
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<213> Streptococcus agalactiae

<400> 177

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125


His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140


Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160


Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175
```

```
Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380
```

```
Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590
```

```
Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800
```

```
Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Leu Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005
```

```
Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200
```

```
Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                 1210                 1215


Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                 1225                 1230


Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                 1240                 1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                 1255                 1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                 1270                 1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                 1285                 1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                 1300                 1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                 1315                 1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                 1330                 1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                 1345                 1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Gly Asp
    1355                 1360                 1365


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<213>  Streptococcus agalactiae

<400>  178
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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205
```

```
Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415
```

```
Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620
```

```
Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830
```

```
Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035
```

```
Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230
```

```
Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


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<212>  PRT
<213>  Streptococcus agalactiae

<400>  179

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
```

```
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asn Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
```

245 250 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
260 265 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
275 280 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
290 295 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305 310 315 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
325 330 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
340 345 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
355 360 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
370 375 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385 390 395 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
405 410 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
420 425 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
435 440 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala

```
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
```

660 665 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
675 680 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
690 695 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp
705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Lys Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg

865 870 875 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
900 905 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
915 920 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
930 935 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu
995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg
1010 1015 1020

Lys Ala Thr Glu Lys Leu Phe Phe Tyr Ser Asn Ile Met Asn Phe
1025 1030 1035

Phe Lys Thr Lys Val Thr Leu Ala Asp Gly Thr Val Val Val Lys
1040 1045 1050

Asp Asp Ile Glu Val Asn Asn Asp Thr Gly Glu Ile Val Trp Asp
1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro

```
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Phe Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
```

1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Lys Leu Tyr Gln Asp Asn
1280 1285 1290

Lys Glu Asn Ile Ser Val Asp Glu Leu Ala Asn Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe
1310 1315 1320

Phe Asp Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu
1325 1330 1335

Val Leu Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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<213> Streptococcus agalactiae

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Arg Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

```
Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285
```

```
Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495
```

```
Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700
```

```
Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910
```

```
Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110
```

```
Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305
```

```
Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
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<211> 1365
<212> PRT
<213> Streptococcus agalactiae

<400> 181

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110
```

```
Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Tyr Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Arg Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320
```

```
Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525
```

```
Arg Phe Leu Ala Glu Gly Phe Lys Asp Phe Gln Phe Leu Asn Arg Lys
    530                 535                 540

Gln Lys Glu Thr Ile Phe Asn Ser Leu Phe Lys Glu Lys Arg Lys Val
545                 550                 555                 560

Thr Glu Lys Asp Ile Ile Ser Phe Leu Asn Lys Val Asp Gly Tyr Glu
                565                 570                 575

Gly Ile Ala Ile Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser
            580                 585                 590

Thr Tyr His Asp Leu Lys Lys Ile Leu Gly Lys Asp Phe Leu Asp Asn
        595                 600                 605

Thr Asp Asn Glu Leu Ile Leu Glu Asp Ile Val Gln Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Asp Ile Tyr Lys Asp
625                 630                 635                 640

Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asn Lys
            660                 665                 670

Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Ser Ala
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu Ser Phe Lys
    690                 695                 700

Pro Ile Ile Asp Lys Ala Arg Thr Gly Ser His Ser Asp Asn Leu Lys
705                 710                 715                 720

Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735
```

```
Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr
            740                 745                 750

Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Lys Gly Leu Ser Arg Ser Arg Gln Arg Leu Thr Thr Leu Arg Glu
    770                 775                 780

Ser Leu Ala Asn Leu Lys Ser Glu Lys Lys Pro Lys Tyr Val Lys Asp
785                 790                 795                 800

Gln Val Glu Asn His His Leu Ser Asp Asp Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Lys Asp Met Tyr Thr Asp Asp Glu Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Val Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940
```

```
Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140
```

```
Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Pro Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335
```

```
Val Leu  Asn Ser Thr Leu Ile  His Lys Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
```

<210> 182
<211> 1365
<212> PRT
<213> Streptococcus agalactiae

<400> 182

```
Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125


His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140
```

```
Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350
```

```
Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560
```

```
Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765
```

```
Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975
```

```
Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Ile Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170
```

```
Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350

Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
```

<210> 183
<211> 1365
<212> PRT
<213> Streptococcus agalactiae

<400> 183

```
Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125


His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140


Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160


Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175


Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
```

```
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
```

385 390 395 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
405 410 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
420 425 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
435 440 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
450 455 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465 470 475 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
485 490 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
500 505 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
515 520 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
530 535 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545 550 555 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
565 570 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
580 585 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe

595 600 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
610 615 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625 630 635 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
645 650 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
660 665 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
675 680 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
690 695 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr

805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865 870 875 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
900 905 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
915 920 925

Thr Lys His Val Ala Ser Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
930 935 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu
995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg

```
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
```

1205 1210 1215

Gly Asn Glu Leu Ala Leu Pro Thr Gln Phe Met Lys Phe Leu Tyr
1220 1225 1230

Leu Ala Ser Arg Tyr Asn Glu Ser Lys Gly Lys Pro Glu Glu Ile
1235 1240 1245

Glu Lys Lys Gln Glu Phe Val Asn Gln His Val Ser Tyr Phe Asp
1250 1255 1260

Asp Ile Leu Gln Leu Ile Asn Asp Phe Ser Lys Arg Val Ile Leu
1265 1270 1275

Ala Asp Ala Asn Leu Glu Lys Ile Asn Lys Leu Tyr Gln Asp Asn
1280 1285 1290

Lys Glu Asn Ile Ser Val Asp Glu Leu Ala Asn Asn Ile Ile Asn
1295 1300 1305

Leu Phe Thr Phe Thr Ser Leu Gly Ala Pro Ala Ala Phe Lys Phe
1310 1315 1320

Phe Asp Lys Ile Val Asp Arg Lys Arg Tyr Thr Ser Thr Lys Glu
1325 1330 1335

Val Leu Asn Ser Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr
1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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<212> PRT
<213> Streptococcus agalactiae

<400> 184

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

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Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ser Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Asp Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asn Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Arg Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Ile Asp
        195                 200                 205

Val Glu Gly Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220
```

```
Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Val Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Thr Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Ser Lys Thr
        355                 360                 365

Asn Gln Gly Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Gly Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430
```

```
Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640
```

```
Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Ser Asp
        675                 680                 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Pro Ile Ile Asp Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Val Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Thr Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Glu Glu Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
        835                 840                 845
```

```
Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865                 870                 875                 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050
```

```
Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Phe Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Asp
    1175                1180                1185

Asp Lys  Leu Met Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Leu Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245
```

```
Glu Gln  Lys Gln Glu Phe Val  Val Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  185
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<212>  PRT
<213>  Streptococcus agalactiae

<400>  185

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255
```

```
Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460
```

```
Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670
```

```
Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880
```

```
Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080
```

```
Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155

Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Leu Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275
```

```
Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305


Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Ile Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365


<210>  186
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<213>  Streptococcus agalactiae

<400>  186

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80
```

```
Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
        115                 120                 125

His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285
```

```
Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Asp Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495
```

```
Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700
```

```
Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720


Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735


Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750


Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765


Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780


Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800


Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815


Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830


Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845


Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860


Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880


Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895


Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910
```

```
Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
                965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
            980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                 1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110
```

```
Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125


Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140


Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155


Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170


Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185


Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200


Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215


Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230


Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245


Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260


Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290


Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305
```

```
Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320


Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335


Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350


Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
```

<210> 187
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<213> Streptococcus agalactiae

<400> 187

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Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Met Gln Glu Glu Lys Asp Tyr
```

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        115                 120                 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Ser Phe Glu Asn Asn His Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
```

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                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Tyr Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Val
```

530 535 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545 550 555 560

Lys Lys Gln Leu Leu Asp Phe Leu Ala Lys Glu Phe Glu Glu Phe Arg
565 570 575

Ile Val Asp Val Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
580 585 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Asp Phe
595 600 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
610 615 620

Ile Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625 630 635 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
645 650 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
660 665 670

Arg Asp Arg Glu Ser Gln Lys Ile Ile Leu Asp Tyr Leu Ile Ser Asp
675 680 685

Gly Arg Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
690 695 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ser Gly Ser His Ser Asp
705 710 715 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val

740 745 750

Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Glu Asp Gly Val Lys Asn Leu Ala Ser Asp Ile Leu Lys Glu Tyr
785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
820 825 830

Ser Leu Ser Gln Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Ile Asp Ile Val Lys Ala Arg
865 870 875 880

Lys Ala Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Ile Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Pro Asp
900 905 910

Asp Lys Ala Gly Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
915 920 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Lys Val
930 935 940

Asp Asp Asn Asn Lys Pro Ile Arg Lys Val Lys Ile Val Thr Leu Lys

945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu
995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg
1010 1015 1020

Lys Ala Thr Glu Lys Leu Phe Phe Tyr Ser Asn Ile Met Asn Phe
1025 1030 1035

Phe Lys Thr Lys Val Thr Leu Ala Asp Glu Thr Val Val Val Lys
1040 1045 1050

Asp Asp Ile Glu Val Asn Asn Glu Thr Gly Glu Ile Ala Trp Asp
1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Ala His Ser Asn Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Lys Asp Ile Tyr Leu Asp Pro Lys Lys Tyr Gly
1115 1120 1125

Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Val Leu Val Leu Ala
1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Lys Glu

```
    1145                1150                1155

Leu Ile  Gly Ile Thr Ile Met  Glu Arg Glu Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Thr
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Tyr Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Ser Asp Asn
    1280                1285                1290

Lys Asp  Asn Thr Pro Val Asp  Glu Leu Ala Lys Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ser Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asp Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
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1340 1345 1350

Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

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<211> 1365
<212> PRT
<213> Streptococcus agalactiae

<220>
<221> misc_feature
<222> (9)..(9)
<223> Xaa can be any naturally occurring amino acid

<400> 188

Met Asn Lys Pro Tyr Ser Ile Gly Xaa Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
115 120 125

```
His Glu Lys Phe Ser Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Ile Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Ser Phe Asp
                165                 170                 175

Val Arg Asn Thr Asp Ile Ser Lys Gln Tyr Gln Asp Phe Leu Glu Ile
            180                 185                 190

Phe Asn Thr Thr Phe Glu Asn Asn Asp Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asn Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys Tyr
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Ile Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335
```

```
Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
    370                 375                 380

Glu Asp Ser Glu Asn Phe Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Lys Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Asp Leu Val Asp Lys Glu Lys Ser Ala Glu Ala Phe Ile His Arg Met
                485                 490                 495

Thr Asn Asn Asp Phe Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540
```

```
Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu His Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Lys Leu Leu Asp Phe Leu Ala Lys Glu Tyr Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Ile Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Asp Lys Asp Phe
        595                 600                 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Glu Asn
625                 630                 635                 640

Tyr Lys Asp Leu Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asp Lys Glu Ser Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Arg Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu
    690                 695                 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ala Gly Ser His Ser Asp
705                 710                 715                 720

Asn Leu Lys Glu Val Val Gly Glu Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750
```

```
Met Gly Tyr Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
    770                 775                 780

Leu Asp Asp Gly Val Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp
            820                 825                 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865                 870                 875                 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
                885                 890                 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
            900                 905                 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
    930                 935                 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945                 950                 955                 960
```

```
Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
               965                 970                 975

Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
           980                 985                 990

Val Val Ala Lys Ala Ile Leu Thr  Lys Tyr Pro Gln Leu  Glu Pro Glu
        995                1000                1005

Phe Val  Tyr Gly Asp Tyr Pro  Lys Tyr Asn Ser Tyr  Lys Thr Arg
    1010                1015                1020

Lys Ala  Thr Glu Lys Leu Phe  Phe Tyr Ser Asn Ile  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Lys Val Thr Leu  Ala Asp Gly Thr Val  Val Val Lys
    1040                1045                1050

Asp Asp  Ile Glu Val Asn Asn  Asp Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Lys His Phe Ala Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Asn  Asn Ile Val Lys Lys  Thr Glu Ile Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Ala  His Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Tyr Leu Asp Pro Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Ile Val  Ala Tyr Ser Val Leu  Val Val Ala
    1130                1135                1140

Asp Ile  Lys Lys Gly Lys Ala  Gln Lys Leu Lys Thr  Val Thr Glu
    1145                1150                1155
```

```
Leu Leu  Gly Ile Thr Ile Met  Glu Arg Ser Arg Phe  Glu Lys Asn
    1160                1165                1170

Pro Ser  Ala Phe Leu Glu Ser  Lys Gly Tyr Leu Asn  Ile Arg Ala
    1175                1180                1185

Asp Lys  Leu Ile Ile Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Leu Ile Asn  Asp Phe Ser Lys Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350
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Glu Thr Arg Ile Asp Leu Gly Lys Leu Gly Glu Asp
1355 1360 1365

<210> 189
<211> 1365
<212> PRT
<213> Streptococcus agalactiae

<400> 189

Met Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Ile Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Arg Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Gly Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Ile Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Lys Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Asp Tyr
115 120 125

His Glu Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
130 135 140

Lys Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Asp Asp Arg Phe Asp

```
                165                 170                 175

Val Arg Asn Thr Asp Ile Gln Lys Gln Tyr Gln Ala Phe Leu Glu Ile
            180                 185                 190

Phe Asp Thr Thr Phe Glu Asn Asn His Leu Leu Ser Gln Asn Val Asp
        195                 200                 205

Val Glu Ala Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp
    210                 215                 220

Arg Ile Leu Ala Gln Tyr Pro Asp Gln Lys Ser Thr Gly Ile Phe Ala
225                 230                 235                 240

Glu Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His
                245                 250                 255

Phe Asn Leu Glu Asp Lys Thr Pro Leu Gln Phe Ala Lys Asp Ser Tyr
            260                 265                 270

Asp Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Glu Phe Ala
        275                 280                 285

Asp Leu Phe Ser Ala Ala Lys Lys Leu Tyr Asp Ser Val Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Thr Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Gln Arg Tyr Asp Glu His Arg Glu Asp Leu Lys Gln Leu
                325                 330                 335

Lys Gln Phe Val Lys Ala Ser Leu Pro Glu Lys Tyr Gln Glu Ile Phe
            340                 345                 350

Ala Asp Ser Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr
        355                 360                 365

Asn Gln Glu Ala Phe Tyr Lys Tyr Leu Ser Lys Leu Leu Thr Lys Gln
```

```
    370                 375                 380

Glu Gly Ser Glu Tyr Leu Leu Glu Lys Ile Lys Asn Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Thr Glu Leu Arg Ala Ile Ile Arg Arg Gln Ser Glu Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Leu Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Glu Lys Ser Asp Phe Ala
    450                 455                 460

Trp Met Thr Arg Lys Thr Asp Asp Ser Ile Arg Pro Trp Asn Phe Glu
465                 470                 475                 480

Glu Leu Val Asp Lys Glu Ala Ser Ala Glu Ala Phe Ile His Cys Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Ile Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Lys Asn Glu Gln Gly Glu Thr Tyr Phe Phe Asp Ser Asn Ile
    530                 535                 540

Lys Gln Glu Ile Phe Asp Gly Val Phe Lys Glu Tyr Arg Lys Val Ser
545                 550                 555                 560

Lys Lys Gln Leu Leu Asp Phe Leu Ala Lys Glu Phe Glu Glu Phe Arg
                565                 570                 575

Ile Val Asp Val Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala
```

580 585 590

Ser Leu Gly Thr Tyr His Asp Leu Glu Lys Ile Leu Gly Lys Asp Phe
595 600 605

Leu Asp Asn Pro Asp Asn Glu Ser Ile Leu Glu Asp Ile Val Gln Thr
610 615 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Lys Arg Leu Asp Ile
625 630 635 640

Tyr Lys Asp Phe Phe Thr Glu Ser Gln Leu Lys Lys Leu Tyr Arg Arg
645 650 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile
660 665 670

Arg Asn Lys Glu Asn Gln Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
675 680 685

Gly Ser Ala Asn Arg Asn Phe Met Gln Leu Ile Lys Asp Ala Gly Leu
690 695 700

Ser Phe Lys Ser Ile Ile Ser Lys Ala Gln Ser Gly Ser His Ser Asp
705 710 715 720

Asn Leu Lys Glu Val Val Ser Glu Leu Ala Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
740 745 750

Met Gly Tyr Lys Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
755 760 765

Gln Thr Thr Asn Gln Gly Arg Arg Asn Ser Arg Gln Arg Tyr Lys Leu
770 775 780

Leu Asp Asp Gly Val Arg Asn Leu Ala Ser Asn Ile Leu Lys Glu Tyr

785 790 795 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Glu Arg Leu Phe Leu Tyr Tyr
805 810 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Glu Lys Ala Leu Asp Ile Asp
820 825 830

Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile
835 840 845

Lys Asp Asp Ser Ile Asp Asn Arg Val Leu Val Ser Ser Ala Lys Asn
850 855 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val Lys Asp Cys
865 870 875 880

Lys Val Phe Trp Lys Lys Leu Leu Asp Ala Lys Leu Met Ser Gln Arg
885 890 895

Lys Tyr Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Ser Asp
900 905 910

Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile
915 920 925

Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Asn Glu Leu
930 935 940

Asp Ser Lys Gly Arg Arg Ile Arg Lys Val Lys Ile Val Thr Leu Lys
945 950 955 960

Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile
965 970 975

Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala
980 985 990

Val Val Ala Lys Ala Ile Leu Thr Lys Tyr Pro Gln Leu Glu Pro Glu

995 1000 1005

Phe Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Thr Arg
1010 1015 1020

Lys Ala Thr Glu Lys Leu Phe Phe Tyr Ser Asn Ile Met Asn Phe
1025 1030 1035

Phe Lys Thr Lys Val Thr Leu Ala Asp Gly Thr Val Val Val Lys
1040 1045 1050

Asp Asp Ile Glu Val Asn Asn Asp Thr Gly Glu Ile Val Trp Asp
1055 1060 1065

Lys Lys Lys His Phe Ala Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Asn Asn Ile Val Lys Lys Thr Glu Ile Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Ala His Gly Asn Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Lys Asp Ile Tyr Leu Asp Pro Lys Lys Tyr Gly
1115 1120 1125

Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Val Leu Val Val Ala
1130 1135 1140

Asp Ile Lys Lys Gly Lys Ala Gln Lys Leu Lys Thr Val Thr Glu
1145 1150 1155

Leu Leu Gly Ile Thr Ile Met Glu Arg Ser Arg Phe Glu Lys Asn
1160 1165 1170

Pro Ser Ala Phe Leu Glu Ser Lys Gly Tyr Leu Asn Ile Arg Thr
1175 1180 1185

Asp Lys Leu Ile Ile Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu

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    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Gly Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Leu Ala Leu Pro  Thr Gln Phe Met Lys  Phe Leu Tyr
    1220                1225                1230

Leu Ala  Ser Arg Tyr Asn Glu  Ser Lys Gly Lys Pro  Glu Glu Ile
    1235                1240                1245

Glu Lys  Lys Gln Glu Phe Val  Asn Gln His Val Ser  Tyr Phe Asp
    1250                1255                1260

Asp Ile  Leu Gln Ile Ile Asn  Asp Phe Ser Asn Arg  Val Ile Leu
    1265                1270                1275

Ala Asp  Ala Asn Leu Glu Lys  Ile Asn Lys Leu Tyr  Gln Asp Asn
    1280                1285                1290

Lys Glu  Asn Ile Ser Val Asp  Glu Leu Ala Asn Asn  Ile Ile Asn
    1295                1300                1305

Leu Phe  Thr Phe Thr Ser Leu  Gly Ala Pro Ala Ala  Phe Lys Phe
    1310                1315                1320

Phe Asp  Lys Ile Val Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu
    1325                1330                1335

Val Leu  Asn Ser Thr Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr
    1340                1345                1350

Glu Thr  Arg Ile Asp Leu Gly  Lys Leu Gly Glu Asp
    1355                1360                1365
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<213> Streptococcus anginosus

<400> 190

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Met Asn Gln Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Met Gln Val Asp Glu Ser
                85                  90                  95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Asp Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Ile Ala Ala Glu Val Lys Tyr
        115                 120                 125

His Asp Glu Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ile Ser Gln Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gln Leu Lys Ala
                165                 170                 175

Glu Asn Thr Asn Val Gln Ala Leu Phe Lys Asp Phe Val Glu Val Tyr
            180                 185                 190

Asp Lys Thr Val Glu Glu Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205
```

```
Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Ile Ala His Tyr Pro Ala Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Phe Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Gly Leu Leu Gly Glu Val Gly Asp Glu Tyr Ala Asp
        275                 280                 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Val Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Phe Glu
                325                 330                 335

Asp Phe Ile Lys Val Asn Ala Leu Asp Gln Tyr Asn Ala Ile Phe Lys
            340                 345                 350

Asp Lys Asn Lys Lys Gly Tyr Ala Gly Tyr Ile Glu Ser Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Gly Ile Leu Leu Gln Ile Asn
    370                 375                 380

Gly Ser Gly Asp Phe Leu Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415
```

```
Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Gly Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465                 470                 475                 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Val Asn Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ser Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asn Lys Ser Phe Leu
        595                 600                 605

Asp Asn Lys Glu Asn Ala Gln Ile Ile Glu Asp Ile Ile Gln Thr Leu
    610                 615                 620
```

```
Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asn Lys Glu Asn Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Ile Ile Gly Asp Val Asp Asp
705                 710                 715                 720

Ile Ala Asn Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Asn Pro Ala Asn Ile Ile Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Asp Arg Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Val Asn Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815

Met Tyr Thr Gly Glu Thr Leu Asp Ile Asn Asn Leu Ser Gln Tyr Asp
            820                 825                 830
```

```
Ile Asp His Ile Ile Pro Gln Ala Tyr Ile Lys Asp Asp Ser Phe Asp
        835                 840                 845

Asn Arg Val Leu Thr Ser Ser Ser Glu Asn Arg Gly Lys Ser Asp Asn
    850                 855                 860

Val Pro Ser Ile Glu Val Val Cys Ala Arg Lys Ala Asp Trp Met Arg
865                 870                 875                 880

Leu Arg Lys Ala Gly Leu Ile Ser Gln Arg Lys Phe Asp Asn Leu Thr
                885                 890                 895

Lys Ala Glu Arg Gly Gly Leu Thr Glu Asn Asp Lys Ala Gly Phe Ile
            900                 905                 910

Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925

Val Leu Asp Ala Arg Phe Asn Ala Lys His Asp Glu Asn Lys Lys Val
    930                 935                 940

Ile Arg Asp Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Gln
945                 950                 955                 960

Phe Arg Lys Asp Phe Lys Phe Tyr Lys Val Arg Glu Ile Asn Asp Tyr
                965                 970                 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Ile Gly Thr Ala Leu
            980                 985                 990

Leu Lys Lys Tyr Pro Lys Leu Ala  Ser Glu Phe Val Tyr  Gly Glu Phe
        995                 1000                1005

Lys Lys  Tyr Asp Val Ser Asp  Lys Glu Ile Gly Lys  Ala Thr Ala
    1010                1015                1020

Lys Tyr  Phe Phe Tyr Ser Asn  Leu Met Asn Phe Phe  Lys Lys Glu
    1025                1030                1035
```

```
Val Lys  Phe Ala Asp Gly Thr  Val Val Glu Arg Pro  Asp Ile Glu
    1040                1045                1050

Thr Ser  Glu Asp Gly Glu Ile  Ala Trp Asn Lys Gln  Thr Asp Phe
    1055                1060                1065

Lys Ile  Val Arg Lys Val Leu  Ser Tyr Pro Gln Val  Asn Ile Val
    1070                1075                1080

Lys Lys  Thr Glu Val Gln Thr  His Gly Leu Asp Arg  Pro Ser Pro
    1085                1090                1095

Lys Pro  Lys Pro Asp Ser Ser  Glu Asn Leu Val Gly  Val Lys Arg
    1100                1105                1110

Asn Leu  Asp Pro Lys Lys Tyr  Gly Gly Tyr Ala Gly  Ile Ser Asn
    1115                1120                1125

Ser Tyr  Ala Val Leu Val Lys  Ala Ile Ile Glu Lys  Gly Val Lys
    1130                1135                1140

Lys Lys  Glu Thr Met Val Leu  Glu Phe Gln Gly Ile  Ser Ile Leu
    1145                1150                1155

Asp Arg  Ile Thr Phe Glu Lys  Asp Lys Arg Ala Phe  Leu Leu Gly
    1160                1165                1170

Lys Gly  Tyr Lys Asp Ile Lys  Lys Ile Ile Glu Leu  Pro Lys Tyr
    1175                1180                1185

Ser Leu  Phe Glu Leu Lys Asp  Gly Ser Arg Arg Met  Leu Ala Ser
    1190                1195                1200

Arg Gly  Glu Ile His Lys Gly  Asn Glu Leu Phe Val  Pro Gln Lys
    1205                1210                1215

Phe Thr  Thr Leu Leu Tyr His  Ala Lys Arg Ile Asn  Asn Pro Ile
    1220                1225                1230
```

```
Asn Lys  Asp His Ile Glu Tyr  Val Lys Lys His Arg  Asp Asp Phe
    1235                 1240                 1245


Lys Glu  Leu Leu Asn Tyr Val  Leu Glu Phe Asn Glu  Lys Tyr Val
    1250                 1255                 1260


Gly Ala  Thr Lys Asn Gly Glu  Arg Leu Lys Glu Ala  Val Ala Asp
    1265                 1270                 1275


Phe Asp  Ser Lys Ser Asn Glu  Glu Ile Cys Thr Ser  Phe Leu Gly
    1280                 1285                 1290


Leu Phe  Glu Leu Thr Ser Leu  Gly Ser Ala Ser Asp  Phe Glu Phe
    1295                 1300                 1305


Leu Gly  Val Lys Ile Pro Arg  Tyr Arg Asp Tyr Thr  Pro Ser Ser
    1310                 1315                 1320


Leu Leu  Lys Asp Ser Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1325                 1330                 1335


Tyr Glu  Thr Arg Ile Asp Leu  Ser Lys Leu Gly Glu  Asp
    1340                 1345                 1350


<210>  191
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<213>  Streptococcus anginosus

<400>  191

Met Lys Lys Glu Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Leu
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Thr Glu Glu Met Asn Lys Val Asp Glu Asn
                85                  90                  95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Glu Glu Asp Lys Gln
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Gly Thr Leu Lys Glu Glu Lys Glu Tyr
        115                 120                 125

His Lys Lys Phe Lys Thr Ile Tyr His Leu Arg Glu Glu Leu Ala Asn
    130                 135                 140

Ser Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Tyr Glu Gly Asp Leu Lys Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Ala Leu Phe Lys Asp Phe Val Glu Glu Tyr
            180                 185                 190

Asp Lys Thr Ile Glu Glu Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Ser Arg Leu Glu Asn
    210                 215                 220

Leu Ile Ala His Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255
```

```
Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Glu Ile Gly Asp Glu Tyr Ala Asp
        275                 280                 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Ala Val Asp Asp Asn Thr Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Val Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Leu Lys
                325                 330                 335

Asp Phe Ile Lys Val Asn Ala Pro Asp Gln Tyr Asn Ala Ile Phe Lys
            340                 345                 350

Asp Lys Asn Lys Lys Gly Tyr Ala Gly Tyr Ile Glu Ser Gly Val Glu
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Gly Ile Leu Leu Lys Ile Asn
    370                 375                 380

Gly Ser Gly Asp Phe Leu Asp Lys Ile Asp Cys Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Gly Ser Arg Phe Ala Trp
    450                 455                 460
```

```
Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465                 470                 475                 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Pro Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Thr Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Val Asn Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ser Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Ser Phe Leu
        595                 600                 605

Asp Asp Lys Ala Asn Glu Lys Thr Ile Glu Asp Ile Ile Gln Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670
```

```
Asn Lys Glu Asn Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Arg Ala Gln Ile Ile Gly Asp Val Asp Asp
705                 710                 715                 720

Ile Ala Asn Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Asn Pro Ala Asn Ile Ile Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Asp Lys Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Val Asn Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815

Met Tyr Thr Gly Glu Thr Leu Asp Ile Asn Asn Leu Ser Gln Tyr Asp
            820                 825                 830

Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Leu Asp
        835                 840                 845

Asn Arg Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser Asp Asp
    850                 855                 860

Val Pro Ser Ile Glu Val Val His Glu Met Lys Ser Phe Trp Ser Lys
865                 870                 875                 880
```

```
Leu Leu Ser Val Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr
               885                 890                 895

Lys Ala Glu Arg Gly Gly Leu Thr Glu Glu Asp Lys Ala Gly Phe Ile
           900                 905                 910

Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925

Ile Leu Asp Glu Arg Phe Asn Thr Glu Phe Asp Gly Ala Gln Arg Arg
    930                 935                 940

Ile Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Asn
945                 950                 955                 960

Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr
               965                 970                 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Asn Ala Leu
           980                 985                 990

Leu Leu Lys Tyr Pro Gln Leu Glu  Pro Glu Phe Val Tyr  Gly Glu Tyr
        995                 1000                1005

Pro Lys  Tyr Asn Ser Tyr Arg  Ser Arg Lys Ser Ala  Thr Glu Lys
    1010                1015                1020

Phe Leu  Phe Tyr Ser Asn Ile  Leu Arg Phe Phe Lys  Lys Glu Asp
    1025                1030                1035

Ile Gln  Thr Asn Glu Asp Gly  Glu Ile Ala Trp Asn  Lys Glu Lys
    1040                1045                1050

His Ile  Lys Ile Leu Arg Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1055                1060                1065

Ile Val  Lys Lys Thr Glu Glu  Gln Thr Gly Gly Phe  Ser Lys Glu
    1070                1075                1080
```

```
Ser Ile  Leu Pro Lys Gly Glu  Ser Asp Lys Leu Ile  Pro Arg Lys
    1085                1090                1095

Thr Lys  Asn Ser Tyr Trp Asn  Pro Lys Lys Tyr Gly  Gly Phe Asp
    1100                1105                1110

Ser Pro  Val Val Ala Tyr Ser  Ile Leu Val Phe Ala  Asp Val Glu
    1115                1120                1125

Lys Gly  Lys Ser Lys Lys Leu  Arg Lys Val Gln Asp  Met Val Gly
    1130                1135                1140

Ile Thr  Ile Met Glu Lys Lys  Arg Phe Glu Lys Asn  Pro Val Asp
    1145                1150                1155

Phe Leu  Glu Gln Arg Gly Tyr  Arg Asn Val Arg Leu  Glu Lys Ile
    1160                1165                1170

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Leu Glu  Asn Lys Arg
    1175                1180                1185

Arg Arg  Leu Leu Ala Ser Ala  Arg Glu Leu Gln Lys  Gly Asn Glu
    1190                1195                1200

Leu Val  Ile Pro Gln Arg Phe  Thr Thr Leu Leu Tyr  His Ser Tyr
    1205                1210                1215

Gln Ile  Glu Lys Asn Tyr Glu  Pro Glu His Arg Glu  Tyr Val Glu
    1220                1225                1230

Lys His  Lys Asp Glu Phe Lys  Glu Leu Leu Glu Tyr  Ile Ser Val
    1235                1240                1245

Phe Ser  Arg Lys Tyr Val Leu  Ala Asp Asn Asn Leu  Thr Lys Ile
    1250                1255                1260

Glu Met  Leu Phe Ser Lys Asn  Lys Asp Ala Glu Val  Ser Ser Leu
    1265                1270                1275
```

```
Ala Lys  Ser Phe Ile Ser Leu  Leu Thr Phe Thr Ala  Phe Gly Ala
    1280                 1285                 1290


Pro Ala  Ala Phe Asn Phe Phe  Gly Glu Asn Ile Asp  Arg Lys Arg
    1295                 1300                 1305


Tyr Thr  Ser Val Thr Glu Cys  Leu Asn Ala Thr Leu  Ile His Gln
    1310                 1315                 1320


Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Lys Leu
    1325                 1330                 1335


Gly Glu  Asp
    1340
```

<210> 192
<211> 1341
<212> PRT
<213> Streptococcus anginosus

<400> 192

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Met Lys Lys Glu Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Met Gln Val Asp Glu Ser
                85                  90                  95
```

```
Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
            100                 105                 110

Gly Ser Arg Tyr Pro Ile Phe Gly Asn Ile Ala Ala Glu Val Lys Tyr
        115                 120                 125

His Asp Asp Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Val Asp
    130                 135                 140

Ile Ser Gln Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gln Leu Lys Ala
                165                 170                 175

Glu Asn Thr Asn Val Gln Ala Leu Phe Lys Asp Phe Val Glu Val Tyr
            180                 185                 190

Asp Lys Thr Val Glu Glu Ser His Leu Ser Glu Met Thr Val Asp Ala
        195                 200                 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Val Glu Cys Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Gly Leu Leu Gly Glu Ile Gly Asp Glu Tyr Ala Asp
        275                 280                 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300
```

```
Ile Leu Ala Val Asp Asp Asn Thr Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Val Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Leu Lys
                325                 330                 335

Asp Phe Ile Lys Val Asn Ala Pro Ala Gln Tyr Asp Asp Ile Phe Lys
            340                 345                 350

Asp Glu Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile Asp
    370                 375                 380

Gly Ser Asp Tyr Phe Leu Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Gly Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465                 470                 475                 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510
```

```
Pro Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Thr Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Val Asn Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Ser Phe Leu
        595                 600                 605

Asp Asp Lys Val Asn Glu Lys Ile Ile Glu Asp Ile Ile Gln Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Thr Gln Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asn Lys Glu Asn Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Arg Ala Gln Ile Ile Gly Asp Val Asp Asp
705                 710                 715                 720
```

```
Ile Ala Asn Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Asn Pro Ala Asn Ile Ile Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Asp Lys Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Val Asn Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815

Met Tyr Thr Gly Glu Thr Leu Asp Ile Asn Asn Leu Ser Gln Tyr Asp
            820                 825                 830

Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Leu Asp
        835                 840                 845

Asn Arg Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser Asp Asp
    850                 855                 860

Val Pro Ser Ile Glu Val Val His Glu Met Lys Ser Phe Trp Ser Lys
865                 870                 875                 880

Leu Leu Ser Val Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr
                885                 890                 895

Lys Ala Glu Arg Gly Gly Leu Thr Glu Glu Asp Lys Ala Gly Phe Ile
            900                 905                 910

Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925
```

```
Ile Leu Asp Glu Arg Phe Asn Thr Glu Phe Asp Gly Ala Gln Arg Arg
    930                 935                 940

Ile Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Asn
945                 950                 955                 960

Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr
                965                 970                 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Asn Ala Leu
            980                 985                 990

Leu Leu Lys Tyr Pro Gln Leu Glu  Pro Glu Phe Val Tyr  Gly Glu Tyr
        995                 1000                1005

Pro Lys  Tyr Asn Ser Tyr Arg  Ser Arg Lys Ser Ala  Thr Glu Lys
    1010                1015                1020

Phe Leu  Phe Tyr Ser Asn Ile  Leu Arg Phe Phe Lys  Lys Glu Asp
    1025                1030                1035

Ile Gln  Thr Asn Glu Asp Gly  Glu Ile Ala Trp Asn  Lys Glu Lys
    1040                1045                1050

His Ile  Lys Ile Leu Arg Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1055                1060                1065

Ile Val  Lys Lys Thr Glu Glu  Gln Thr Gly Gly Phe  Ser Lys Glu
    1070                1075                1080

Ser Ile  Leu Pro Lys Gly Glu  Ser Asp Lys Leu Ile  Pro Arg Lys
    1085                1090                1095

Thr Lys  Asn Ser Tyr Trp Asn  Pro Lys Lys Tyr Gly  Gly Phe Asp
    1100                1105                1110

Ser Pro  Val Val Ala Tyr Ser  Ile Leu Val Phe Ala  Asp Val Glu
    1115                1120                1125
```

```
Lys Gly  Lys Ser Lys Lys Leu  Arg Lys Val Gln Asp  Met Val Gly
    1130                1135                1140

Ile Thr  Ile Met Glu Lys Lys  Arg Phe Glu Lys His  Pro Val Asp
    1145                1150                1155

Phe Leu  Glu Gln Arg Gly Tyr  Arg Asn Val Arg Leu  Glu Lys Ile
    1160                1165                1170

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Leu Glu  Asn Lys Arg
    1175                1180                1185

Arg Arg  Leu Leu Ala Ser Ala  Arg Glu Leu Gln Lys  Gly Asn Glu
    1190                1195                1200

Leu Val  Ile Pro Gln Arg Phe  Thr Thr Leu Leu Tyr  His Ser Tyr
    1205                1210                1215

Arg Ile  Glu Lys Asp Tyr Glu  Pro Glu His Arg Glu  Tyr Val Glu
    1220                1225                1230

Lys His  Lys Asp Glu Phe Lys  Glu Leu Leu Glu Tyr  Ile Ser Val
    1235                1240                1245

Phe Ser  Arg Lys Tyr Val Leu  Ala Asp Asn Asn Leu  Thr Lys Ile
    1250                1255                1260

Glu Met  Leu Phe Ser Lys Asn  Lys Asp Ala Glu Val  Ser Ser Leu
    1265                1270                1275

Ala Lys  Ser Phe Ile Ser Leu  Leu Thr Phe Thr Ala  Phe Gly Ala
    1280                1285                1290

Pro Ala  Ala Phe Asn Phe Phe  Gly Glu Asn Ile Asp  Arg Lys Arg
    1295                1300                1305

Tyr Thr  Ser Val Thr Glu Cys  Leu Asn Ala Thr Leu  Ile His Gln
    1310                1315                1320
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Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Lys Leu
1325 1330 1335

Gly Glu Asp
1340

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Met Lys Lys Glu Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65 70 75 80

Tyr Leu Gln Glu Ile Phe Thr Glu Glu Met Asn Lys Val Asp Glu Asn
85 90 95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Glu Glu Asp Lys Gln
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Gly Thr Leu Lys Glu Glu Lys Glu Tyr
115 120 125

His Lys Lys Phe Lys Thr Ile Tyr His Leu Arg Glu Glu Leu Ala Asn
130 135 140

Ser Lys Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His

145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Tyr Glu Gly Asp Leu Lys Ala
165 170 175

Glu Asn Thr Asp Val Gln Ala Leu Phe Lys Asp Phe Val Glu Glu Tyr
180 185 190

Asp Lys Thr Ile Glu Glu Ser His Leu Ser Glu Ile Thr Val Asp Ala
195 200 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Ser Arg Leu Glu Asn
210 215 220

Leu Ile Ala His Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225 230 235 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
245 250 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
260 265 270

Glu Asp Leu Glu Glu Leu Leu Gly Glu Ile Gly Asp Glu Tyr Ala Asp
275 280 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
290 295 300

Ile Leu Ala Val Asp Asp Asn Thr Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Val Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Leu Lys
325 330 335

Asp Phe Ile Lys Val Asn Ala Pro Asp Gln Tyr Asn Ala Ile Phe Lys
340 345 350

Asp Lys Asn Lys Lys Gly Tyr Ala Gly Tyr Ile Glu Ser Gly Val Glu

```
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Gly Ile Leu Leu Lys Ile Asn
    370                 375                 380

Gly Ser Gly Asp Phe Leu Asp Lys Ile Asp Cys Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Gly Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465                 470                 475                 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Pro Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Thr Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Glu Glu Phe Arg Ile
```

565 570 575

Val Asn Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ser Ser
580 585 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Ser Phe Leu
595 600 605

Asp Asp Lys Ala Asn Glu Lys Thr Ile Glu Asp Ile Ile Gln Thr Leu
610 615 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625 630 635 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Arg His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
660 665 670

Asn Lys Glu Asn Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
690 695 700

Phe Lys Glu Glu Ile Ala Arg Ala Gln Ile Ile Gly Asp Val Asp Asp
705 710 715 720

Ile Ala Asn Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
740 745 750

Gly His Asn Pro Ala Asn Ile Ile Ile Glu Met Ala Arg Glu Asn Gln
755 760 765

Thr Thr Asp Lys Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu

```
    770                 775                 780

Gln Asp Ser Leu Lys Pro Val Asn Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815

Met Tyr Thr Gly Glu Thr Leu Asp Ile Asn Asn Leu Ser Gln Tyr Asp
            820                 825                 830

Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Leu Asp
        835                 840                 845

Asn Arg Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser Asp Asp
    850                 855                 860

Val Pro Ser Ile Glu Val Val His Glu Met Lys Ser Phe Trp Ser Lys
865                 870                 875                 880

Leu Leu Ser Val Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr
                885                 890                 895

Lys Ala Glu Arg Gly Gly Leu Thr Glu Glu Asp Lys Ala Gly Phe Ile
            900                 905                 910

Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925

Ile Leu Asp Glu Arg Phe Asn Thr Glu Phe Asp Gly Ala Gln Arg Arg
    930                 935                 940

Ile Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Asn
945                 950                 955                 960

Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr
                965                 970                 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Asn Ala Leu
```

980 985 990

Leu Leu Lys Tyr Pro Gln Leu Glu Pro Glu Phe Val Tyr Gly Glu Tyr
995 1000 1005

Pro Lys Tyr Asn Ser Tyr Arg Ser Arg Lys Ser Ala Thr Glu Lys
1010 1015 1020

Phe Leu Phe Tyr Ser Asn Ile Leu Arg Phe Phe Lys Lys Glu Asp
1025 1030 1035

Ile Gln Thr Asn Glu Asp Gly Glu Ile Ala Trp Asn Lys Glu Lys
1040 1045 1050

His Ile Lys Ile Leu Arg Lys Val Leu Ser Tyr Pro Gln Val Asn
1055 1060 1065

Ile Val Lys Lys Thr Glu Glu Gln Thr Gly Gly Phe Ser Lys Glu
1070 1075 1080

Ser Ile Leu Pro Lys Gly Glu Ser Asp Lys Leu Ile Pro Arg Lys
1085 1090 1095

Thr Lys Asn Ser Tyr Trp Asn Pro Lys Lys Tyr Gly Gly Phe Asp
1100 1105 1110

Ser Pro Val Val Ala Tyr Ser Ile Leu Val Phe Ala Asp Val Glu
1115 1120 1125

Lys Gly Lys Ser Lys Lys Leu Arg Lys Val Gln Asp Met Val Gly
1130 1135 1140

Ile Thr Ile Met Glu Lys Lys Arg Phe Glu Lys Asn Pro Val Asp
1145 1150 1155

Phe Leu Glu Gln Arg Gly Tyr Arg Asn Val Arg Leu Glu Lys Ile
1160 1165 1170

Ile Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu Asn Lys Arg

1175 1180 1185

Arg Arg Leu Leu Ala Ser Ala Arg Glu Leu Gln Lys Gly Asn Glu
1190 1195 1200

Leu Val Ile Pro Gln Arg Phe Thr Thr Leu Leu Tyr His Ser Tyr
1205 1210 1215

Gln Ile Glu Lys Asn Tyr Glu Pro Glu His Arg Glu Tyr Val Glu
1220 1225 1230

Lys His Lys Asp Glu Phe Lys Glu Leu Leu Glu Tyr Ile Ser Val
1235 1240 1245

Phe Ser Arg Lys Tyr Val Leu Ala Asp Asn Asn Leu Thr Lys Ile
1250 1255 1260

Glu Met Leu Phe Ser Lys Asn Lys Asp Ala Glu Val Ser Ser Leu
1265 1270 1275

Ala Lys Ser Phe Ile Ser Leu Leu Thr Phe Thr Ala Phe Gly Ala
1280 1285 1290

Pro Ala Ala Phe Asn Phe Phe Gly Glu Asn Ile Asp Arg Lys Arg
1295 1300 1305

Tyr Thr Ser Val Thr Glu Cys Leu Asn Ala Thr Leu Ile His Gln
1310 1315 1320

Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Lys Leu
1325 1330 1335

Gly Glu Asp
1340

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Met Thr Lys Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser
1               5                  10                  15

Val Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys
            20                  25                  30

Met Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu
        35                  40                  45

Leu Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg
    50                  55                  60

Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu
65                  70                  75                  80

Arg Tyr Leu Gln Asp Ile Phe Thr Glu Glu Met Ala Lys Val Asp Asp
                85                  90                  95

Ser Phe Phe Gln Arg Leu Asp Glu Ser Phe Leu Thr Asp Asn Asp Lys
            100                 105                 110

Asn Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala
        115                 120                 125

Tyr His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala
    130                 135                 140

Asp Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala
145                 150                 155                 160

His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn
                165                 170                 175

Ala Glu Asn Thr Asp Val Gln Lys Leu Phe Thr Asp Phe Val Gly Val
            180                 185                 190

Tyr Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp
        195                 200                 205
```

```
Ala Ala Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu
    210                 215                 220

Asn Leu Ile Asn Asn Tyr Pro Lys Glu Lys Lys Asn Thr Leu Phe Gly
225                 230                 235                 240

Asn Leu Ile Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn
                245                 250                 255

Phe Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala
        275                 280                 285

Asp Leu Phe Thr Ser Ser Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Lys Arg Tyr Val Glu His His Glu Asp Leu Glu Lys Leu
                325                 330                 335

Lys Glu Phe Ile Lys Ala Asn Lys Ser Glu Leu Tyr His Asp Ile Phe
            340                 345                 350

Lys Asp Lys Thr Gln Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val
        355                 360                 365

Lys Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Gly Ile Leu Thr Lys Ile
    370                 375                 380

Asn Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His
                405                 410                 415
```

```
Leu Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Glu Glu Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asp Ser Arg Phe Ala
    450                 455                 460

Trp Ala Glu Tyr Arg Ser Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp
465                 470                 475                 480

Lys Val Ile Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met
                485                 490                 495

Thr Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser His Val Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Lys Tyr Val Asn Glu Gln Gly Lys Asp Ser Phe Phe Asp Ser Asn Met
    530                 535                 540

Lys Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr
545                 550                 555                 560

Lys Glu Lys Leu Leu Asn Tyr Leu Asp Lys Glu Phe Pro Glu Tyr Arg
                565                 570                 575

Ile Gln Asp Leu Val Gly Leu Asp Lys Glu Asn Lys Ser Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Ser Phe
        595                 600                 605

Leu Asp Asp Lys Val Asn Glu Glu Val Ile Glu Asp Ile Ile Lys Thr
    610                 615                 620
```

```
Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Gln Gln Arg Leu Gln Lys
625                 630                 635                 640

Tyr Ser Asp Ile Phe Thr Lys Gln Gln Leu Lys Lys Leu Glu Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asn Lys Glu Asn Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Ser Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu
    690                 695                 700

Ser Phe Lys Gln Ile Ile Gln Glu Ala Gln Val Val Gly Asp Val Asp
705                 710                 715                 720

Asp Ile Glu Thr Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Ile Lys Val
            740                 745                 750

Met Gly Asp Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Arg Gly Arg Ser Gln Ser Gln Gln Arg Leu Lys Lys
    770                 775                 780

Leu Gln Asn Ser Leu Lys Pro Ser Tyr Ile Glu Asp Lys Val Glu Asn
785                 790                 795                 800

Ser His Leu Gln Asn Asp Gln Leu Phe Leu Tyr Tyr Ile Gln Asn Gly
                805                 810                 815

Lys Asp Met Tyr Thr Gly Asp Glu Leu Asp Ile Asp His Leu Ser Asp
            820                 825                 830
```

```
Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asp Val Pro Ser Leu Gly Ile Val Arg Ala Arg Lys Ala Glu Trp
865                 870                 875                 880

Val Arg Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ala Arg Phe Asn Thr Glu Arg Asp Glu Asn Asp
    930                 935                 940

Lys Val Ile Arg Asp Val Lys Val Ile Thr Leu Lys Ser Asn Leu Val
945                 950                 955                 960

Ser Gln Phe Arg Lys Glu Phe Lys Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Leu Lys Lys Tyr Pro Lys  Leu Ala Pro Glu Phe  Val Tyr Gly
        995                 1000                1005

Glu Tyr  Lys Lys Tyr Asp Val  Ser Ser Asp Asp His  Ser Glu Met
    1010                1015                1020

Gly Lys  Ala Thr Ala Lys Tyr  Phe Phe Tyr Ser Asn  Leu Met Asn
    1025                1030                1035
```

```
Phe Phe  Lys Arg Val Ile Arg  Tyr Ser Asn Gly Lys  Val Ile Val
    1040                1045                1050

Arg Pro  Val Val Glu Tyr Ser  Lys Asp Thr Gly Glu  Ile Ala Trp
    1055                1060                1065

Asn Lys  Arg Thr Asp Phe Glu  Lys Val Arg Lys Val  Leu Ser Tyr
    1070                1075                1080

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Thr Gln  Thr Gly Gly
    1085                1090                1095

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asp Ser  Asp Lys Leu
    1100                1105                1110

Ile Pro  Arg Lys Thr Lys Lys  Val Leu Trp Glu Pro  Lys Lys Tyr
    1115                1120                1125

Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr Ser Val  Leu Val Val
    1130                1135                1140

Ala Asp  Val Glu Lys Gly Lys  Thr Lys Lys Leu Lys  Thr Val Lys
    1145                1150                1155

Glu Leu  Val Gly Ile Ser Ile  Met Glu Arg Ser Phe  Phe Glu Lys
    1160                1165                1170

Asn Pro  Val Glu Phe Leu Lys  Asn Lys Gly Tyr Gln  Asn Val Gln
    1175                1180                1185

Glu Asp  Lys Leu Met Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Phe
    1190                1195                1200

Glu Gly  Gly Arg Arg Arg Leu  Leu Ala Ser Ala Thr  Glu Leu Gln
    1205                1210                1215

Lys Gly  Asn Glu Ile Met Leu  Ser Ala His Leu Val  Ala Leu Leu
    1220                1225                1230
```

```
Tyr His  Ala His Arg Ile Gly  Asn Phe Asn Ser Ala  Glu His Leu
    1235                1240                1245


Lys Tyr  Val Ser Glu His Lys  Lys Glu Phe Glu Glu  Val Leu Ser
    1250                1255                1260


Cys Val  Glu Asn Phe Ala Asn  Val Tyr Val Asp Val  Glu Lys Asn
    1265                1270                1275


Leu Ser  Lys Ile Arg Ala Ala  Ala Asp Ser Met Asp  Asn Phe Ser
    1280                1285                1290


Ile Glu  Glu Ile Ser Asp Ser  Phe Ile Asn Leu Leu  Thr Leu Thr
    1295                1300                1305


Ala Leu  Gly Ala Pro Ala Asp  Phe Asn Phe Leu Gly  Glu Lys Ile
    1310                1315                1320


Pro Arg  Lys Arg Tyr Asn Ser  Thr Lys Glu Cys Leu  Asn Ala Thr
    1325                1330                1335


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1340                1345                1350


Leu Ser  Lys Leu Gly Glu Glu
    1355                1360


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<400>  195

Met Glu Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30
```

```
Lys Val Leu Gly Asn Thr Asn Arg Lys Ser Ile Lys Lys Asn Leu Met
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Asn Glu Met Ala Lys Leu Asp Asp Ser
                85                  90                  95

Phe Phe Gln Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

Asn Glu Arg His Pro Ile Phe Gly Asn Leu Ala Asp Glu Val Ala Tyr
        115                 120                 125

His Arg Asn Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Pro Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Leu Asn Ala
                165                 170                 175

Glu Asn Ser Asp Val Ala Lys Leu Phe Tyr Gln Leu Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Ser Leu Asp Glu Ile Glu Val Asp Ala Lys
        195                 200                 205

Gly Ile Leu Ser Ala Arg Leu Ser Lys Ser Lys Arg Leu Glu Lys Leu
    210                 215                 220

Ile Ala Val Phe Pro Asn Glu Lys Lys Asn Gly Leu Phe Gly Asn Ile
225                 230                 235                 240
```

```
Ile Ala Leu Ala Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Thr Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Glu Leu Leu Gly Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Ser Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Ser Asn Ser Glu Val Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Val Lys Arg Tyr Asp Glu His His Gln Asp Leu Ala Leu Leu Lys Thr
                325                 330                 335

Leu Val Arg Gln Gln Phe Pro Glu Lys Tyr Ala Glu Ile Phe Lys Asp
            340                 345                 350

Asp Thr Lys Asn Gly Tyr Ala Gly Tyr Val Gly Ile Gly Ala Thr Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Ala Glu Glu Leu Leu Ala Lys Leu Asn Arg Asp Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Lys
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Glu Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445
```

```
Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Leu
    450                 455                 460

Thr Arg Lys Ser Glu Glu Ala Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Glu Gln Leu Pro Asn Lys Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Arg Met Arg Lys Pro Glu Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ile Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655
```

```
Gly Trp Gly Arg Leu Ser Arg Lys Met Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ser Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Glu Ile Glu Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Thr
        755                 760                 765

Lys Gly Leu Gln Gln Ser Arg Glu Arg Lys Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Glu Ser Gln Ile Leu Lys Glu Asn Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Val Glu Asn Arg Gly Lys Ser
    850                 855                 860
```

```
Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880


Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895


Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Ala Asp Lys Ala Gly
            900                 905                 910


Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925


Ala Arg Ile Leu Asp Ser Arg Met Asn Thr Lys Arg Asp Lys Asn Asp
    930                 935                 940


Lys Pro Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960


Ser Asp Phe Arg Lys Asp Phe Gln Leu Tyr Lys Val Arg Asp Ile Asn
                965                 970                 975


Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990


Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005


Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020


Thr Ala  Lys Arg Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035


Thr Glu  Val Lys Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050


Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Val Val Trp  Asn Lys Glu
    1055                1060                1065
```

```
Lys Asp  Phe Ala Thr Val Arg  Lys Val Leu Ala Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1085                1090                1095

Glu Ser  Ile Leu Ser Lys Arg  Glu Ser Ala Lys Leu  Ile Pro Arg
    1100                1105                1110

Lys Lys  Gly Trp Asp Thr Arg  Lys Tyr Gly Gly Phe  Gly Ser Pro
    1115                1120                1125

Thr Val  Ala Tyr Ser Ile Leu  Val Val Ala Lys Val  Glu Lys Gly
    1130                1135                1140

Lys Ala  Lys Lys Leu Lys Ser  Val Lys Val Leu Val  Gly Ile Thr
    1145                1150                1155

Ile Met  Glu Lys Gly Ser Tyr  Glu Lys Asp Pro Ile  Gly Phe Leu
    1160                1165                1170

Glu Ala  Lys Gly Tyr Lys Asp  Ile Lys Lys Glu Leu  Ile Phe Lys
    1175                1180                1185

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Arg Arg
    1190                1195                1200

Met Leu  Ala Ser Glu Leu Gln  Lys Ala Asn Glu Leu  Val Leu Pro
    1205                1210                1215

Gln His  Leu Val Arg Leu Leu  Tyr Tyr Thr Gln Asn  Ile Ser Ala
    1220                1225                1230

Thr Thr  Gly Ser Asn Asn Leu  Gly Tyr Ile Glu Gln  His Arg Glu
    1235                1240                1245

Glu Phe  Lys Glu Ile Phe Glu  Lys Ile Ile Asp Phe  Ser Glu Lys
    1250                1255                1260
```

```
Tyr Ile  Leu Lys Asn Lys Val  Asn Ser Asn Leu Lys  Ser Ser Phe
    1265                1270                1275


Asp Glu  Gln Phe Ala Val Ser  Asp Ser Ile Leu Leu  Ser Asn Ser
    1280                1285                1290


Phe Val  Ser Leu Leu Lys Tyr  Thr Ser Phe Gly Ala  Ser Gly Gly
    1295                1300                1305


Phe Thr  Phe Leu Asp Leu Asp  Val Lys Gln Gly Arg  Leu Arg Tyr
    1310                1315                1320


Gln Thr  Val Thr Glu Val Leu  Asp Ala Thr Leu Ile  Tyr Gln Ser
    1325                1330                1335


Ile Thr  Gly Leu Tyr Glu Thr  Arg Thr Asp Leu Ser  Gln Leu Gly
    1340                1345                1350


Gly Asp
    1355
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<213> Streptococcus constellatus

<400> 196

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Met Gly Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Thr Gly Glu Met Asn Lys Val Asp Glu Asn
                85                  90                  95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Asp Glu Asp Lys Arg
            100                 105                 110

Gly Glu His His Pro Ile Phe Gly Asn Ile Ala Ala Glu Val Lys Tyr
        115                 120                 125

His Asp Asp Phe Pro Thr Ile Tyr His Leu Arg Arg His Leu Ala Asp
    130                 135                 140

Thr Ser Lys Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Tyr Glu Gly Asp Leu Lys Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Ala Leu Phe Lys Asp Phe Val Glu Glu Tyr
            180                 185                 190

Asp Lys Thr Ile Glu Glu Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Ser Arg Leu Glu Asn
    210                 215                 220

Leu Ile Ala His Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Asp Leu His Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270
```

```
Glu Asp Leu Glu Gly Phe Leu Gly Glu Val Gly Asp Glu Tyr Ala Asp
        275                 280                 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Val Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Leu Lys
                325                 330                 335

Asp Phe Ile Lys Val Asn Ala Pro Asp Gln Tyr Asn Ala Ile Phe Lys
            340                 345                 350

Asp Lys Asn Lys Lys Gly Tyr Ala Ser Tyr Ile Glu Ser Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Gly Ile Leu Leu Lys Ile Asn
    370                 375                 380

Gly Ser Gly Asp Phe Leu Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Gly Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465                 470                 475                 480
```

```
Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Pro Leu Tyr Glu Ala Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Thr Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Val Asn Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ser Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Ser Phe Leu
        595                 600                 605

Asp Asp Lys Ala Asn Glu Lys Thr Ile Glu Asp Ile Ile Gln Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asn Lys Glu Asn Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685
```

```
Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Arg Ala Gln Ile Ile Asp Asp Val Asp Asp
705                 710                 715                 720

Ile Ala Asn Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Asn Pro Ala Asn Ile Ile Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Asp Lys Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Val Asn Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815

Met Tyr Thr Gly Glu Thr Leu Asp Ile Asn Asn Leu Ser Gln Tyr Asp
            820                 825                 830

Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Leu Asp
        835                 840                 845

Asn Arg Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser Asp Asp
    850                 855                 860

Val Pro Ser Ile Glu Val Val His Glu Met Lys Ser Phe Trp Ser Lys
865                 870                 875                 880

Leu Leu Ser Val Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr
                885                 890                 895
```

```
Lys Ala Glu Arg Gly Gly Leu Thr Glu Glu Asp Lys Ala Gly Phe Ile
            900                 905                 910

Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925

Ile Leu Asp Glu Arg Phe Asn Thr Glu Phe Asp Gly Asn Lys Arg Arg
    930                 935                 940

Ile Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Asn
945                 950                 955                 960

Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr
                965                 970                 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Asn Ala Leu
            980                 985                 990

Leu Leu Lys Tyr Pro Gln Leu Glu  Pro Glu Phe Val Tyr  Gly Glu Tyr
        995                 1000                1005

Pro Lys  Tyr Asn Ser Tyr Arg  Ser Arg Lys Ser Ala  Thr Glu Lys
    1010                1015                1020

Phe Leu  Phe Tyr Ser Asn Ile  Leu Arg Phe Phe Lys  Lys Glu Asp
    1025                1030                1035

Ile Gln  Thr Asn Glu Asp Gly  Glu Ile Ala Trp Asn  Lys Glu Lys
    1040                1045                1050

His Ile  Lys Ile Leu Arg Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1055                1060                1065

Ile Val  Lys Lys Thr Glu Glu  Gln Thr Gly Gly Phe  Ser Lys Glu
    1070                1075                1080

Ser Ile  Leu Pro Lys Gly Glu  Ser Asp Lys Leu Ile  Pro Arg Lys
    1085                1090                1095
```

```
Thr Lys  Asn Ser Tyr Trp Asp  Pro Lys Lys Tyr Gly  Gly Phe Asp
    1100                1105                1110

Ser Pro  Val Val Ala Tyr Ser  Ile Leu Val Phe Ala  Asp Val Glu
    1115                1120                1125

Lys Gly  Lys Ser Lys Lys Leu  Arg Lys Val Gln Asp  Met Val Gly
    1130                1135                1140

Ile Thr  Ile Met Glu Lys Lys  Arg Phe Glu Lys Asn  Pro Val Asp
    1145                1150                1155

Phe Leu  Glu Gln Arg Gly Tyr  Arg Asn Val Arg Leu  Glu Lys Ile
    1160                1165                1170

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Leu Glu  Asn Lys Arg
    1175                1180                1185

Arg Arg  Leu Leu Ala Ser Ala  Lys Glu Leu Gln Lys  Gly Asn Glu
    1190                1195                1200

Leu Val  Ile Pro Gln Arg Phe  Thr Thr Leu Leu Tyr  His Ser Tyr
    1205                1210                1215

Arg Ile  Glu Lys Asp Tyr Glu  Pro Glu His Arg Glu  Tyr Val Glu
    1220                1225                1230

Lys His  Lys Asp Glu Phe Lys  Glu Leu Leu Glu Tyr  Ile Ser Val
    1235                1240                1245

Phe Ser  Arg Lys Tyr Val Leu  Ala Asp Asn Asn Leu  Thr Lys Ile
    1250                1255                1260

Glu Met  Leu Phe Ser Lys Asn  Lys Asp Ala Glu Val  Ser Ser Leu
    1265                1270                1275

Ala Lys  Ser Phe Ile Ser Leu  Leu Thr Phe Thr Ala  Phe Gly Ala
    1280                1285                1290
```

Pro Ala Ala Phe Asn Phe Phe Gly Glu Asn Ile Asp Arg Lys Arg
1295 1300 1305

Tyr Thr Ser Val Thr Glu Cys Leu Asn Ala Thr Leu Ile His Gln
1310 1315 1320

Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Lys Leu
1325 1330 1335

Gly Glu Asp
1340

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<400> 197

Met Thr Gln Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Ile Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Ile Leu Gly Asn Thr Asn Lys Gln Tyr Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Lys Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ile Glu Glu Met Asn Lys Val Asp Glu Asn
85 90 95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Gly Thr Leu Lys Glu Glu Lys Glu Tyr

115 120 125

Tyr Lys Glu Phe Glu Thr Ile Tyr His Leu Arg Lys Arg Leu Ala Asp
130 135 140

Ser Thr Gly Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gln Leu Lys Ala
165 170 175

Glu Asn Thr Asp Val Gln Thr Leu Phe Asn Asp Phe Val Glu Val Tyr
180 185 190

Asp Lys Thr Ile Glu Glu Ser His Leu Ala Glu Ile Thr Val Asp Ala
195 200 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
210 215 220

Leu Val Lys Cys Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225 230 235 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
245 250 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
260 265 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
275 280 285

Leu Phe Thr Ser Ala Lys Asn Leu Tyr Asp Thr Ile Leu Leu Ser Gly
290 295 300

Ile Leu Ala Val Asp Asp Asn Ser Thr Lys Ala Leu Leu Ser Ala Ser
305 310 315 320

Met Ile Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Leu Lys

325 330 335

Asp Phe Ile Lys Val Asn Ala Pro Ala Gln Tyr Asp Asp Ile Phe Lys
340 345 350

Asp Glu Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
355 360 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile Asp
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
420 425 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Val Arg Lys Gly Ser Arg Phe Ala Trp
450 455 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465 470 475 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
485 490 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Ile Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Ala Asn Met Lys

530 535 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Pro Lys Val Thr Lys
545 550 555 560

Asp Lys Leu Leu Asn Tyr Leu Asp Lys Glu Phe Asp Glu Phe Arg Ile
565 570 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
580 585 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Ser Phe Leu
595 600 605

Asp Asp Lys Ala Asn Glu Lys Thr Ile Glu Asp Ile Ile Gln Thr Leu
610 615 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625 630 635 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Arg His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
660 665 670

Asn Lys Glu Asn Asn Lys Thr Ile Leu Glu Tyr Leu Val Asp Asp Gly
675 680 685

Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Thr Leu Pro
690 695 700

Phe Lys Gln Ile Ile Lys Asp Ala Gln Ala Ile Asp Asp Val Asp Asp
705 710 715 720

Ile Glu Leu Ile Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met

```
            740                 745                 750

Gly Tyr Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Thr Lys Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu
    770                 775                 780

Gln Asp Ser Leu Thr Pro Val Ser Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815

Met Tyr Thr Gly Glu Glu Leu Asp Ile His His Leu Ser Asp Tyr Asp
            820                 825                 830

Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser Ile Asp
        835                 840                 845

Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly Lys Ser Asp Asn
    850                 855                 860

Val Pro Asn Leu Glu Val Val Cys Asp Arg Lys Ala Asp Trp Ile Arg
865                 870                 875                 880

Leu Arg Glu Ala Gly Leu Ile Ser Gln Arg Lys Phe Asp Asn Leu Thr
                885                 890                 895

Lys Ala Glu Arg Gly Gly Leu Thr Glu Asn Asp Lys Ala Gly Phe Ile
            900                 905                 910

His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925

Ile Leu Asp Ala Arg Phe Asn Pro Lys Arg Asp Asp Asn Lys Lys Val
    930                 935                 940

Ile Arg Asp Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Gln
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945 950 955 960

Phe Arg Arg Asp Phe Lys Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr
965 970 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr Ala Leu
980 985 990

Leu Lys Lys Tyr Pro Lys Leu Thr Ser Glu Phe Val Tyr Gly Glu Tyr
995 1000 1005

Lys Lys Tyr Asp Val Ser Asp Asn Asp Glu Ile Gly Lys Ala Thr
1010 1015 1020

Ala Lys Tyr Phe Phe Tyr Ser Asn Leu Met Asn Phe Phe Lys Thr
1025 1030 1035

Glu Val Lys Phe Ala Asp Gly Thr Val Val Glu Arg Pro Asp Ile
1040 1045 1050

Glu Thr Ser Glu Asp Gly Glu Ile Ala Trp Asn Lys Gln Thr Asp
1055 1060 1065

Phe Lys Ile Val Arg Lys Val Leu Ser Tyr Pro Gln Val Asn Ile
1070 1075 1080

Val Lys Lys Val Glu Lys Gln Thr Gly Arg Phe Ser Lys Glu Ser
1085 1090 1095

Ile Leu Pro Lys Gly Asp Ser Asp Lys Leu Ile Ala Arg Lys Thr
1100 1105 1110

Lys Glu Asn Tyr Trp Asp Thr Lys Lys Tyr Gly Gly Phe Asp Ser
1115 1120 1125

Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Asp Ile Lys Lys
1130 1135 1140

Gly Lys Ala Lys Lys Leu Lys Thr Val Lys Glu Leu Val Gly Ile

1145 1150 1155

Ser Ile Met Glu Arg Pro Phe Phe Glu Lys Asn Pro Ile Met Phe
1160 1165 1170

Leu Glu Ser Lys Gly Tyr Arg Asn Ile Gln Lys Asp Lys Leu Ile
1175 1180 1185

Lys Leu Pro Lys Tyr Ser Leu Phe Glu Phe Glu Gly Gly Arg Arg
1190 1195 1200

Arg Leu Leu Ala Ser Ala Val Glu Leu Gln Lys Gly Asn Glu Met
1205 1210 1215

Val Leu Pro Gln Tyr Leu Asn Asn Leu Leu Tyr His Ala His Arg
1220 1225 1230

Ile Asp Asn Ser Asp Asn Ser Glu His Leu Lys Tyr Ile Thr Glu
1235 1240 1245

His Lys Glu Glu Phe Gly Lys Leu Leu Ser Tyr Ile Glu Asn Phe
1250 1255 1260

Ala Lys Ser Tyr Val Asp Val Asp Lys Asn Leu Glu Lys Ile Gln
1265 1270 1275

Leu Ala Val Glu Lys Ile Asp Ser Phe Ser Val Lys Glu Ile Ser
1280 1285 1290

Asn Ser Phe Ile His Leu Leu Thr Leu Thr Ala Leu Gly Ala Pro
1295 1300 1305

Ala Asp Phe Asn Phe Leu Gly Glu Lys Ile Pro Arg Lys Arg Tyr
1310 1315 1320

Thr Ser Thr Lys Glu Cys Leu Asn Ala Thr Leu Ile His Gln Ser
1325 1330 1335

Ile Thr Gly Leu Tyr Glu Thr Gln Thr Asp Leu Ser Lys Leu Gly

1340 1345 1350

Glu Asp
1355

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<400> 198

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Arg
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Ser Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
100 105 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
115 120 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
130 135 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

```
Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Met Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365
```

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Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Glu Phe Leu Ser Gly Lys Gln Lys
    530                 535                 540

Glu Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575
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Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Lys Tyr Ala Asn
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780
```

```
Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Ile Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990
```

```
Ala Leu Ile Lys Lys Tyr Thr Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Arg Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Glu Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Ala  Leu Thr Asn
    1085                1090                1095

Glu Ser  Ile Tyr Ala Arg Gly  Ser Phe Asp Lys Leu  Ile Ser Arg
    1100                1105                1110

Lys His  Arg Phe Glu Ser Ser  Lys Tyr Gly Gly Phe  Gly Ser Pro
    1115                1120                1125

Thr Val  Thr Tyr Ser Val Leu  Val Val Ala Lys Ser  Lys Val Gln
    1130                1135                1140

Asp Gly  Lys Val Lys Lys Ile  Lys Thr Gly Lys Glu  Leu Ile Gly
    1145                1150                1155

Met Thr  Leu Leu Asp Lys Leu  Val Phe Glu Lys Asn  Pro Leu Lys
    1160                1165                1170

Phe Ile  Glu Asp Lys Gly Tyr  Gly Asn Val Gln Ile  Asp Lys Cys
    1175                1180                1185
```

```
Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Phe Glu  Asn Gly Thr
    1190                1195                1200

Arg Arg  Met Leu Ala Ser Arg  Gly Asp Leu Gln Lys  Ala Asn Glu
    1205                1210                1215

Met Phe  Leu Pro Ala Lys Leu  Val Thr Leu Leu Tyr  His Ala His
    1220                1225                1230

Lys Ile  Glu Ser Ser Lys Glu  Leu Glu His Glu Ala  Tyr Ile Leu
    1235                1240                1245

Asp His  Tyr Asn Asp Leu Tyr  Gln Leu Leu Ser Tyr  Ile Glu Arg
    1250                1255                1260

Phe Ala  Ser Leu Tyr Val Asp  Val Glu Lys Asn Ile  Ser Lys Val
    1265                1270                1275

Lys Glu  Leu Phe Ser Asn Ile  Glu Ser Tyr Ser Ile  Ser Glu Ile
    1280                1285                1290

Cys Ser  Ser Val Ile Asn Leu  Leu Thr Leu Thr Ala  Ser Gly Ala
    1295                1300                1305

Pro Ala  Asp Phe Lys Phe Leu  Gly Thr Thr Ile Pro  Arg Lys Arg
    1310                1315                1320

Tyr Gly  Ser Pro Gln Ser Ile  Leu Ser Ser Thr Leu  Ile His Gln
    1325                1330                1335

Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu
    1340                1345                1350

Gly Gly  Asp
    1355
```

<210> 199
<211> 1356

<212> PRT
<213> Streptococcus dysgalactiae

<400> 199

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Ser Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190
```

```
Asn Gln Leu Phe Glu Glu Lys Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Lys Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asn Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400
```

```
Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Glu Phe Leu Ser Gly Lys Gln Lys
    530                 535                 540

Glu Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605
```

```
Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Lys Tyr Ala Asn
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815
```

```
Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020
```

```
Thr Ala  Lys Arg Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Glu Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Ala  Leu Thr Asn
    1085                1090                1095

Glu Ser  Ile Tyr Ala Arg Gly  Ser Phe Asp Lys Leu  Ile Ser Arg
    1100                1105                1110

Lys His  Arg Phe Glu Ser Ser  Lys Tyr Gly Gly Phe  Gly Ser Pro
    1115                1120                1125

Thr Val  Thr Tyr Ser Val Leu  Val Val Ala Lys Ser  Lys Val Gln
    1130                1135                1140

Asp Gly  Lys Val Lys Lys Ile  Lys Thr Gly Lys Glu  Leu Ile Gly
    1145                1150                1155

Ile Thr  Leu Leu Asp Lys Leu  Val Phe Glu Lys Asn  Pro Leu Lys
    1160                1165                1170

Phe Ile  Glu Asp Lys Gly Tyr  Gly Asn Val Gln Ile  Asp Lys Cys
    1175                1180                1185

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Phe Glu  Asn Gly Thr
    1190                1195                1200

Arg Arg  Met Leu Ala Ser Arg  Gly Asp Leu Gln Lys  Ala Asn Glu
    1205                1210                1215
```

```
Met Phe  Leu Pro Ala Lys Leu  Val Thr Leu Leu Tyr  His Ala His
    1220                 1225                 1230


Lys Ile  Glu Ser Ser Lys Glu  Leu Glu His Glu Ala  Tyr Ile Leu
    1235                 1240                 1245


Asp His  Tyr Asn Asp Leu Tyr  Gln Leu Leu Ser Tyr  Ile Glu Arg
    1250                 1255                 1260


Phe Ala  Ser Leu Tyr Val Asp  Val Glu Lys Asn Ile  Ser Lys Val
    1265                 1270                 1275


Lys Glu  Leu Phe Ser Asn Ile  Glu Ser Tyr Ser Ile  Ser Glu Ile
    1280                 1285                 1290


Cys Ser  Ser Val Ile Asn Leu  Leu Thr Leu Thr Ala  Ser Gly Ala
    1295                 1300                 1305


Pro Ala  Asp Phe Lys Phe Leu  Gly Thr Thr Ile Pro  Arg Lys Arg
    1310                 1315                 1320


Tyr Gly  Ser Pro Gln Ser Ile  Leu Ser Ser Thr Leu  Ile His Gln
    1325                 1330                 1335


Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu
    1340                 1345                 1350


Gly Gly  Asp
    1355


<210>  200
<211>  1356
<212>  PRT
<213>  Streptococcus dysgalactiae

<400>  200

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Ser Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Met Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220
```

```
Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240


Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255


Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270


Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285


Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300


Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320


Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335


Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350


Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365


Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380


Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400


Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415


Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430
```

```
Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Glu Phe Leu Ser Gly Lys Gln Lys
    530                 535                 540

Glu Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640
```

```
Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Ile Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
        835                 840                 845
```

```
Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asp Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Arg Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050
```

```
Ile Glu  Thr Asn Glu Glu Thr  Gly Glu Ile Val Trp  Asn Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Ala  Leu Thr Asn
    1085                1090                1095

Glu Ser  Ile Tyr Ala Arg Gly  Ser Phe Asp Lys Leu  Ile Ser Arg
    1100                1105                1110

Lys His  Arg Phe Glu Ser Ser  Lys Tyr Gly Gly Phe  Gly Ser Pro
    1115                1120                1125

Thr Val  Thr Tyr Ser Val Leu  Val Val Ala Lys Ser  Lys Val Gln
    1130                1135                1140

Asp Gly  Lys Val Lys Lys Ile  Lys Thr Gly Lys Glu  Leu Ile Gly
    1145                1150                1155

Ile Thr  Leu Leu Asp Lys Leu  Val Phe Glu Lys Asn  Pro Leu Lys
    1160                1165                1170

Phe Ile  Glu Asp Lys Gly Tyr  Gly Asn Val Gln Ile  Asp Lys Cys
    1175                1180                1185

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Phe Glu  Asn Gly Thr
    1190                1195                1200

Arg Arg  Met Leu Ala Ser Arg  Gly Asp Leu Gln Lys  Ala Asn Glu
    1205                1210                1215

Met Phe  Leu Pro Ala Lys Leu  Val Thr Leu Leu Tyr  His Ala His
    1220                1225                1230

Lys Ile  Glu Ser Ser Lys Glu  Leu Glu His Glu Ala  Tyr Ile Leu
    1235                1240                1245
```

```
Asp His  Tyr Asn Asp Leu Tyr  Gln Leu Leu Ser Tyr  Ile Glu Arg
    1250                1255                1260


Phe Ala  Ser Leu Tyr Val Asp  Val Glu Lys Asn Ile  Ser Lys Val
    1265                1270                1275


Lys Glu  Leu Phe Ser Asn Ile  Glu Ser Tyr Ser Ile  Ser Glu Ile
    1280                1285                1290


Cys Ser  Ser Val Ile Asn Leu  Leu Thr Leu Thr Ala  Ser Gly Ala
    1295                1300                1305


Pro Ala  Asp Phe Lys Phe Leu  Gly Thr Thr Ile Pro  Arg Lys Arg
    1310                1315                1320


Tyr Gly  Ser Pro Gln Ser Ile  Leu Ser Ser Thr Leu  Ile His Gln
    1325                1330                1335


Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu
    1340                1345                1350


Gly Gly  Asp
    1355
```

<210> 201
<211> 1356
<212> PRT
<213> Streptococcus dysgalactiae

<400> 201

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
```

```
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Ser Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Met Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
```

```
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
```

```
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Glu Phe Leu Ser Gly Lys Gln Lys
    530                 535                 540

Glu Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Lys Tyr Ala Asn
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
```

675 680 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu Thr Phe Lys Glu
690 695 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705 710 715 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Ser Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly His Lys
740 745 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
755 760 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
770 775 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785 790 795 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
805 810 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
820 825 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
835 840 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
850 855 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865 870 875 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn

885 890 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
900 905 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
915 920 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
930 935 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945 950 955 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
965 970 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
980 985 990

Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe Val Tyr Gly
995 1000 1005

Asp Tyr Lys Val Tyr Asp Val Ser Glu Gln Glu Ile Gly Lys Ala
1010 1015 1020

Thr Ala Lys Arg Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe Lys
1025 1030 1035

Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro Leu
1040 1045 1050

Ile Glu Thr Asn Glu Glu Thr Gly Glu Ile Val Trp Asp Lys Gly
1055 1060 1065

Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln Val
1070 1075 1080

Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Ala Leu Thr Asn

1085 1090 1095

Glu Ser Ile Tyr Ala Arg Gly Ser Phe Asp Lys Leu Ile Ser Arg
1100 1105 1110

Lys His Arg Phe Glu Ser Ser Lys Tyr Gly Gly Phe Gly Ser Pro
1115 1120 1125

Thr Val Thr Tyr Ser Val Leu Val Val Ala Lys Ser Lys Val Gln
1130 1135 1140

Asp Gly Lys Val Lys Lys Ile Lys Thr Gly Lys Glu Leu Ile Gly
1145 1150 1155

Ile Thr Leu Leu Asp Lys Leu Val Phe Glu Lys Asn Pro Leu Lys
1160 1165 1170

Phe Ile Glu Asp Lys Gly Tyr Gly Asn Val Gln Ile Asp Lys Cys
1175 1180 1185

Ile Lys Leu Pro Lys Tyr Ser Leu Phe Glu Phe Glu Asn Gly Thr
1190 1195 1200

Arg Arg Met Leu Ala Ser Arg Gly Asp Leu Gln Lys Ala Asn Glu
1205 1210 1215

Met Phe Leu Pro Ala Lys Leu Val Thr Leu Leu Tyr His Ala His
1220 1225 1230

Lys Ile Glu Ser Ser Lys Glu Leu Glu His Glu Ala Tyr Ile Leu
1235 1240 1245

Asp His Tyr Asn Asp Leu Tyr Gln Leu Leu Ser Tyr Ile Glu Arg
1250 1255 1260

Phe Ala Ser Leu Tyr Val Asp Val Glu Lys Asn Ile Ser Lys Val
1265 1270 1275

Lys Glu Leu Phe Ser Asn Ile Glu Ser Tyr Ser Ile Ser Glu Ile

1280 1285 1290

Cys Ser Ser Val Ile Asn Leu Leu Thr Leu Thr Ala Ser Gly Ala
1295 1300 1305

Pro Ala Asp Phe Lys Phe Leu Gly Thr Thr Ile Pro Arg Lys Arg
1310 1315 1320

Tyr Gly Ser Pro Gln Ser Ile Leu Ser Ser Thr Leu Ile His Gln
1325 1330 1335

Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu
1340 1345 1350

Gly Gly Asp
1355

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<211> 1356
<212> PRT
<213> Streptococcus dysgalactiae

<400> 202

Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
20 25 30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Arg
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Ser Glu Met Ser Lys Val Asp Asp Ser
85 90 95

```
Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Met Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300
```

```
Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510
```

```
Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Glu Phe Leu Ser Gly Lys Gln Lys
    530                 535                 540

Glu Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Ile Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720
```

```
Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750

Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asp Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925
```

```
Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Arg Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Glu Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Ala  Leu Thr Asn
    1085                1090                1095

Glu Ser  Ile Tyr Ala Arg Gly  Ser Phe Asp Lys Leu  Ile Ser Arg
    1100                1105                1110

Lys His  Arg Phe Glu Ser Ser  Lys Tyr Gly Gly Phe  Gly Ser Pro
    1115                1120                1125
```

```
Thr Val  Thr Tyr Ser Val Leu  Val Val Ala Lys Cys  Lys Val Gln
    1130                1135                1140

Asp Gly  Lys Val Lys Lys Ile  Lys Thr Gly Lys Glu  Leu Ile Gly
    1145                1150                1155

Ile Thr  Leu Leu Asp Lys Leu  Val Phe Glu Lys Asn  Pro Leu Lys
    1160                1165                1170

Phe Ile  Glu Asp Lys Gly Tyr  Gly Asn Val Gln Ile  Asp Lys Cys
    1175                1180                1185

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Phe Glu  Asn Gly Thr
    1190                1195                1200

Arg Arg  Met Leu Ala Ser Arg  Gly Asp Leu Gln Lys  Ala Asn Glu
    1205                1210                1215

Met Phe  Leu Pro Ala Lys Leu  Val Thr Leu Leu Tyr  His Ala His
    1220                1225                1230

Lys Ile  Glu Ser Ser Lys Glu  Leu Glu His Glu Ala  Tyr Ile Leu
    1235                1240                1245

Asp His  Tyr Asn Asp Leu Tyr  Gln Leu Leu Ser Tyr  Ile Glu Arg
    1250                1255                1260

Phe Ala  Ser Leu Tyr Val Asp  Val Glu Lys Asn Ile  Ser Lys Val
    1265                1270                1275

Lys Glu  Leu Phe Ser Asn Ile  Glu Ser Tyr Ser Ile  Ser Glu Ile
    1280                1285                1290

Cys Ser  Ser Val Ile Asn Leu  Leu Thr Leu Thr Ala  Ser Gly Ala
    1295                1300                1305

Pro Ala  Asp Phe Lys Phe Leu  Gly Thr Thr Ile Pro  Arg Lys Arg
    1310                1315                1320
```

```
Tyr Gly  Ser Pro Gln Ser Ile  Leu Ser Ser Thr Leu  Ile His Gln
    1325                1330                1335


Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu
    1340                1345                1350


Gly Gly  Asp
    1355
```

<210> 203
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<212> PRT
<213> Streptococcus dysgalactiae

<400> 203

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Arg
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Ser Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125
```

```
His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Arg Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Arg Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Ser Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335
```

```
Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Ala Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540
```

```
Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Ile Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Ala Ile Gln Lys Ala Gln Val Ser Gly Gln Gly His Ser Leu His Glu
705                 710                 715                 720

Gln Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly His Lys
            740                 745                 750
```

```
Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Gln
        755                 760                 765

Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu Gly
    770                 775                 780

Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu Asn
785                 790                 795                 800

Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser Asp
            820                 825                 830

Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr Trp
865                 870                 875                 880

Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn Asp
    930                 935                 940

Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960
```

```
Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile Asn
               965                 970                 975

Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
           980                 985                 990

Ala Leu Ile Lys Lys Tyr Pro Lys  Leu Glu Ser Glu Phe  Val Tyr Gly
        995                1000                1005

Asp Tyr  Lys Val Tyr Asp Val  Ser Glu Gln Glu Ile  Gly Lys Ala
    1010                1015                1020

Thr Ala  Lys Arg Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1025                1030                1035

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1040                1045                1050

Ile Glu  Thr Asn Glu Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1055                1060                1065

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1070                1075                1080

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Ala  Leu Thr Asn
    1085                1090                1095

Glu Ser  Ile Tyr Ala Arg Gly  Ser Phe Asp Lys Leu  Ile Ser Arg
    1100                1105                1110

Lys His  Arg Phe Glu Ser Ser  Lys Tyr Gly Gly Phe  Gly Ser Pro
    1115                1120                1125

Thr Val  Thr Tyr Ser Val Leu  Val Val Ala Lys Ser  Lys Val Gln
    1130                1135                1140

Asp Gly  Lys Val Lys Lys Ile  Lys Thr Gly Lys Glu  Leu Ile Gly
    1145                1150                1155
```

```
Ile Thr  Leu Leu Asp Lys Leu  Val Phe Glu Lys Asn  Pro Leu Lys
    1160                1165                1170

Phe Ile  Glu Asp Lys Gly Tyr  Gly Asn Val Gln Ile  Asp Lys Cys
    1175                1180                1185

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Phe Glu  Asn Gly Thr
    1190                1195                1200

Arg Arg  Met Leu Ala Ser Arg  Gly Asp Leu Gln Lys  Ala Asn Glu
    1205                1210                1215

Met Phe  Leu Pro Ala Lys Leu  Val Thr Leu Leu Tyr  His Ala His
    1220                1225                1230

Lys Ile  Glu Ser Ser Lys Glu  Leu Glu His Glu Ala  Tyr Ile Leu
    1235                1240                1245

Asp His  Tyr Asn Asp Leu Tyr  Gln Leu Leu Ser Tyr  Ile Glu Arg
    1250                1255                1260

Phe Ala  Ser Leu Tyr Val Asp  Val Glu Lys Asn Ile  Ser Lys Val
    1265                1270                1275

Lys Glu  Leu Phe Ser Asn Ile  Glu Ser Tyr Ser Ile  Ser Glu Ile
    1280                1285                1290

Cys Ser  Ser Val Ile Asn Leu  Leu Thr Leu Thr Ala  Ser Gly Ala
    1295                1300                1305

Pro Ala  Asp Phe Lys Phe Leu  Gly Thr Thr Ile Pro  Arg Lys Arg
    1310                1315                1320

Tyr Gly  Ser Pro Gln Ser Ile  Leu Ser Ser Thr Leu  Ile His Gln
    1325                1330                1335

Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu
    1340                1345                1350
```

Gly Gly Asp
    1355

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<212> PRT
<213> Streptococcus equi

<400> 204

Met Lys Lys Pro Tyr Thr Ile Ala Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Val Val Val Thr Asp Asp Tyr Arg Val Pro Thr Lys Lys Met
            20   25   30

Lys Val Leu Gly Asn Thr Glu Arg Lys Thr Ile Lys Lys Asn Leu Ile
        35   40   45

Gly Ala Leu Leu Phe Asp Ser Gly Asp Thr Ala Glu Gly Thr Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65   70   75   80

Tyr Leu Lys Glu Ile Phe Thr Glu Glu Met Ala Lys Val Asp Asp Gly
                85   90   95

Phe Phe Gln Arg Leu Glu Asp Ser Phe Tyr Val Leu Glu Asp Lys Glu
            100   105   110

Gly Asn Lys His Pro Ile Phe Ala Asn Leu Ala Asp Glu Val Ala Tyr
        115   120   125

His Lys Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Val Asp
    130   135   140

Asn Pro Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Val Ala His
145   150   155   160

```
Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Thr Leu Ser Ser
                165                 170                 175

Lys Asn Asn Asn Leu Gln Lys Ser Phe Asp His Leu Val Asp Thr Tyr
            180                 185                 190

Asn Leu Leu Phe Glu Glu Gln Leu Leu Thr Glu Gly Ile Asn Ala Lys
        195                 200                 205

Glu Leu Leu Ser Ala Ala Leu Ser Lys Ser Lys Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ser Leu Ile Pro Gly Gln Lys Lys Thr Gly Ile Phe Gly Asn Ile
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ala Asn Phe Gly
                245                 250                 255

Leu Ser Lys Asp Val Lys Leu Gln Leu Ala Lys Asp Thr Tyr Ala Asp
            260                 265                 270

Asp Leu Asp Ser Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Thr Glu Ser Asp Glu Ile Thr Arg Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Val Lys Arg Tyr Arg Glu His His Lys Asp Leu Val Thr Leu Lys Thr
                325                 330                 335

Leu Ile Lys Asp Gln Leu Pro Glu Lys Tyr Gln Glu Ile Phe Leu Asp
            340                 345                 350

Lys Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Gly Gln Val Ser Gln
        355                 360                 365
```

```
Glu Glu Phe Tyr Lys Tyr Leu Lys Pro Ile Leu Ala Arg Leu Asp Gly
    370                 375                 380

Ser Glu Pro Leu Leu Leu Lys Ile Asp Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Glu
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Val Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Lys Lys Ile Glu Ser Leu Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly His Ser Arg Phe Ala Trp Val
    450                 455                 460

Lys Arg Lys Phe Asp Gly Ala Ile Arg Pro Trp Asn Phe Glu Glu Ile
465                 470                 475                 480

Val Asp Glu Glu Ala Ser Ala Gln Ile Phe Ile Glu Lys Met Thr Lys
                485                 490                 495

Asn Asp Leu Tyr Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Ala Thr Glu Gly Met Thr Arg Pro Gln Phe Leu Ser Ala Asp Gln Lys
    530                 535                 540

Gln Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asn Tyr Phe Lys Lys Ile Glu Cys Trp Asp Ser
                565                 570                 575
```

```
Val Glu Ile Thr Gly Val Glu Asp Ser Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Gln Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Pro Asp Asn Gln Lys Ile Ile Glu Asp Ile Ile Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Lys Met Ile Ser Lys Arg Leu Asp Gln Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Lys Val Val Leu Asn Lys Leu Glu Arg His His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Gly Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Ser Glu Leu Ser Phe Ile Asp
    690                 695                 700

Glu Ile Ala Lys Ala Gln Val Ile Gly Lys Thr Glu Tyr Ser Lys Asp
705                 710                 715                 720

Leu Val Gly Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Ser
                725                 730                 735

Gln Thr Ile Lys Ile Val Asp Glu Leu Val Lys Ile Met Gly Tyr Leu
            740                 745                 750

Pro Gln Gln Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Ala
        755                 760                 765

Gln Gly Ile Lys Asn Ala Arg Gln Arg Met Arg Lys Leu Glu Glu Thr
    770                 775                 780
```

```
Ala Lys Lys Leu Gly Ser Asn Ile Leu Lys Glu His Pro Val Asp Asn
785                 790                 795                 800


Ser Gln Leu Gln Asn Asp Lys Arg Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815


Lys Asp Met Tyr Thr Gly Asp Asp Leu Asp Ile Asp Tyr Leu Ser Ser
            820                 825                 830


Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asn Asn Ser
        835                 840                 845


Ile Asp Asn Lys Val Leu Thr Ser Gln Gly Ala Asn Arg Gly Lys Leu
    850                 855                 860


Asp Asn Val Pro Ser Glu Ala Ile Val Arg Lys Met Lys Gly Tyr Trp
865                 870                 875                 880


Gln Ser Leu Leu Arg Ala Gly Ala Ile Ser Lys Gln Lys Phe Asp Asn
                885                 890                 895


Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Gln Val Asp Lys Ala Gly
            900                 905                 910


Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925


Ala Gln Ile Leu Asp Ser Arg Phe Asn Thr Glu Phe Asp Asp His Asn
    930                 935                 940


Lys Arg Ile Arg Lys Val His Ile Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960


Ser Asp Phe Arg Lys Glu Phe Gly Leu Tyr Lys Ile Arg Asp Ile Asn
                965                 970                 975


His Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys
            980                 985                 990
```

```
Ala Ile Leu Gly Lys Tyr Pro Gln  Leu Ala Pro Glu Phe  Val Tyr Gly
        995                 1000                1005


Asp Tyr  Pro Lys Tyr Asn Ser  Phe Lys Glu Arg Gln  Lys Ala Thr
    1010                1015                1020


Gln Lys  Met Leu Phe Tyr Ser  Asn Ile Leu Lys Phe  Phe Lys Asp
    1025                1030                1035


Gln Glu  Ser Leu His Val Asn  Ser Asp Gly Glu Glu  Ile Trp Asn
    1040                1045                1050


Ala Asn  Lys His Leu Pro Ile  Ile Lys Asn Val Leu  Ser Ile Pro
    1055                1060                1065


Gln Val  Asn Ile Val Lys Lys  Thr Glu Val Gln Thr  Gly Gly Phe
    1070                1075                1080


Tyr Lys  Glu Ser Ile Leu Ser  Lys Gly Asn Ser Asp  Lys Leu Ile
    1085                1090                1095


Pro Arg  Lys Asn Asn Trp Asp  Thr Arg Lys Tyr Gly  Gly Phe Asp
    1100                1105                1110


Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val Ile Ala  Lys Met Glu
    1115                1120                1125


Lys Gly  Lys Ala Lys Val Leu  Lys Pro Val Lys Glu  Met Val Gly
    1130                1135                1140


Ile Thr  Ile Met Glu Arg Thr  Ala Phe Glu Glu Asn  Pro Val Val
    1145                1150                1155


Phe Leu  Glu Ala Arg Gly Tyr  Arg Glu Ile Gln Glu  His Leu Ile
    1160                1165                1170


Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Leu Glu  Asn Gly Arg
    1175                1180                1185
```

```
Arg Arg  Leu Leu Ala Ser Ser  Glu Leu Gln Lys Gly  Asn Glu Leu
    1190                1195                1200


Phe Leu  Pro Val Asp Tyr Met  Thr Phe Leu Tyr Leu  Ala Ala His
    1205                1210                1215


Tyr His  Glu Leu Thr Gly Ser  Ser Glu Asp Val Leu  Arg Lys Lys
    1220                1225                1230


Tyr Phe  Val Asp Arg His Leu  His Tyr Phe Asp Asp  Ile Ile Gln
    1235                1240                1245


Met Ile  Asn Asp Phe Ala Glu  Arg His Ile Leu Ala  Ser Ser Asn
    1250                1255                1260


Leu Glu  Lys Ile Asn His Thr  Tyr His Asn Asn Ser  Asp Leu Pro
    1265                1270                1275


Val Asn  Glu Arg Ala Glu Asn  Ile Ile Asn Val Phe  Thr Phe Val
    1280                1285                1290


Ala Leu  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Ala Thr Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu Val Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Val Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Gln Leu Gly Glu Asn
    1340                1345


<210>  205
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<212>  PRT
<213>  Streptococcus equi

<400>  205

Met Lys Lys Pro Tyr Thr Ile Ala Leu Asp Ile Gly Thr Asn Ser Val
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1 5 10 15

Gly Trp Val Val Val Thr Asp Asp Tyr Arg Val Pro Thr Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Glu Arg Lys Thr Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asp Thr Ala Glu Gly Thr Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65 70 75 80

Tyr Leu Lys Glu Ile Phe Thr Glu Glu Met Ala Lys Val Asp Asp Gly
85 90 95

Phe Phe Gln Arg Leu Glu Asp Ser Phe Tyr Val Leu Glu Asp Lys Glu
100 105 110

Gly Asn Lys His Pro Ile Phe Ala Asn Leu Ala Asp Glu Val Ala Tyr
115 120 125

His Lys Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Val Asp
130 135 140

Asn Pro Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Val Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Thr Leu Ser Ser
165 170 175

Lys Asn Asn Asn Leu Gln Lys Ser Phe Asp His Leu Val Asp Thr Tyr
180 185 190

Asn Leu Leu Phe Glu Glu Gln Leu Leu Thr Glu Gly Ile Asn Ala Lys
195 200 205

Glu Leu Leu Ser Ala Ala Leu Ser Lys Ser Lys Arg Leu Glu Asn Leu

210 215 220

Ile Ser Leu Ile Pro Gly Gln Lys Lys Thr Gly Ile Phe Gly Asn Ile
225 230 235 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ala Asn Phe Gly
245 250 255

Leu Ser Lys Asp Val Lys Leu Gln Leu Ala Lys Asp Thr Tyr Ala Asp
260 265 270

Asp Leu Asp Ser Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
275 280 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
290 295 300

Leu Thr Glu Ser Asp Glu Ile Thr Arg Ala Pro Leu Ser Ala Ser Met
305 310 315 320

Val Lys Arg Tyr Arg Glu His His Lys Asp Leu Val Thr Leu Lys Thr
325 330 335

Leu Ile Lys Asp Gln Leu Pro Glu Lys Tyr Gln Glu Ile Phe Leu Asp
340 345 350

Lys Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Gly Gln Val Ser Gln
355 360 365

Glu Glu Phe Tyr Lys Tyr Leu Lys Pro Ile Leu Ala Arg Leu Asp Gly
370 375 380

Ser Glu Pro Leu Leu Leu Lys Ile Asp Arg Glu Asp Phe Leu Arg Lys
385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Glu
405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Val Phe Tyr Pro Phe Leu

420 425 430

Lys Asp Asn Arg Lys Lys Ile Glu Ser Leu Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly His Ser Arg Phe Ala Trp Val
450 455 460

Lys Arg Lys Phe Asp Gly Ala Ile Arg Pro Trp Asn Phe Glu Glu Ile
465 470 475 480

Val Asp Glu Glu Ala Ser Ala Gln Ile Phe Ile Glu Lys Met Thr Lys
485 490 495

Asn Asp Leu Tyr Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Ala Thr Glu Gly Met Thr Arg Pro Gln Phe Leu Ser Ala Asp Gln Lys
530 535 540

Gln Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asn Tyr Phe Lys Lys Ile Glu Cys Trp Asp Ser
565 570 575

Val Glu Ile Thr Gly Val Glu Asp Ser Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Gln Asp Lys Asp Phe Leu Asp Asn
595 600 605

Pro Asp Asn Gln Lys Ile Ile Glu Asp Ile Ile Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Lys Lys Met Ile Ser Lys Arg Leu Asp Gln Tyr Ala His

625 630 635 640

Leu Phe Asp Lys Val Val Leu Asn Lys Leu Glu Arg His His Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Gly Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Ser Glu Leu Ser Phe Ile Asp
690 695 700

Glu Ile Ala Lys Ala Gln Val Ile Gly Lys Thr Glu Tyr Ser Lys Asp
705 710 715 720

Leu Val Gly Asn Leu Ala Ser Ser Pro Ala Ile Lys Lys Gly Ile Ser
725 730 735

Gln Thr Ile Lys Ile Val Asp Glu Leu Val Lys Ile Met Gly Tyr Leu
740 745 750

Pro Gln Gln Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Ala
755 760 765

Gln Gly Ile Lys Asn Ala Arg Gln Arg Met Arg Lys Leu Glu Glu Thr
770 775 780

Ala Lys Lys Leu Gly Ser Asn Ile Leu Lys Glu His Pro Val Asp Asn
785 790 795 800

Ser Gln Leu Gln Asn Asp Lys Arg Tyr Leu Tyr Tyr Leu Gln Asn Gly
805 810 815

Lys Asp Met Tyr Thr Gly Asp Asp Leu Asp Ile Asp Tyr Leu Ser Ser
820 825 830

Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asn Asn Ser

835 840 845

Ile Asp Asn Lys Val Leu Thr Ser Gln Gly Ala Asn Arg Gly Lys Leu
850 855 860

Asp Asn Val Pro Ser Glu Ala Ile Val Arg Lys Met Lys Gly Tyr Trp
865 870 875 880

Gln Ser Leu Leu Arg Ala Gly Ala Ile Ser Lys Gln Lys Phe Asp Asn
885 890 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Gln Val Asp Lys Ala Gly
900 905 910

Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
915 920 925

Ala Gln Ile Leu Asp Ser Arg Phe Asn Thr Glu Phe Asp Asp His Asn
930 935 940

Lys Arg Ile Arg Lys Val His Ile Ile Thr Leu Lys Ser Lys Leu Val
945 950 955 960

Ser Asp Phe Arg Lys Glu Phe Gly Leu Tyr Lys Ile Arg Asp Ile Asn
965 970 975

His Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys
980 985 990

Ala Ile Leu Gly Lys Tyr Pro Gln Leu Ala Pro Glu Phe Val Tyr Gly
995 1000 1005

Asp Tyr Pro Lys Tyr Asn Ser Phe Lys Glu Arg Gln Lys Ala Thr
1010 1015 1020

Gln Lys Thr Leu Phe Tyr Ser Asn Ile Leu Lys Phe Phe Lys Asp
1025 1030 1035

Gln Glu Ser Leu His Val Asn Ser Asp Gly Glu Glu Ile Trp Asn

1040 1045 1050

Ala Asn Lys His Leu Pro Ile Ile Lys Asn Val Leu Ser Ile Pro
1055 1060 1065

Gln Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe
1070 1075 1080

Tyr Lys Glu Ser Ile Leu Ser Lys Gly Asn Ser Asp Lys Leu Ile
1085 1090 1095

Pro Arg Lys Asn Asn Trp Asp Thr Arg Lys Tyr Gly Gly Phe Asp
1100 1105 1110

Ser Pro Thr Val Ala Tyr Ser Val Leu Val Ile Ala Lys Met Glu
1115 1120 1125

Lys Gly Lys Ala Lys Val Leu Lys Pro Val Lys Glu Met Val Gly
1130 1135 1140

Ile Thr Ile Met Glu Arg Ile Ala Phe Glu Glu Asn Pro Val Val
1145 1150 1155

Phe Leu Glu Ala Lys Gly Tyr Arg Glu Ile Gln Glu His Leu Ile
1160 1165 1170

Ile Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg
1175 1180 1185

Arg Arg Leu Leu Ala Ser Ser Glu Leu Gln Lys Gly Asn Glu Leu
1190 1195 1200

Phe Leu Pro Val Asp Tyr Met Thr Phe Leu Tyr Leu Ala Ala His
1205 1210 1215

Tyr His Glu Leu Thr Gly Ser Ser Glu Asp Val Leu Arg Lys Lys
1220 1225 1230

Tyr Phe Val Glu Arg His Leu His Tyr Phe Asp Asp Ile Ile Gln

```
    1235                1240                1245

Met Ile  Asn Asp Phe Ala Glu  Arg His Ile Leu Ala  Ser Ser Asn
    1250                1255                1260

Leu Glu  Lys Ile Asn His Thr  Tyr His Asn Asn Ser  Asp Leu Pro
    1265                1270                1275

Ile Asn  Glu Arg Ala Glu Asn  Ile Ile Asn Val Phe  Thr Phe Val
    1280                1285                1290

Ala Leu  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Ala Thr Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu Val Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Val Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Ser  Gln Leu Gly Glu Asn
    1340                1345
```

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<212> PRT
<213> Streptococcus equi

<400> 206

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Met Lys Lys Pro Tyr Thr Ile Ala Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15

Gly Trp Val Val Val Thr Asp Asp Tyr Arg Val Pro Thr Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Glu Arg Lys Thr Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asp Thr Ala Glu Gly Thr Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Pro Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Phe Leu Lys Glu Ile Phe Thr Glu Glu Met Ala Lys Val Asp Asp Gly
                85                  90                  95

Phe Phe Gln Arg Leu Glu Asp Ser Phe Tyr Val Leu Glu Asp Lys Glu
            100                 105                 110

Gly Asn Lys His Pro Ile Phe Ala Asn Leu Ala Asp Glu Val Ala Tyr
        115                 120                 125

His Lys Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Val Asp
    130                 135                 140

Asn Pro Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Val Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Thr Leu Ser Ser
                165                 170                 175

Lys Asn Asn Asn Leu Gln Lys Ser Phe Asp His Leu Val Asp Thr Tyr
            180                 185                 190

Asn Leu Leu Phe Glu Glu Gln Leu Leu Thr Glu Gly Ile Asn Ala Lys
        195                 200                 205

Glu Leu Leu Ser Ala Ala Leu Ser Lys Ser Lys Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ser Leu Ile Pro Gly Gln Lys Lys Thr Gly Ile Phe Gly Asn Ile
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ala Asn Phe Gly
                245                 250                 255

Leu Ser Lys Asp Val Lys Leu Gln Leu Ala Lys Asp Thr Tyr Ala Asp
            260                 265                 270
```

```
Asp Leu Asp Ser Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Thr Glu Ser Asp Glu Ile Thr Arg Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Val Lys Arg Tyr Arg Glu His His Lys Asp Leu Val Thr Leu Lys Thr
                325                 330                 335

Leu Ile Lys Asp Gln Leu Pro Glu Lys Tyr Gln Glu Ile Phe Leu Asp
            340                 345                 350

Lys Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Gly Gln Val Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Tyr Leu Lys Pro Ile Leu Ala Arg Leu Asp Gly
    370                 375                 380

Ser Glu Pro Leu Leu Leu Lys Ile Asp Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Glu
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Val Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Lys Lys Ile Glu Ser Leu Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly His Ser Arg Phe Ala Trp Val
    450                 455                 460

Lys Arg Lys Phe Asp Gly Ala Ile Arg Pro Trp Asn Phe Glu Glu Ile
465                 470                 475                 480
```

```
Val Asp Glu Glu Ala Ser Ala Gln Ile Phe Ile Glu Lys Met Thr Lys
                485                 490                 495

Asn Asp Leu Tyr Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Ala Thr Glu Gly Met Thr Arg Pro Gln Phe Leu Ser Ala Asp Gln Lys
    530                 535                 540

Gln Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asn Tyr Phe Lys Lys Ile Glu Cys Trp Asp Ser
                565                 570                 575

Val Glu Ile Thr Gly Val Glu Asp Ser Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Gln Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Pro Asp Asn Gln Lys Ile Ile Glu Asp Ile Ile Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Lys Lys Met Ile Ser Lys Arg Leu Asp Gln Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Lys Val Val Leu Asn Lys Leu Glu Arg His His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Gly Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685
```

```
Arg Asn Phe Met Gln Leu Ile His Asp Ser Glu Leu Ser Phe Ile Asp
    690                 695                 700

Glu Ile Ala Lys Ala Gln Val Ile Gly Lys Thr Glu Tyr Ser Lys Asp
705                 710                 715                 720

Leu Val Gly Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Ser
                725                 730                 735

Gln Thr Ile Lys Ile Val Asp Glu Leu Val Lys Ile Met Gly Tyr Leu
            740                 745                 750

Pro Gln Gln Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Ala
        755                 760                 765

Gln Gly Ile Lys Asn Ala Arg Gln Arg Met Arg Lys Leu Glu Glu Thr
    770                 775                 780

Ala Lys Lys Leu Gly Ser Asn Ile Leu Lys Glu His Pro Val Asp Asn
785                 790                 795                 800

Ser Gln Leu Gln Asn Asp Lys Arg Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Lys Asp Met Tyr Thr Gly Asp Asp Leu Asp Ile Asp Tyr Leu Ser Ser
            820                 825                 830

Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asn Asn Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Thr Ser Gln Gly Ala Asn Arg Gly Lys Leu
    850                 855                 860

Asp Asn Val Pro Ser Glu Ala Ile Val Arg Lys Met Lys Gly Tyr Trp
865                 870                 875                 880

Gln Ser Leu Leu Arg Ala Gly Ala Ile Ser Lys Gln Lys Phe Asp Asn
                885                 890                 895
```

```
Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Gln Val Asp Lys Ala Gly
            900                 905                 910

Phe Ile Gln Leu Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ser Arg Phe Asn Thr Glu Phe Asp Asp His Asn
    930                 935                 940

Lys Arg Ile Arg Lys Val His Ile Ile Thr Leu Lys Ser Lys Leu Val
945                 950                 955                 960

Ser Asp Phe Arg Lys Glu Phe Gly Leu Tyr Lys Ile Arg Asp Ile Asn
                965                 970                 975

His Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys
            980                 985                 990

Ala Ile Leu Gly Lys Tyr Pro Gln  Leu Ala Pro Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Pro Lys Tyr Asn Ser  Phe Lys Glu Arg Gln  Lys Ala Thr
    1010                1015                1020

Gln Lys  Thr Leu Phe Tyr Ser  Asn Ile Leu Lys Phe  Phe Lys Asp
    1025                1030                1035

Gln Glu  Ser Leu His Val Asn  Ser Asp Gly Glu Glu  Ile Trp Asn
    1040                1045                1050

Ala Asn  Lys His Leu Pro Ile  Ile Lys Asn Val Leu  Ser Ile Pro
    1055                1060                1065

Gln Val  Asn Ile Val Lys Lys  Thr Glu Val Gln Thr  Gly Gly Phe
    1070                1075                1080

Tyr Lys  Glu Ser Ile Leu Ser  Lys Gly Asn Ser Asp  Lys Leu Ile
    1085                1090                1095
```

```
Pro Arg  Lys Asn Asn Trp Asp  Thr Arg Lys Tyr Gly  Gly Phe Asp
    1100                1105                1110

Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val Ile Ala  Lys Met Glu
    1115                1120                1125

Lys Gly  Lys Ala Lys Val Leu  Lys Pro Val Lys Glu  Met Val Gly
    1130                1135                1140

Ile Thr  Ile Met Glu Arg Ile  Ala Phe Glu Glu Asn  Pro Val Val
    1145                1150                1155

Phe Leu  Glu Ala Lys Gly Tyr  Arg Glu Ile Gln Glu  His Leu Ile
    1160                1165                1170

Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu Leu Glu  Asn Gly Arg
    1175                1180                1185

Arg Arg  Leu Leu Ala Ser Ser  Glu Leu Gln Lys Gly  Asn Glu Leu
    1190                1195                1200

Phe Leu  Pro Val Asp Tyr Met  Thr Phe Leu Tyr Leu  Ala Ala His
    1205                1210                1215

Tyr His  Glu Leu Thr Gly Ser  Ser Glu Asp Val Leu  Arg Lys Lys
    1220                1225                1230

Tyr Phe  Val Glu Arg His Leu  His Tyr Phe Asp Asp  Ile Ile Gln
    1235                1240                1245

Met Ile  Asn Asp Phe Ala Glu  Arg His Ile Leu Ala  Ser Ser Asn
    1250                1255                1260

Leu Glu  Lys Ile Asn His Thr  Tyr His Asn Asn Ser  Asp Leu Pro
    1265                1270                1275

Val Asn  Glu Arg Ala Glu Asn  Ile Ile Asn Val Phe  Thr Phe Val
    1280                1285                1290
```

```
Ala Leu  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Ala Thr Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Lys Glu Val Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Val Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Gln Leu Gly Glu Asn
    1340                1345
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<211> 1360
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<400> 207

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Met Glu Lys Thr Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Ala Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Lys Glu Met Ala Lys Val Asp Glu Ser
                85                  90                  95


Phe Phe Gln Arg Leu Glu Glu Ser Phe Leu Thr Asp Asp Asp Lys Thr
            100                 105                 110
```

```
Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Thr Tyr
        115                 120                 125

His Gln Glu Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ser Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gln Leu Asn Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Lys Ile Phe Ala Asp Phe Val Gly Val Tyr
            180                 185                 190

Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Ala Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Ile Lys Gln Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Val Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Ala Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320
```

```
Met Ile Lys Arg Tyr Glu Glu His His Glu Asp Leu Glu Lys Leu Lys
                325                 330                 335

Thr Phe Ile Lys Val Asn Asn Phe Asp Lys Tyr His Glu Ile Phe Lys
            340                 345                 350

Asp Lys Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Ile Phe Tyr Lys His Leu Lys Ser Ile Ile Ser Glu Lys Asn
    370                 375                 380

Gly Gly Gln Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro Tyr Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Thr Ile Leu Arg Arg Gln Gly Glu Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Ala Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asn Ser Arg Phe Ala Trp
    450                 455                 460

Ala Lys Tyr His Ser Asp Glu Pro Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Val Val Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Tyr Val Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Ile Lys
        515                 520                 525
```

```
Tyr Val Asn Glu Gln Gly Lys Ser Phe Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Ala Lys Leu Leu Ser Tyr Leu Asn Asn Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Asn Asp Leu Ile Gly Leu Asp Lys Asp Ser Lys Ser Phe Asn Ala Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Ser Phe Leu
        595                 600                 605

Asp Asp Lys Thr Asn Glu Gln Ile Ile Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Asp Met Ile His Glu Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Ser Gln Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asn Lys Glu Asn Asn Lys Thr Ile Leu Asp Phe Leu Ile Asp Asp Gly
        675                 680                 685

Asp Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu Ser
    690                 695                 700

Phe Lys Thr Thr Ile Gln Glu Ala Gln Val Val Gly Asp Val Asp Asp
705                 710                 715                 720

Ile Glu Ala Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735
```

```
Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Asn Pro Gln Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Ile Thr Gly Tyr Gly Arg Asn Arg Ser Asn Gln Arg Leu Lys Arg Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Ser Tyr Val Asp Ser Lys Val Glu Asn Ser
785                 790                 795                 800

His Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp His Leu Ser Asp Tyr
            820                 825                 830

Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Ile
        835                 840                 845

Asp Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly Lys Ser Asp
    850                 855                 860

Asp Val Pro Ser Ile Glu Ile Val Arg Asn Arg Lys Ser Tyr Trp Tyr
865                 870                 875                 880

Lys Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe Asp Asn Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Thr Asp Lys Ala Gly Phe
            900                 905                 910

Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala
        915                 920                 925

Gln Ile Leu Asp Ala Arg Phe Asn Thr Lys Cys Asp Glu Asn Asp Lys
    930                 935                 940
```

```
Val Ile Arg Asp Val Lys Val Ile Thr Leu Lys Ser Ser Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Glu Phe Lys Phe Tyr Lys Val Arg Glu Ile Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr Ala
            980                 985                 990

Leu Leu Lys Lys Tyr Pro Lys Leu  Ala Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr Lys  Lys Tyr Asp Val Ser  Ser Asp Asn His Ser  Glu Leu Gly
    1010                1015                1020

Lys Ala  Thr Ala Lys Tyr Phe  Phe Tyr Ser Asn Leu  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Glu Val Lys Tyr  Ala Asp Gly Arg Val  Phe Glu Arg
    1040                1045                1050

Pro Asp  Ile Glu Thr Asn Ala  Asp Gly Glu Val Val  Trp Asn Lys
    1055                1060                1065

Gln Arg  Asp Phe Asn Ile Val  Arg Lys Val Leu Ser  Tyr Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Val  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Gly Asp Ser Asp Lys  Leu Ile Pro
    1100                1105                1110

Arg Lys  Thr Lys Lys Leu Gln  Trp Glu Thr Gln Lys  Tyr Gly Gly
    1115                1120                1125

Phe Asp  Ser Pro Thr Val Ala  Tyr Ser Val Leu Val  Val Ala Asp
    1130                1135                1140
```

```
Val Glu  Lys Gly Lys Thr Arg  Lys Leu Lys Thr Val  Lys Glu Leu
    1145                1150                1155

Val Gly  Ile Ser Ile Met Glu  Arg Ser Ser Phe Glu  Glu Asn Pro
    1160                1165                1170

Val Ser  Phe Leu Glu Lys Lys  Gly Tyr His Asn Val  Gln Glu Asp
    1175                1180                1185

Lys Leu  Ile Lys Leu Pro Lys  Tyr Ser Leu Phe Glu  Phe Glu Gly
    1190                1195                1200

Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Thr Glu Leu  Gln Lys Gly
    1205                1210                1215

Asn Glu  Val Val Leu Pro Gln  Tyr Met Val Asn Leu  Leu Tyr His
    1220                1225                1230

Ser Gln  His Val Asn Asn Ser  His Lys Pro Glu His  Leu Asn Tyr
    1235                1240                1245

Val Lys  Gln His Lys Asp Glu  Phe Lys Asp Ile Phe  Asn Leu Ile
    1250                1255                1260

Ile Ser  Ile Ala Arg Ile Asn  Ile Leu Lys Pro Lys  Val Val Asp
    1265                1270                1275

Asn Leu  Ile Asn Glu Phe Thr  Glu Tyr Gly Gln Glu  Asp Ile Ser
    1280                1285                1290

Ser Leu  Ser Glu Ser Phe Ile  Asn Leu Leu Lys Phe  Ile Ser Phe
    1295                1300                1305

Gly Ala  Pro Gly Ala Phe Lys  Phe Leu Lys Leu Asp  Val Lys Gln
    1310                1315                1320

Ser Asn  Leu Arg Tyr Lys Ser  Thr Thr Glu Ala Leu  Ser Ala Thr
    1325                1330                1335
```

```
Leu Ile  His Gln Ser Val Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1340                1345                1350


Leu Ser  Lys Leu Gly Glu Glu
    1355                1360


<210>  208
<211>  1353
<212>  PRT
<213>  Streptococcus gallolyticus

<400>  208

Met Thr Lys Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser
1               5                   10                  15


Val Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys
            20                  25                  30


Met Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu
        35                  40                  45


Leu Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg
    50                  55                  60


Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu
65                  70                  75                  80


Arg Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Thr Lys Val Asp Glu
                85                  90                  95


Ser Phe Phe Tyr Arg Leu Asp Glu Ser Phe Leu Thr Thr Asp Glu Lys
            100                 105                 110


Asp Phe Glu Arg His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala
        115                 120                 125


Tyr His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Asn Tyr Leu Ala
    130                 135                 140
```

```
Asp Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala
145                 150                 155                 160


His Met Ile Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Asn
                165                 170                 175


Ala Glu Asn Thr Asp Val Gln Lys Leu Phe Thr Asp Phe Val Gly Val
            180                 185                 190


Tyr Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp
        195                 200                 205


Val Ala Ser Thr Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu
    210                 215                 220


Asn Leu Ile Lys Tyr Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly
225                 230                 235                 240


Asn Leu Ile Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Met Asn
                245                 250                 255


Phe Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr
            260                 265                 270


Glu Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala
        275                 280                 285


Asp Leu Phe Thr Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser
    290                 295                 300


Gly Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320


Ser Met Ile Lys Arg Tyr Val Glu His His Glu Asp Leu Glu Lys Leu
                325                 330                 335


Lys Glu Phe Ile Lys Ala Asn Lys Ser Glu Leu Tyr His Asp Ile Phe
            340                 345                 350
```

```
Lys Asp Lys Asn Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val
        355                 360                 365

Lys Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile
    370                 375                 380

Asp Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His
                405                 410                 415

Leu Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Lys Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Val Arg Lys Asp Ser Arg Phe Ala
    450                 455                 460

Trp Ala Glu Tyr Arg Ser Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp
465                 470                 475                 480

Lys Val Ile Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met
                485                 490                 495

Thr Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
            500                 505                 510

Ser His Val Tyr Glu Thr Tyr Ala Val Tyr Asn Glu Leu Thr Lys Ile
        515                 520                 525

Lys Tyr Val Asn Glu Gln Gly Lys Glu Ser Phe Phe Asp Ser Asn Met
    530                 535                 540

Lys Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr
545                 550                 555                 560
```

```
Lys Glu Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Pro Glu Tyr Arg
                565                 570                 575

Ile Lys Asp Leu Ile Gly Leu Asp Lys Glu Asn Lys Ser Phe Asn Ala
            580                 585                 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Ala Phe
        595                 600                 605

Leu Asp Asp Lys Val Asn Glu Glu Val Ile Glu Asp Ile Ile Lys Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Lys Asp Met Ile His Glu Arg Leu Gln Lys
625                 630                 635                 640

Tyr Ser Asp Ile Phe Thr Ala Asn Gln Leu Lys Lys Leu Glu Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asn Lys Glu Asn Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Ser Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Thr Leu
    690                 695                 700

Pro Phe Lys Gln Ile Ile Gln Lys Ser Gln Val Val Gly Asp Val Asp
705                 710                 715                 720

Asp Ile Glu Ala Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Asp Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn
        755                 760                 765
```

```
Gln Thr Thr Asn Arg Gly Arg Ser Gln Ser Gln Gln Arg Leu Lys Lys
    770                 775                 780

Leu Gln Ser Ser Leu Lys Pro Ser Tyr Ile Glu Asp Lys Val Glu Asn
785                 790                 795                 800

Ser His Leu Gln Asn Asp Gln Leu Phe Leu Tyr Tyr Ile Gln Asn Gly
                805                 810                 815

Lys Asp Met Tyr Thr Gly Asp Glu Leu Asp Ile Asp His Leu Ser Asp
            820                 825                 830

Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asp Val Pro Ser Leu Asp Ile Val Arg Ala Arg Lys Ala Glu Trp
865                 870                 875                 880

Val Arg Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe Asp Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ala Arg Phe Asn Thr Glu His Asp Glu Asn Asp
    930                 935                 940

Lys Val Ile Arg Asp Val Lys Val Ile Thr Leu Lys Ser Asn Leu Val
945                 950                 955                 960

Ser Gln Phe Arg Lys Asp Phe Glu Phe Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975
```

```
Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
            980                 985                 990


Ala Leu Leu Lys Lys Tyr Pro Lys  Leu Ala Ser Glu Phe  Val Tyr Gly
        995                 1000                1005


Glu Tyr  Lys Lys Tyr Asp Ile  Ser Ser Asp Lys Ala  Thr Ala Lys
    1010                1015                1020


Tyr Phe  Phe Tyr Ser Asn Leu  Met Asn Phe Phe Lys  Thr Lys Val
    1025                1030                1035


Lys Tyr  Ala Asp Gly Thr Val  Phe Glu Arg Pro Ile  Ile Glu Thr
    1040                1045                1050


Asn Ala  Asp Gly Glu Ile Ala  Trp Asn Lys Gln Ile  Asp Phe Glu
    1055                1060                1065


Lys Val  Arg Lys Val Leu Ser  Tyr Pro Gln Val Asn  Ile Val Lys
    1070                1075                1080


Lys Val  Glu Thr Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1085                1090                1095


Pro Lys  Gly Asp Ser Asp Lys  Leu Ile Pro Arg Lys  Thr Lys Lys
    1100                1105                1110


Val Tyr  Trp Asp Thr Lys Lys  Tyr Gly Gly Phe Asp  Ser Pro Thr
    1115                1120                1125


Val Ala  Tyr Ser Val Phe Val  Val Ala Asp Val Glu  Lys Gly Lys
    1130                1135                1140


Ala Lys  Lys Leu Lys Thr Val  Lys Glu Leu Val Gly  Ile Ser Ile
    1145                1150                1155


Met Glu  Arg Ser Phe Phe Glu  Glu Asn Pro Val Glu  Phe Leu Glu
    1160                1165                1170
```

```
Asn Lys  Gly Tyr His Asn Ile  Arg Glu Asp Lys Leu  Ile Lys Leu
    1175                1180                1185

Pro Lys  Tyr Ser Leu Phe Glu  Phe Glu Gly Gly Arg  Arg Arg Leu
    1190                1195                1200

Leu Ala  Ser Ala Ser Glu Leu  Gln Lys Gly Asn Glu  Met Val Leu
    1205                1210                1215

Pro Gly  Tyr Leu Val Glu Leu  Leu Tyr His Ala His  Arg Ala Asp
    1220                1225                1230

Asn Phe  Asn Ser Thr Glu Tyr  Leu Asn Tyr Val Ser  Glu His Lys
    1235                1240                1245

Lys Glu  Phe Glu Lys Val Leu  Ser Cys Val Glu Asp  Phe Ala Asn
    1250                1255                1260

Leu Tyr  Val Asp Val Glu Lys  Asn Leu Ser Lys Ile  Arg Ala Val
    1265                1270                1275

Ala Asp  Ser Met Asp Asn Phe  Ser Ile Glu Glu Ile  Ser Asn Ser
    1280                1285                1290

Phe Ile  Asn Leu Leu Thr Leu  Thr Ala Leu Gly Ala  Pro Ala Asp
    1295                1300                1305

Phe Asn  Phe Leu Gly Glu Lys  Ile Pro Arg Lys Arg  Tyr Thr Ser
    1310                1315                1320

Thr Lys  Glu Cys Leu Thr Ala  Thr Leu Ile His Gln  Ser Ile Thr
    1325                1330                1335

Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser Lys Leu  Gly Glu Glu
    1340                1345                1350
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<211> 1354
<212> PRT
<213> Streptococcus gallolyticus

<400> 209

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Met Thr Glu Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser
1               5                  10                  15

Val Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys
            20                  25                  30

Met Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu
        35                  40                  45

Leu Gly Ala Leu Leu Phe Asp Asn Gly Glu Thr Ala Glu Ala Thr Arg
    50                  55                  60

Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu
65                  70                  75                  80

Arg Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ala Lys Val Asp Glu
                85                  90                  95

Ser Phe Phe Tyr Arg Leu Asp Glu Ser Phe Leu Thr Thr Asp Asp Lys
            100                 105                 110

Asp Phe Glu Arg His Pro Ile Phe Gly Asn Lys Ala Asp Glu Ile Lys
        115                 120                 125

Tyr His Gln Glu Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala
    130                 135                 140

Asp Ser His Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala
145                 150                 155                 160

His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn
                165                 170                 175

Ala Glu Asn Thr Asp Val Gln Lys Leu Phe Glu Ala Phe Val Glu Val
            180                 185                 190

Tyr Asp Arg Thr Phe Asp Asp Ser Asn Leu Ser Glu Ile Thr Val Asp
```

195 200 205

Ala Ser Ser Ile Leu Thr Glu Lys Phe Ser Lys Ser Arg Arg Leu Glu
210 215 220

Asn Leu Ile Lys His Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly
225 230 235 240

Asn Leu Val Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Ser
245 250 255

Phe Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr
260 265 270

Glu Glu Asp Leu Glu Glu Leu Ile Gly Lys Ile Gly Asp Glu Tyr Ala
275 280 285

Asp Leu Phe Thr Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser
290 295 300

Gly Ile Leu Thr Val Ala Asp Asn Thr Thr Lys Ala Pro Leu Ser Ala
305 310 315 320

Ser Met Ile Lys Arg Tyr Asn Glu His Gln Val Asp Leu Lys Lys Leu
325 330 335

Lys Glu Phe Ile Lys Asn Asn Ala Ser Asp Lys Tyr Asp Glu Ile Phe
340 345 350

Asn Asp Lys Asp Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val
355 360 365

Lys Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Thr Thr Leu Ser Lys Ile
370 375 380

Asp Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu
385 390 395 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His

405 410 415

Leu Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Ala
420 425 430

Phe Leu Lys Glu Asn Gln Ala Lys Ile Glu Lys Ile Leu Thr Phe Arg
435 440 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asn Ser Arg Phe Ala
450 455 460

Trp Ala Glu Tyr His Ser Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp
465 470 475 480

Glu Ile Ile Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met
485 490 495

Thr Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His
500 505 510

Ser Leu Val Tyr Glu Thr Tyr Thr Val Tyr Asn Glu Leu Thr Lys Val
515 520 525

Lys Tyr Val Asn Glu Gln Gly Lys Ser Asn Phe Phe Asp Ala Asn Met
530 535 540

Lys Gln Glu Ile Phe Glu His Val Phe Lys Glu Asn Arg Lys Val Thr
545 550 555 560

Lys Asp Lys Phe Leu Asn Tyr Leu Asn Lys Glu Phe Pro Glu Tyr Arg
565 570 575

Ile Gln Asp Leu Ile Gly Leu Asp Lys Glu Asn Lys Ser Phe Asn Ala
580 585 590

Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Ser Phe
595 600 605

Leu Asp Asp Lys Thr Asn Glu Thr Ile Ile Glu Asp Ile Ile Gln Thr

```
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Asp Met Ile Arg Gln Arg Leu Gln Lys
625                 630                 635                 640

Tyr Ser Asp Ile Phe Thr Pro Gln Gln Leu Lys Lys Leu Glu Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile
            660                 665                 670

Arg Asn Lys Glu Asn Gly Lys Ser Ile Leu Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Gly Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Ser Asp Asp Thr Leu
    690                 695                 700

Pro Phe Lys Gln Ile Ile Lys Asp Ala Gln Ile Ile Gly Asp Ile Asp
705                 710                 715                 720

Asp Val Thr Ser Val Val Arg Glu Leu Pro Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly His Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Asn Arg Gly Arg Asn Gln Ser Gln Gln Arg Leu Lys Lys
    770                 775                 780

Leu Gln Asp Ser Leu Lys Pro Ser Tyr Ile Glu Gly Lys Val Glu Asn
785                 790                 795                 800

Asn His Leu Gln Asp Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly
                805                 810                 815

Lys Asp Met Tyr Thr Gly Asp Glu Leu Asp Ile Asp His Leu Ser Asp
```

820 825 830

Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser
835 840 845

Ile Asp Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly Lys Ser
850 855 860

Asp Asp Val Pro Ser Leu Asp Ile Val His Asp Arg Lys Ala Asp Trp
865 870 875 880

Ile Arg Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe Asp Asn
885 890 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Asn Asp Lys Ala Gly
900 905 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
915 920 925

Ala Gln Ile Leu Asp Ser Arg Phe Asn Thr Glu Arg Asp Glu Asn Asp
930 935 940

Lys Val Ile Arg Asn Val Lys Val Ile Thr Leu Lys Ser Asn Leu Val
945 950 955 960

Ser Gln Phe Arg Lys Asp Phe Lys Phe Tyr Lys Val Arg Glu Ile Asn
965 970 975

Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr
980 985 990

Ala Leu Leu Lys Lys Tyr Pro Lys Leu Ala Pro Glu Phe Val Tyr Gly
995 1000 1005

Glu Tyr Lys Lys Tyr Asp Ile Ser Gly Asp Lys Ala Thr Ala Lys
1010 1015 1020

Tyr Phe Phe Tyr Ser Asn Leu Met Asn Phe Phe Lys Arg Val Ile

1025 1030 1035

Arg Tyr Ser Asn Gly Lys Val Val Val Arg Pro Val Ile Glu Cys
1040 1045 1050

Ser Lys Asp Thr Gly Glu Ile Ala Trp Asn Lys Gln Thr Asp Phe
1055 1060 1065

Glu Lys Val Arg Arg Val Leu Ser Tyr Pro Gln Val Asn Ile Val
1070 1075 1080

Lys Lys Val Glu Thr Gln Thr Gly Gly Phe Ser Lys Glu Ser Ile
1085 1090 1095

Leu Pro Lys Gly Asn Ser Asp Lys Leu Ile Pro Arg Lys Thr Lys
1100 1105 1110

Lys Phe Arg Trp Asp Thr Pro Lys Tyr Gly Gly Phe Asp Ser Pro
1115 1120 1125

Asn Ile Ala Tyr Ser Val Phe Val Ile Ala Asp Val Glu Lys Gly
1130 1135 1140

Lys Ala Lys Lys Leu Lys Thr Val Lys Glu Leu Val Gly Ile Ser
1145 1150 1155

Ile Met Glu Arg Ser Ser Phe Glu Glu Asn Pro Val Val Phe Leu
1160 1165 1170

Glu Lys Lys Gly Tyr Gln Asn Val Gln Glu Asp Asn Leu Ile Lys
1175 1180 1185

Leu Pro Lys Tyr Ser Leu Phe Glu Phe Glu Gly Gly Arg Arg Arg
1190 1195 1200

Leu Leu Ala Ser Ala Ser Glu Leu Gln Lys Gly Asn Glu Val Val
1205 1210 1215

Leu Ser Arg His Leu Val Glu Leu Leu Tyr His Ala His Arg Val

1220 1225 1230

Asn Ser Phe Asn Asn Ser Glu His Leu Lys Tyr Val Ser Glu His
1235 1240 1245

Lys Lys Glu Phe Gly Glu Val Leu Ser Cys Val Glu Asn Phe Ala
1250 1255 1260

Lys Ser Tyr Val Asp Val Glu Lys Asn Leu Gly Lys Ile Arg Ala
1265 1270 1275

Val Ala Asp Lys Ile Asp Thr Phe Ser Ile Glu Asp Ile Ser Ile
1280 1285 1290

Ser Phe Val Asn Leu Leu Thr Leu Thr Ala Leu Gly Ala Pro Ala
1295 1300 1305

Asp Phe Asn Phe Leu Gly Glu Lys Ile Pro Arg Lys Arg Tyr Thr
1310 1315 1320

Ser Thr Lys Glu Cys Leu Asn Ala Thr Leu Ile His Gln Ser Ile
1325 1330 1335

Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Lys Leu Gly Glu
1340 1345 1350

Glu

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<400> 210

Met Thr Lys Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser
1 5 10 15

Val Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys
20 25 30

```
Met Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu
        35                  40                  45

Leu Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg
    50                  55                  60

Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu
65                  70                  75                  80

Arg Tyr Leu Gln Glu Ile Phe Ala Asn Glu Ile Ala Lys Val Asp Glu
                85                  90                  95

Ser Phe Phe Gln Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys
            100                 105                 110

Thr Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala
        115                 120                 125

Tyr His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala
    130                 135                 140

Asp Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala
145                 150                 155                 160

His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn
                165                 170                 175

Ala Glu Asn Thr Asp Val Gln Lys Ile Phe Ala Asp Phe Val Gly Val
            180                 185                 190

Tyr Asn Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp
        195                 200                 205

Val Ala Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu
    210                 215                 220

Asn Leu Ile Lys Tyr Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly
225                 230                 235                 240
```

```
Asn Leu Ile Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn
                245                 250                 255

Phe Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala
        275                 280                 285

Asp Leu Phe Thr Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser
    290                 295                 300

Gly Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Lys Arg Tyr Val Glu His His Glu Asp Leu Glu Lys Leu
                325                 330                 335

Lys Glu Phe Ile Lys Ala Asn Lys Ser Glu Leu Tyr His Asp Ile Phe
            340                 345                 350

Lys Asp Lys Asn Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val
        355                 360                 365

Lys Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Ile Leu Ser Lys Ile
    370                 375                 380

Lys Ile Asp Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp
385                 390                 395                 400

Phe Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln
                405                 410                 415

Ile His Leu Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr
            420                 425                 430

Tyr Pro Phe Leu Lys Glu Lys Gln Asp Arg Ile Glu Lys Ile Leu Thr
        435                 440                 445
```

```
Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Val Arg Lys Asp Ser Arg
    450                 455                 460

Phe Ala Trp Ala Glu Tyr Arg Ser Asp Glu Lys Ile Thr Pro Trp Asn
465                 470                 475                 480

Phe Asp Lys Val Ile Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr
                485                 490                 495

Arg Met Thr Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro
            500                 505                 510

Lys His Ser His Val Tyr Glu Thr Tyr Ala Val Tyr Asn Glu Leu Thr
        515                 520                 525

Lys Ile Lys Tyr Val Asn Glu Gln Gly Lys Glu Ser Phe Phe Asp Ser
    530                 535                 540

Asn Met Lys Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys
545                 550                 555                 560

Val Thr Lys Glu Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Pro Glu
                565                 570                 575

Tyr Arg Ile Lys Asp Leu Ile Gly Leu Asp Lys Glu Asn Lys Ser Phe
            580                 585                 590

Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys
        595                 600                 605

Ala Phe Leu Asp Asp Lys Val Asn Glu Glu Val Ile Glu Asp Ile Ile
    610                 615                 620

Lys Thr Leu Thr Leu Phe Glu Asp Lys Asp Met Ile His Glu Arg Leu
625                 630                 635                 640

Gln Lys Tyr Ser Asp Ile Phe Thr Ala Asn Gln Leu Lys Lys Leu Glu
                645                 650                 655
```

```
Arg Arg His Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn
            660                 665                 670

Gly Ile Arg Asn Lys Glu Asn Asn Lys Thr Ile Leu Asp Tyr Leu Ile
        675                 680                 685

Asp Asp Gly Ser Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp
    690                 695                 700

Thr Leu Pro Phe Lys Gln Ile Ile Gln Lys Ser Gln Val Val Gly Asp
705                 710                 715                 720

Val Asp Asp Ile Glu Ala Val Val His Asp Leu Pro Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Lys Val Met Gly Gly Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Asn Arg Gly Arg Ser Gln Ser Gln Gln Arg Leu
    770                 775                 780

Lys Lys Leu Gln Asn Ser Leu Lys Pro Ser Tyr Ile Glu Asp Lys Val
785                 790                 795                 800

Glu Asn Ser His Leu Gln Asn Asp Gln Leu Phe Leu Tyr Tyr Ile Gln
                805                 810                 815

Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Asp Ile Asp His Leu
            820                 825                 830

Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp
        835                 840                 845

Asp Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Ala Lys Asn Arg Gly
    850                 855                 860
```

```
Lys Ser Asp Asp Val Pro Ser Leu Asp Ile Val Arg Ala Arg Lys Ala
865                 870                 875                 880

Glu Trp Val Arg Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe
                885                 890                 895

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gln Ile Leu Asp Ala Arg Phe Asn Thr Glu His Asp Glu
    930                 935                 940

Asn Asp Lys Val Ile Arg Asp Val Lys Val Ile Thr Leu Lys Ser Asn
945                 950                 955                 960

Leu Val Ser Gln Phe Arg Lys Asp Phe Glu Phe Tyr Lys Val Arg Glu
                965                 970                 975

Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val
            980                 985                 990

Gly Thr Ala Leu Leu Lys Lys Tyr  Pro Lys Leu Ala Ser  Glu Phe Val
        995                 1000                1005

Tyr Gly  Glu Tyr Lys Lys Tyr  Asp Ile Ser Ser Asp  Lys Ala Thr
    1010                1015                1020

Ala Lys  Tyr Phe Phe Tyr Ser  Asn Leu Met Asn Phe  Phe Lys Thr
    1025                1030                1035

Lys Val  Lys Tyr Ala Asp Gly  Thr Val Phe Glu Arg  Pro Ile Ile
    1040                1045                1050

Glu Thr  Asn Ala Asp Gly Glu  Ile Ala Trp Asn Lys  Gln Ile Asp
    1055                1060                1065
```

```
Phe Glu  Lys Val Arg Lys Val  Leu Ser Tyr Pro Gln  Val Asn Ile
    1070                1075                1080

Val Lys  Lys Val Glu Thr Gln  Thr Gly Gly Phe Ser  Lys Glu Ser
    1085                1090                1095

Ile Leu  Pro Lys Gly Asp Ser  Asp Lys Leu Ile Pro  Arg Lys Thr
    1100                1105                1110

Lys Lys  Val Tyr Trp Asp Thr  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Phe Val Val Ala Asp  Val Glu Lys
    1130                1135                1140

Gly Lys  Ala Lys Lys Leu Lys  Thr Val Lys Glu Leu  Val Gly Ile
    1145                1150                1155

Ser Ile  Met Glu Arg Ser Phe  Phe Glu Glu Asn Pro  Val Glu Phe
    1160                1165                1170

Leu Glu  Asn Lys Gly Tyr His  Asn Ile Arg Glu Asp  Lys Leu Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Phe Glu Gly  Gly Arg Arg
    1190                1195                1200

Arg Leu  Leu Ala Ser Ala Ser  Glu Leu Gln Lys Gly  Asn Glu Met
    1205                1210                1215

Val Leu  Pro Gly Tyr Leu Val  Glu Leu Leu Tyr His  Ala His Arg
    1220                1225                1230

Ala Asp  Asn Phe Asn Ser Thr  Glu Tyr Leu Asn Tyr  Val Ser Glu
    1235                1240                1245

His Lys  Lys Glu Phe Glu Lys  Val Leu Ser Cys Val  Glu Asp Phe
    1250                1255                1260
```

```
Ala Asn  Leu Tyr Val Asp Val  Glu Lys Asn Leu Ser  Lys Ile Arg
    1265                1270                1275


Ala Val  Ala Asp Ser Met Asp  Asn Phe Ser Ile Glu  Glu Ile Ser
    1280                1285                1290


Asn Ser  Phe Ile Asn Leu Leu  Thr Leu Thr Ala Leu  Gly Ala Pro
    1295                1300                1305


Ala Asp  Phe Asn Phe Leu Gly  Glu Lys Ile Pro Arg  Lys Arg Tyr
    1310                1315                1320


Thr Ser  Thr Lys Glu Cys Leu  Asn Ala Thr Leu Ile  His Gln Ser
    1325                1330                1335


Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Lys Leu Gly
    1340                1345                1350


Glu Glu
    1355


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<212>  PRT
<213>  Streptococcus infantarius

<400>  211

Met Glu Lys Ser Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Lys Tyr Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Val Thr Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Lys Glu Met Thr Lys Val Asp Glu Ser
                85                  90                  95

Phe Phe Gln Arg Leu Glu Glu Ser Phe Leu Thr Asp Asp Asp Lys Thr
            100                 105                 110

Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala Tyr
        115                 120                 125

His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys Tyr Leu Ala Asp
    130                 135                 140

Ser Gln Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Lys Leu Phe Asn Val Phe Val Glu Thr Tyr
            180                 185                 190

Asp Lys Ile Val Asp Glu Ser His Leu Ser Glu Ile Glu Val Asp Ala
        195                 200                 205

Ser Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Ile Lys Gln Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270
```

```
Glu Asp Leu Glu Glu Leu Leu Gly Lys Val Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Ile Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Val Glu His His Glu Asp Leu Glu Lys Leu Lys
                325                 330                 335

Glu Phe Ile Lys Ile Asn Lys Leu Lys Leu Tyr His Asp Ile Phe Lys
            340                 345                 350

Asp Lys Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Thr Ile Leu Thr Lys Ile Asp
    370                 375                 380

Asp Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Asp Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ser Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Ala Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asp Ser Arg Phe Ala Trp
    450                 455                 460

Ala Asn Tyr His Ser Asp Glu Pro Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480
```

```
Val Val Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

His Val Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Ile Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ser Phe Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Ala Lys Leu Leu Ser Tyr Leu Asn Asn Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Asn Asp Leu Ile Gly Leu Asp Lys Asp Ser Lys Ser Phe Asn Ala Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Leu Asp Lys Ser Phe Leu
        595                 600                 605

Asp Asp Lys Thr Asn Gly Gln Ile Ile Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Asp Met Ile His Glu Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Phe Phe Thr Ser Gln Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asn Lys Glu Asn Asn Lys Thr Ile Leu Asp Phe Leu Ile Asp Asp Gly
        675                 680                 685
```

```
His Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Glu Ser Leu Ser
    690                 695                 700

Phe Lys Thr Ile Ile Gln Glu Ala Gln Val Val Gly Asp Val Asp Asp
705                 710                 715                 720

Ile Glu Ala Val Val His Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Val Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly Asp Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Gly Tyr Gly Arg Asn Lys Ser Asn Gln Arg Leu Lys Arg Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Ser Tyr Val Asp Ser Lys Val Glu Asn Ser
785                 790                 795                 800

His Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Arg Leu Ser Asp Tyr
            820                 825                 830

Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Ile
        835                 840                 845

Asp Asn Lys Val Leu Thr Ser Ser Ala Lys Asn Arg Gly Lys Ser Asp
    850                 855                 860

Asp Val Pro Ser Ile Glu Ile Val Arg Asn Arg Arg Ser Tyr Trp Tyr
865                 870                 875                 880

Lys Leu Tyr Lys Ser Gly Leu Ile Ser Lys Arg Lys Phe Asp Asn Leu
                885                 890                 895
```

```
Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Gly Phe
            900                 905                 910

Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala
        915                 920                 925

Gln Ile Leu Asp Ala Arg Phe Asn Thr Lys Arg Asp Glu Asn Asp Lys
    930                 935                 940

Val Ile Arg Asp Val Lys Val Ile Thr Leu Lys Ser Asn Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Glu Phe Lys Phe Tyr Lys Val Arg Glu Ile Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr Ala
            980                 985                 990

Leu Leu Lys Lys Tyr Pro Lys Leu  Thr Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr Lys  Lys Tyr Asp Val Ser  Ser Asp Asp Tyr Ser  Glu Met Gly
    1010                1015                1020

Lys Ala  Thr Ala Lys Tyr Phe  Phe Tyr Ser Asn Leu  Met Asn Phe
    1025                1030                1035

Phe Lys  Thr Glu Val Lys Tyr  Ala Asp Gly Arg Val  Phe Glu Arg
    1040                1045                1050

Pro Asp  Ile Glu Thr Asn Ala  Asp Gly Glu Val Val  Trp Asn Lys
    1055                1060                1065

Gln Lys  Asp Phe Asp Ile Val  Arg Lys Val Leu Ser  Tyr Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Val  Glu Ala Gln Thr Gly  Gly Phe Ser
    1085                1090                1095
```

```
Lys Glu  Ser Ile Leu Ser Lys  Gly Asp Ser Asp Lys  Leu Ile Pro
    1100                1105                1110

Arg Lys  Thr Lys Lys Val Tyr  Trp Asn Thr Lys Lys  Tyr Gly Gly
    1115                1120                1125

Phe Asp  Ser Pro Thr Val Ala  Tyr Ser Val Leu Val  Val Ala Asp
    1130                1135                1140

Ile Glu  Lys Gly Lys Ala Lys  Lys Leu Lys Thr Val  Lys Glu Leu
    1145                1150                1155

Val Gly  Ile Ser Ile Met Glu  Arg Ser Phe Phe Glu  Glu Asn Pro
    1160                1165                1170

Val Ser  Phe Leu Glu Lys Lys  Gly Tyr His Asn Val  Gln Glu Asp
    1175                1180                1185

Lys Leu  Ile Lys Leu Pro Lys  Tyr Ser Leu Phe Glu  Phe Glu Gly
    1190                1195                1200

Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Thr Glu Leu  Gln Lys Gly
    1205                1210                1215

Asn Glu  Val Met Leu Pro Ala  His Leu Val Glu Leu  Leu Tyr His
    1220                1225                1230

Ala His  Arg Ile Asp Ser Phe  Asn Ser Thr Glu His  Leu Lys Tyr
    1235                1240                1245

Val Ser  Glu His Lys Lys Glu  Phe Glu Lys Val Leu  Ser Cys Val
    1250                1255                1260

Glu Asn  Phe Ser Asn Leu Tyr  Val Asp Val Glu Lys  Asn Leu Ser
    1265                1270                1275

Lys Val  Arg Ala Ala Ala Glu  Ser Met Thr Asn Phe  Ser Leu Glu
    1280                1285                1290
```

```
Glu Ile  Ser Ala Ser Phe Ile  Asn Leu Leu Thr Leu  Thr Ala Leu
    1295                 1300                 1305


Gly Ala  Pro Ala Asp Phe Asn  Phe Leu Gly Glu Lys  Ile Pro Arg
    1310                 1315                 1320


Lys Arg  Tyr Thr Ser Thr Lys  Glu Cys Leu Ser Ala  Thr Leu Ile
    1325                 1330                 1335


His Gln  Ser Val Thr Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser
    1340                 1345                 1350


Lys Leu  Gly Glu Glu
    1355
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<212> PRT
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<400> 212

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Met Arg Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Arg Ile Gln Gly Thr Thr Asp Arg Thr Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Asn Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Lys Tyr Arg Ile Lys
65                  70                  75                  80


Glu Leu Gln Lys Ile Phe Ser Ser Glu Met Asn Glu Leu Asp Ile Ala
                85                  90                  95
```

```
Phe Phe Pro Arg Leu Ser Glu Ser Phe Leu Val Ser Asp Asp Lys Glu
            100                 105                 110

Phe Glu Asn His Pro Ile Phe Gly Asn Leu Lys Asp Glu Ile Thr Tyr
        115                 120                 125

His Asn Asp Tyr Pro Thr Ile Tyr His Leu Arg Gln Thr Leu Ala Asp
    130                 135                 140

Ser Asp Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asn Leu Asp Ser
                165                 170                 175

Glu Asn Thr Asp Val His Val Leu Phe Leu Asn Leu Val Asn Ile Tyr
            180                 185                 190

Asn Asn Leu Phe Glu Glu Asp Val Glu Thr Ala Ser Ile Asp Ala Glu
        195                 200                 205

Lys Ile Leu Thr Ser Lys Thr Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Glu Ile Pro Asn Gln Lys Arg Asn Met Leu Phe Gly Asn Leu
225                 230                 235                 240

Val Ser Leu Ala Leu Gly Leu Thr Pro Asn Phe Lys Thr Asn Phe Glu
                245                 250                 255

Leu Leu Glu Asp Ala Lys Leu Gln Ile Ser Lys Asp Ser Tyr Glu Glu
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Ile Ala Ala Lys Lys Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300
```

```
Ile Thr Val Lys Gly Ala Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Val Gln Arg Tyr Glu Glu His Gln Gln Asp Leu Ala Leu Leu Lys Asn
                325                 330                 335

Leu Val Lys Lys Gln Ile Pro Glu Lys Tyr Lys Glu Ile Phe Asp Asn
            340                 345                 350

Lys Glu Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Tyr Ile Lys Pro Ile Leu Leu Lys Leu Asp Gly
    370                 375                 380

Thr Glu Lys Leu Ile Ser Lys Leu Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Asn
                405                 410                 415

Glu Leu Lys Ala Ile Ile Arg Arg Gln Glu Lys Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Asn Gln Lys Lys Ile Glu Lys Leu Phe Thr Phe Lys Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Asn Gly Gln Ser Ser Phe Ala Trp Leu
    450                 455                 460

Lys Arg Gln Ser Asn Glu Ser Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Gln Glu Ala Ser Ala Arg Ala Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Thr Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Pro
            500                 505                 510
```

```
Leu Tyr Glu Met Phe Met Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Gln Thr Glu Gly Met Lys Arg Pro Val Phe Leu Ser Ser Glu Asp Lys
    530                 535                 540

Glu Glu Ile Val Asn Leu Leu Phe Lys Lys Glu Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Glu Tyr Phe Ser Lys Met Lys Cys Phe His Thr
                565                 570                 575

Val Thr Ile Leu Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Phe Lys Asp Lys Ala Phe Leu Asp Asp
        595                 600                 605

Glu Ala Asn Gln Asp Ile Leu Glu Glu Ile Val Trp Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Gln Ala Met Ile Glu Arg Arg Leu Val Lys Tyr Ala Asp
625                 630                 635                 640

Val Phe Glu Lys Ser Val Leu Lys Lys Leu Lys Lys Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Gln Lys Leu Ile Asn Gly Ile Lys Asp Lys
            660                 665                 670

Gln Thr Gly Lys Thr Ile Leu Gly Phe Leu Lys Asp Gly Val Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Ser Ser Leu Asp Phe Ala Lys
    690                 695                 700

Ile Ile Lys Asn Glu Gln Glu Lys Thr Ile Lys Asn Glu Ser Leu Glu
705                 710                 715                 720
```

```
Glu Thr Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Ile Lys Ile Val Asp Glu Ile Val Lys Ile Met Gly Gln
            740                 745                 750

Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Ser Thr
        755                 760                 765

Met Gln Gly Ile Lys Asn Ser Arg Gln Arg Leu Arg Lys Leu Glu Glu
    770                 775                 780

Val His Lys Asn Thr Gly Ser Lys Ile Leu Lys Glu Tyr Asn Val Ser
785                 790                 795                 800

Asn Thr Gln Leu Gln Ser Asp Arg Leu Tyr Leu Tyr Leu Leu Gln Asp
                805                 810                 815

Gly Lys Asp Met Tyr Thr Gly Lys Glu Leu Asp Tyr Asp Asn Leu Ser
            820                 825                 830

Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asp Asn
        835                 840                 845

Ser Ile Asp Asn Thr Val Leu Thr Thr Gln Ala Ser Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Asn Ile Glu Thr Val Asn Lys Met Lys Ser Phe
865                 870                 875                 880

Trp Tyr Lys Gln Leu Lys Ser Gly Ala Ile Ser Gln Arg Lys Phe Asp
                885                 890                 895

His Leu Thr Lys Ala Glu Arg Gly Ala Leu Ser Asp Phe Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925
```

```
Val Ala Gln Ile Leu Asp Ser Arg Phe Asn Ser Asn Leu Thr Glu Asp
    930                 935                 940

Ser Lys Ser Asn Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Lys Met
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gly Phe Tyr Lys Leu Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Ala Gln Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Leu Lys Lys Tyr Pro  Lys Leu Glu Ala Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys His Tyr Asp  Leu Pro Asp Ser Ser  Leu Gly Lys
    1010                1015                1020

Ala Thr  Thr Arg Met Phe Phe  Tyr Ser Asn Leu Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Glu Ile Lys Leu Ala  Asp Asp Thr Ile Phe  Thr Arg Pro
    1040                1045                1050

Gln Ile  Glu Val Asn Thr Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Val Lys  Asp Met Gln Thr Ile  Arg Lys Val Met Ser  Tyr Pro Gln
    1070                1075                1080

Val Asn  Ile Val Met Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Trp Pro Lys  Gly Asp Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Ser Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125
```

```
Pro Ile  Ile Ala Tyr Ser Val  Leu Val Val Ala Lys  Ile Ala Lys
    1130                1135                1140


Gly Lys  Thr Gln Lys Leu Lys  Thr Ile Lys Glu Leu  Val Gly Ile
    1145                1150                1155


Lys Ile  Met Glu Gln Asp Glu  Phe Glu Lys Asp Pro  Ile Ala Phe
    1160                1165                1170


Leu Glu  Lys Lys Gly Tyr Gln  Asp Ile Gln Thr Ser  Ser Ile Ile
    1175                1180                1185


Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200


Arg Leu  Leu Ala Ser Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                1210                1215


Pro Asn  Lys Tyr Val Lys Phe  Leu Tyr Leu Ala Ser  His Tyr Thr
    1220                1225                1230


Lys Phe  Thr Gly Lys Glu Glu  Asp Arg Glu Lys Lys  Arg Ser Tyr
    1235                1240                1245


Val Glu  Ser His Leu Tyr Tyr  Phe Asp Glu Ile Met  Gln Ile Ile
    1250                1255                1260


Val Glu  Tyr Ser Asn Arg Tyr  Ile Leu Ala Asp Ser  Asn Leu Ile
    1265                1270                1275


Lys Ile  Gln Asn Leu Tyr Lys  Glu Lys Asp Asn Phe  Ser Ile Glu
    1280                1285                1290


Glu Gln  Ala Ile Asn Met Leu  Asn Leu Phe Thr Phe  Thr Asp Leu
    1295                1300                1305


Gly Ala  Pro Ser Ala Phe Lys  Phe Phe Asn Gly Asp  Ile Asp Arg
    1310                1315                1320
```

```
Lys Arg  Tyr Ser Ser Thr Asn  Glu Ile Ile Asn Ser  Thr Leu Ile
    1325                1330                1335


Tyr Gln  Ser Pro Thr Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser
    1340                1345                1350


Lys Leu  Gly Gly Lys
    1355


<210>  213
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<212>  PRT
<213>  Streptococcus iniae


<220>
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<222>  (1257)..(1257)
<223>  Xaa can be any naturally occurring amino acid

<400>  213

Met Arg Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Arg Ile Gln Gly Thr Thr Asp Arg Thr Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Asn Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Lys Tyr Arg Ile Lys
65                  70                  75                  80


Glu Leu Gln Lys Ile Phe Ser Ser Glu Met Asn Glu Leu Asp Ile Ala
                85                  90                  95


Phe Phe Pro Arg Leu Ser Glu Ser Phe Leu Val Ser Asp Asp Lys Glu
            100                 105                 110
```

```
Phe Glu Asn His Pro Ile Phe Gly Asn Leu Lys Asp Glu Ile Thr Tyr
        115                 120                 125

His Asn Asp Tyr Pro Thr Ile Tyr His Leu Arg Gln Thr Leu Ala Asp
    130                 135                 140

Ser Asp Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asn Leu Asp Ser
                165                 170                 175

Glu Asn Thr Asp Val His Val Leu Phe Leu Asn Leu Val Asn Ile Tyr
            180                 185                 190

Asn Asn Leu Phe Glu Glu Asp Val Glu Thr Ala Ser Ile Asp Ala Glu
        195                 200                 205

Lys Ile Leu Thr Ser Lys Thr Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Glu Ile Pro Asn Gln Lys Arg Asn Met Leu Phe Gly Asn Leu
225                 230                 235                 240

Val Ser Leu Ala Leu Gly Leu Thr Pro Asn Phe Lys Thr Asn Phe Glu
                245                 250                 255

Leu Leu Glu Asp Ala Lys Leu Gln Ile Ser Lys Asp Ser Tyr Glu Glu
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Ile Ala Ala Lys Lys Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Ile Thr Val Lys Gly Ala Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320
```

```
Val Gln Arg Tyr Glu Glu His Gln Gln Asp Leu Ala Leu Leu Lys Asn
                325                 330                 335

Leu Val Lys Lys Gln Ile Pro Glu Lys Tyr Lys Glu Ile Phe Asp Asn
            340                 345                 350

Lys Glu Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Tyr Ile Lys Pro Ile Leu Leu Lys Leu Asp Gly
    370                 375                 380

Thr Glu Lys Leu Ile Ser Lys Leu Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Asn
                405                 410                 415

Glu Leu Lys Ala Ile Ile Arg Arg Gln Glu Lys Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Asn Gln Lys Lys Ile Glu Lys Leu Phe Thr Phe Lys Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Asn Gly Gln Ser Ser Phe Ala Trp Leu
    450                 455                 460

Lys Arg Gln Ser Asn Glu Ser Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Gln Glu Ala Ser Ala Arg Ala Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Thr Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Pro
            500                 505                 510

Leu Tyr Glu Met Phe Met Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525
```

```
Gln Thr Glu Gly Met Lys Arg Pro Val Phe Leu Ser Ser Glu Asp Lys
    530                 535                 540

Glu Glu Ile Val Asn Leu Leu Phe Lys Lys Glu Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Glu Tyr Phe Ser Lys Met Lys Cys Phe His Thr
                565                 570                 575

Val Thr Ile Leu Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Phe Lys Asp Lys Ala Phe Leu Asp Asp
        595                 600                 605

Glu Ala Asn Gln Asp Ile Leu Glu Glu Ile Val Trp Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Gln Ala Met Ile Glu Arg Arg Leu Val Lys Tyr Ala Asp
625                 630                 635                 640

Val Phe Glu Lys Ser Val Leu Lys Lys Leu Lys Lys Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Gln Lys Leu Ile Asn Gly Ile Lys Asp Lys
            660                 665                 670

Gln Thr Gly Lys Thr Ile Leu Gly Phe Leu Lys Asp Gly Val Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Ser Ser Leu Asp Phe Ala Lys
    690                 695                 700

Ile Ile Lys Asn Glu Gln Glu Lys Thr Ile Lys Asn Glu Ser Leu Glu
705                 710                 715                 720

Glu Thr Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735
```

```
Leu Gln Ser Ile Lys Ile Val Asp Glu Ile Val Lys Ile Met Gly Gln
            740                 745                 750

Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Ser Thr
        755                 760                 765

Met Gln Gly Ile Lys Asn Ser Arg Gln Arg Leu Arg Lys Leu Glu Glu
    770                 775                 780

Val His Lys Asn Thr Gly Ser Lys Ile Leu Lys Glu Tyr Asn Val Ser
785                 790                 795                 800

Asn Thr Gln Leu Gln Ser Asp Arg Leu Tyr Leu Tyr Leu Leu Gln Asp
                805                 810                 815

Gly Lys Asp Met Tyr Thr Gly Lys Glu Leu Asp Tyr Asp Asn Leu Ser
            820                 825                 830

Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asp Asn
        835                 840                 845

Ser Ile Asp Asn Thr Val Leu Thr Thr Gln Ala Ser Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Asn Ile Glu Thr Val Asn Lys Met Lys Ser Phe
865                 870                 875                 880

Trp Tyr Lys Gln Leu Lys Ser Gly Ala Ile Ser Gln Arg Lys Phe Asp
                885                 890                 895

His Leu Thr Lys Ala Glu Arg Gly Ala Leu Ser Asp Phe Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Phe Asn Ser Asn Leu Thr Glu Asp
    930                 935                 940
```

```
Ser Lys Ser Asn Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Lys Met
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gly Phe Tyr Lys Leu Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Ala Gln Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Leu Lys Lys Tyr Pro  Lys Leu Glu Ala Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys His Tyr Asp  Leu Pro Asp Ser Ser  Leu Gly Lys
    1010                1015                1020

Ala Thr  Thr Arg Met Phe Phe  Tyr Ser Asn Leu Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Glu Ile Lys Leu Ala  Asp Asp Thr Ile Phe  Thr Arg Pro
    1040                1045                1050

Gln Ile  Glu Val Asn Thr Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Val Lys  Asp Met Gln Thr Ile  Arg Lys Val Met Ser  Tyr Pro Gln
    1070                1075                1080

Val Asn  Ile Val Met Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Trp Pro Lys  Gly Asp Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Ser Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Ile  Ile Ala Tyr Ser Val  Leu Val Val Ala Lys  Ile Ala Lys
    1130                1135                1140
```

```
Gly Lys  Thr Gln Lys Leu Lys  Thr Ile Lys Glu Leu  Val Gly Ile
    1145                1150                1155


Lys Ile  Met Glu Gln Asp Glu  Phe Glu Lys Asp Pro  Ile Ala Phe
    1160                1165                1170


Leu Glu  Lys Lys Gly Tyr Gln  Asp Ile Gln Thr Ser  Ser Ile Ile
    1175                1180                1185


Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200


Arg Leu  Leu Ala Ser Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                1210                1215


Pro Asn  Lys Tyr Val Lys Phe  Leu Tyr Leu Ala Ser  His Tyr Thr
    1220                1225                1230


Lys Phe  Thr Gly Lys Glu Glu  Asp Arg Glu Lys Lys  Arg Ser Tyr
    1235                1240                1245


Val Glu  Ser His Leu Tyr Tyr  Phe Xaa Glu Val Lys  Ser Ser Phe
    1250                1255                1260


<210>  214
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<213>  Streptococcus iniae


<220>
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<223>  Xaa can be any naturally occurring amino acid

<220>
<221>  misc_feature
<222>  (1257)..(1257)
<223>  Xaa can be any naturally occurring amino acid

<400>  214

Met Arg Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
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1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
20 25 30

Arg Ile Gln Gly Thr Thr Asp Arg Thr Ser Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Asn Gly Glu Thr Ala Glu Ala Thr Arg Leu
50 55 60

Lys Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Lys Tyr Arg Ile Lys
65 70 75 80

Glu Leu Gln Lys Ile Phe Ser Ser Glu Met Asn Glu Leu Asp Ile Ala
85 90 95

Phe Phe Pro Arg Leu Ser Glu Ser Phe Leu Val Ser Asp Asp Lys Glu
100 105 110

Phe Glu Asn His Pro Ile Phe Gly Asn Leu Lys Asp Glu Ile Thr Tyr
115 120 125

His Asn Asp Tyr Pro Thr Ile Tyr His Leu Arg Gln Thr Leu Ala Asp
130 135 140

Ser Asp Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asn Leu Asp Ser
165 170 175

Glu Asn Thr Asp Val His Val Leu Phe Leu Asn Leu Val Asn Ile Tyr
180 185 190

Asn Asn Leu Phe Glu Glu Asp Val Glu Thr Ala Ser Ile Asp Ala Glu
195 200 205

Lys Ile Leu Thr Ser Lys Thr Ser Lys Ser Arg Arg Leu Glu Asn Leu

```
    210                 215                 220

Ile Ala Glu Ile Pro Asn Gln Lys Arg Asn Met Leu Phe Gly Asn Leu
225                 230                 235                 240

Val Ser Leu Ala Leu Gly Leu Thr Pro Asn Phe Lys Thr Asn Phe Glu
                245                 250                 255

Leu Leu Glu Asp Ala Lys Leu Gln Ile Ser Lys Asp Ser Tyr Glu Glu
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Ile Ala Ala Lys Lys Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Ile Thr Val Lys Gly Ala Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Val Gln Arg Tyr Glu Glu His Gln Gln Asp Leu Ala Leu Leu Lys Asn
                325                 330                 335

Leu Val Lys Lys Gln Ile Pro Glu Lys Tyr Lys Glu Ile Phe Asp Asn
            340                 345                 350

Lys Glu Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Tyr Ile Lys Pro Ile Leu Leu Lys Leu Asp Gly
    370                 375                 380

Thr Glu Lys Leu Ile Ser Lys Leu Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Asn
                405                 410                 415

Glu Leu Lys Ala Ile Ile Arg Arg Gln Glu Lys Phe Tyr Pro Phe Leu
```

420 425 430

Lys Glu Asn Gln Lys Lys Ile Glu Lys Leu Phe Thr Phe Lys Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Asn Gly Gln Ser Ser Phe Ala Trp Leu
450 455 460

Lys Arg Gln Ser Asn Glu Ser Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Gln Glu Ala Ser Ala Arg Ala Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Thr Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Pro
500 505 510

Leu Tyr Glu Met Phe Met Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Gln Thr Glu Gly Met Lys Arg Pro Val Phe Leu Ser Ser Glu Asp Lys
530 535 540

Glu Glu Ile Val Asn Leu Leu Phe Lys Lys Glu Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Glu Tyr Phe Ser Lys Met Lys Cys Phe His Thr
565 570 575

Val Thr Ile Leu Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Phe Lys Asp Lys Ala Phe Leu Asp Asp
595 600 605

Glu Ala Asn Gln Asp Ile Leu Glu Glu Ile Val Trp Thr Leu Thr Leu
610 615 620

Phe Glu Asp Gln Ala Met Ile Glu Arg Arg Leu Val Lys Tyr Ala Asp

625 630 635 640

Val Phe Glu Lys Ser Val Leu Lys Lys Leu Lys Lys Arg His Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Gln Lys Leu Ile Asn Gly Ile Lys Asp Lys
660 665 670

Gln Thr Gly Lys Thr Ile Leu Gly Phe Leu Lys Asp Gly Val Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Ser Ser Leu Asp Phe Ala Lys
690 695 700

Ile Ile Lys Asn Glu Gln Glu Lys Thr Ile Lys Asn Glu Ser Leu Glu
705 710 715 720

Glu Thr Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
725 730 735

Leu Gln Ser Ile Lys Ile Val Asp Glu Ile Val Lys Ile Met Gly Gln
740 745 750

Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Ser Thr
755 760 765

Met Gln Gly Ile Lys Asn Ser Arg Gln Arg Leu Arg Lys Leu Glu Glu
770 775 780

Val His Lys Asn Thr Gly Ser Lys Ile Leu Lys Glu Tyr Asn Val Ser
785 790 795 800

Asn Thr Gln Leu Gln Ser Asp Arg Leu Tyr Leu Tyr Leu Leu Gln Asp
805 810 815

Gly Lys Asp Met Tyr Thr Gly Lys Glu Leu Asp Tyr Asp Asn Leu Ser
820 825 830

Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asp Asn

```
        835                 840                 845

Ser Ile Asp Asn Thr Val Leu Thr Thr Gln Ala Ser Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Asn Ile Glu Thr Val Asn Lys Met Lys Ser Phe
865                 870                 875                 880

Trp Tyr Lys Gln Leu Lys Ser Gly Ala Ile Ser Gln Arg Lys Phe Asp
                885                 890                 895

His Leu Thr Lys Ala Glu Arg Gly Ala Leu Ser Asp Phe Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Phe Asn Ser Asn Leu Thr Glu Asp
    930                 935                 940

Ser Lys Ser Asn Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Lys Met
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gly Phe Tyr Lys Leu Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Ala Gln Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Leu Lys Lys Tyr Pro  Lys Leu Glu Ala Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys His Tyr Asp  Leu Pro Asp Ser Ser  Leu Gly Lys
    1010                1015                1020

Ala Thr  Thr Arg Met Phe Phe  Tyr Ser Asn Leu Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Glu Ile Lys Leu Ala  Asp Asp Thr Ile Phe  Thr Arg Pro
```

```
    1040                1045                1050

Gln Ile  Glu Val Asn Thr Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Val Lys  Asp Met Gln Thr Ile  Arg Lys Val Met Ser  Tyr Pro Gln
    1070                1075                1080

Val Asn  Ile Val Met Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Trp Pro Lys  Gly Asp Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Ser Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Ile  Ile Ala Tyr Ser Val  Leu Val Val Ala Lys  Ile Ala Lys
    1130                1135                1140

Gly Lys  Thr Gln Lys Leu Lys  Thr Ile Lys Glu Leu  Val Gly Ile
    1145                1150                1155

Lys Ile  Met Glu Gln Asp Glu  Phe Glu Lys Asp Pro  Ile Ala Phe
    1160                1165                1170

Leu Glu  Lys Lys Gly Tyr Gln  Asp Ile Gln Thr Ser  Ser Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Leu  Leu Ala Ser Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                1210                1215

Pro Asn  Lys Tyr Val Lys Phe  Leu Tyr Leu Ala Ser  His Tyr Thr
    1220                1225                1230

Lys Phe  Thr Gly Lys Glu Glu  Asp Arg Glu Lys Lys  Arg Ser Tyr
```

1235 1240 1245

Val Glu Ser His Leu Tyr Xaa Phe Xaa
1250 1255

<210> 215
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<213> Streptococcus iniae

<400> 215

Met Glu Gln Asp Glu Phe Glu Lys Asp Pro Ile Ala Phe Leu Glu Lys
1 5 10 15

Lys Gly Tyr Gln Asp Ile Gln Thr Ser Ser Ile Ile Lys Leu Pro Lys
20 25 30

Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys Arg Leu Leu Ala Ser
35 40 45

Lys Glu Leu Gln Lys Gly Asn Glu Leu Ala Leu Pro Asn Lys Tyr Val
50 55 60

Lys Phe Leu Tyr Leu Ala Ser His Tyr Thr Lys Phe Thr Gly Lys Glu
65 70 75 80

Glu Asp Arg Glu Lys Lys Arg Ser Tyr Val Glu Ser His Leu Tyr Tyr
85 90 95

Phe Asp Glu Ile Met Gln Ile Ile Val Glu Tyr Ser Asn Arg Tyr Ile
100 105 110

Leu Ala Asp Ser Asn Leu Ile Lys Ile Gln Asn Leu Tyr Lys Glu Lys
115 120 125

Asp Asn Phe Ser Ile Glu Glu Gln Ala Ile Asn Met Leu Asn Leu Phe
130 135 140

Thr Phe Thr Asp Leu Gly Ala Pro Ser Ala Phe Lys Phe Phe Asn Gly
145 150 155 160

```
Asp Ile Asp Arg Lys Arg Tyr Ser Ser Thr Asn Glu Ile Ile Asn Ser
                165                 170                 175

Thr Leu Ile Tyr Gln Ser Pro Thr Gly Leu Tyr Glu Thr Arg Ile Asp
            180                 185                 190

Leu Ser Lys Leu Gly Gly Lys
        195
```

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<212> PRT
<213> Streptococcus iniae

<400> 216

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Met Arg Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30

Arg Ile Gln Gly Thr Thr Asp Arg Thr Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Asn Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Lys Tyr Arg Ile Lys
65                  70                  75                  80

Glu Leu Gln Lys Ile Phe Ser Ser Glu Met Asn Glu Leu Asp Ile Ala
                85                  90                  95

Phe Phe Pro Arg Leu Ser Glu Ser Phe Leu Val Ser Asp Asp Lys Glu
            100                 105                 110

Phe Glu Asn His Pro Ile Phe Gly Asn Leu Lys Asp Glu Ile Thr Tyr
        115                 120                 125
```

```
His Asn Asp Tyr Pro Thr Ile Tyr His Leu Arg Gln Thr Leu Ala Asp
    130                 135                 140

Ser Asp Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asn Leu Asp Ser
                165                 170                 175

Glu Asn Thr Asp Val His Val Leu Phe Leu Asn Leu Val Asn Ile Tyr
            180                 185                 190

Asn Asn Leu Phe Glu Glu Asp Val Glu Thr Ala Ser Ile Asp Ala Glu
        195                 200                 205

Lys Ile Leu Thr Ser Lys Thr Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Glu Ile Pro Asn Gln Lys Arg Asn Met Leu Phe Gly Asn Leu
225                 230                 235                 240

Val Ser Leu Ala Leu Gly Leu Thr Pro Asn Phe Lys Thr Asn Phe Glu
                245                 250                 255

Leu Leu Glu Asp Ala Lys Leu Gln Ile Ser Lys Asp Ser Tyr Glu Glu
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Ile Ala Ala Lys Lys Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Ile Thr Val Lys Gly Ala Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Val Gln Arg Tyr Glu Glu His Gln Gln Asp Leu Ala Leu Leu Lys Asn
                325                 330                 335
```

```
Leu Val Lys Lys Gln Ile Pro Glu Lys Tyr Lys Glu Ile Phe Asp Asn
            340                 345                 350

Lys Glu Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Tyr Ile Lys Pro Ile Leu Leu Lys Leu Asp Gly
    370                 375                 380

Thr Glu Lys Leu Ile Ser Lys Leu Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Asn
                405                 410                 415

Glu Leu Lys Ala Ile Ile Arg Arg Gln Glu Lys Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Asn Gln Lys Lys Ile Glu Lys Leu Phe Thr Phe Lys Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Asn Gly Gln Ser Ser Phe Ala Trp Leu
    450                 455                 460

Lys Arg Gln Ser Asn Glu Ser Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Gln Glu Ala Ser Ala Arg Ala Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Thr Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Pro
            500                 505                 510

Leu Tyr Glu Met Phe Met Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Gln Thr Glu Gly Met Lys Arg Pro Val Phe Leu Ser Ser Glu Asp Lys
    530                 535                 540
```

```
Glu Glu Ile Val Asn Leu Leu Phe Lys Lys Glu Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Glu Tyr Phe Ser Lys Met Lys Cys Phe His Thr
                565                 570                 575

Val Thr Ile Leu Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Phe Lys Asp Lys Ala Phe Leu Asp Asp
        595                 600                 605

Glu Ala Asn Gln Asp Ile Leu Glu Glu Ile Val Trp Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Gln Ala Met Ile Glu Arg Arg Leu Val Lys Tyr Ala Asp
625                 630                 635                 640

Val Phe Glu Lys Ser Val Leu Lys Lys Leu Lys Lys Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Gln Lys Leu Ile Asn Gly Ile Lys Asp Lys
            660                 665                 670

Gln Thr Gly Lys Thr Ile Leu Gly Phe Leu Lys Asp Gly Val Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Ser Ser Leu Asp Phe Ala Lys
    690                 695                 700

Ile Ile Lys Asn Glu Gln Glu Lys Thr Ile Lys Asn Glu Ser Leu Glu
705                 710                 715                 720

Glu Thr Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Ile Lys Ile Val Asp Glu Ile Val Lys Ile Met Gly Gln
            740                 745                 750
```

```
Asn Pro Asp Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Ser Thr
        755                 760                 765

Met Gln Gly Ile Lys Asn Ser Arg Gln Arg Leu Arg Lys Leu Glu Glu
    770                 775                 780

Val His Lys Asn Thr Gly Ser Lys Ile Leu Lys Glu Tyr Asn Val Ser
785                 790                 795                 800

Asn Thr Gln Leu Gln Ser Asp Arg Leu Tyr Leu Tyr Leu Leu Gln Asp
                805                 810                 815

Gly Lys Asp Met Tyr Thr Gly Lys Glu Leu Asp Tyr Asp Asn Leu Ser
            820                 825                 830

Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asp Asn
        835                 840                 845

Ser Ile Asp Asn Thr Val Leu Thr Thr Gln Ala Ser Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Asn Ile Glu Thr Val Asn Lys Met Lys Ser Phe
865                 870                 875                 880

Trp Tyr Lys Gln Leu Lys Ser Gly Ala Ile Ser Gln Arg Lys Phe Asp
                885                 890                 895

His Leu Thr Lys Ala Glu Arg Gly Ala Leu Ser Asp Phe Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Phe Asn Ser Asn Leu Thr Glu Asp
    930                 935                 940

Ser Lys Ser Asn Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Lys Met
945                 950                 955                 960
```

```
Val Ser Asp Phe Arg Lys Asp Phe Gly Phe Tyr Lys Leu Arg Glu Val
               965                 970                 975

Asn Asp Tyr His His Ala Gln Asp Ala Tyr Leu Asn Ala Val Val Gly
           980                 985                 990

Thr Ala Leu Leu Lys Lys Tyr Pro  Lys Leu Glu Ala Glu  Phe Val Tyr
        995                1000                1005

Gly Asp  Tyr Lys His Tyr Asp  Leu Pro Asp Ser Ser  Leu Gly Lys
    1010                1015                1020

Ala Thr  Thr Arg Met Phe Phe  Tyr Ser Asn Leu Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Glu Ile Lys Leu Ala  Asp Asp Thr Ile Phe  Thr Arg Pro
    1040                1045                1050

Gln Ile  Glu Val Asn Thr Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Val Lys  Asp Met Gln Thr Ile  Arg Lys Val Met Ser  Tyr Pro Gln
    1070                1075                1080

Val Asn  Ile Val Met Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Trp Pro Lys  Gly Asp Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Ser Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Ile  Ile Ala Tyr Ser Val  Leu Val Val Ala Lys  Ile Ala Lys
    1130                1135                1140

Gly Lys  Thr Gln Lys Leu Lys  Thr Ile Lys Glu Leu  Val Gly Ile
    1145                1150                1155
```

```
Lys Ile  Met Glu Gln Asp Glu  Phe Glu Lys Asp Pro  Ile Ala Phe
    1160                1165                1170


Leu Glu  Lys Lys Gly Tyr Gln  Asp Ile Gln Thr Ser  Ser Ile Ile
    1175                1180                1185


Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200


Arg Leu  Leu Ala Ser Glu Leu  Gln Lys Gly Asn Glu  Leu Ala Leu
    1205                1210                1215


Pro Asn  Lys Tyr Val Lys Phe  Leu Tyr Leu Ala Ser  His Tyr Thr
    1220                1225                1230


Lys Phe  Thr Gly Lys Glu Glu  Asp Arg Glu Lys Lys  Arg Ser Tyr
    1235                1240                1245


Val Glu  Ser His Leu Tyr Tyr  Phe Asp Val Arg Leu  Ser Gln Val
    1250                1255                1260


Phe Arg  Val Thr Asn Val Glu  Phe
    1265                1270


<210>  217
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<212>  PRT
<213>  Streptococcus intermedius

<400>  217

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255
```

```
Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Glu Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Ile Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ser Trp
    450                 455                 460
```

```
Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480


Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495


Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Arg His Ser
            500                 505                 510


Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525


Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540


Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560


Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575


Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590


Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605


Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620


Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640


Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Asn Leu Glu Arg Arg His
                645                 650                 655


Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670
```

```
Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880
```

```
Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080
```

```
Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asn  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Leu Val Lys
    1130                1135                1140

Asp Leu  Val Gly Ile Thr Ile  Met Glu Arg Thr Ile  Phe Glu Lys
    1145                1150                1155

Asn Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Val Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu
    1175                1180                1185

Glu Asn  Gly Arg Arg Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Met Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Lys Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Asn Ile Leu Ala  Glu Ser Asn
    1250                1255                1260

Leu Glu  Lys Ile Glu Glu Leu  Tyr Ala Gln Asn Asn  Asn Lys Asp
    1265                1270                1275
```

```
Ile Thr  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Asn Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Arg Leu Gly Gly Asp
    1340                1345
```

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<211> 1333
<212> PRT
<213> Streptococcus massiliensis

<400> 218

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Met Glu Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Val Glu Arg Arg Leu
    50                  55                  60


Asn Arg Thr Thr Ser Arg Arg Tyr Asp Arg Arg Arg Asn Arg Ile Arg
65                  70                  75                  80


Tyr Leu Gln His Ile Phe Ala Glu Glu Met Asn Arg Ala Asp Glu Asn
                85                  90                  95


Phe Phe His Arg Leu Lys Glu Ser Phe Phe Val Glu Glu Asp Lys Thr
```

100 105 110

Tyr Ser Lys Tyr Pro Ile Phe Gly Thr Leu Glu Glu Glu Lys Asn Tyr
115 120 125

His Lys Asn Tyr Pro Thr Ile Tyr His Leu Arg Lys Thr Leu Ala Asp
130 135 140

Thr Pro Asp Lys Met Asp Ile Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asp Ile
165 170 175

Glu Asn Ile Gly Ile Gln Asp Ser Phe Lys Ser Phe Ile Glu Glu Tyr
180 185 190

Asn Thr Gln Phe Gly Thr Lys Leu Asp Ser Thr Thr Lys Val Glu Ala
195 200 205

Ile Phe Thr Glu Asn Ser Ser Lys Ala Lys Arg Val Glu Thr Ile Leu
210 215 220

Gly Leu Phe Pro Asp Glu Thr Ala Ala Gly Asn Leu Asp Lys Phe Leu
225 230 235 240

Lys Leu Met Leu Gly Asn Gln Ala Asp Phe Lys Lys Val Phe Asp Leu
245 250 255

Glu Glu Lys Ile Thr Leu Gln Phe Ser Lys Asp Ser Tyr Glu Glu Asp
260 265 270

Leu Glu Leu Leu Leu Ser Lys Ile Asp Glu Glu Tyr Ala Ala Leu Phe
275 280 285

Asp Leu Ala Lys Lys Val Tyr Asp Ala Val Leu Leu Ser Asn Ile Leu
290 295 300

Thr Val Lys Glu Lys Asn Thr Lys Ala Pro Leu Ser Ala Ser Met Ile

305 310 315 320

Lys Arg Tyr Glu Glu His Lys Asp Asp Leu Lys Ala Phe Lys Arg Phe
325 330 335

Phe Arg Glu Arg Leu Pro Glu Lys Tyr Glu Thr Met Phe Lys Asp Leu
340 345 350

Thr Lys Pro Ser Tyr Ala Ala Tyr Val Ser Gly Ala Val Thr Glu Asp
355 360 365

Asp Phe Tyr Lys Phe Ser Lys Gly Leu Leu Ile Asp Val Glu Gly Ala
370 375 380

Glu Tyr Phe Leu Glu Lys Ile Glu Arg Glu Asp Phe Leu Arg Lys Gln
385 390 395 400

Arg Thr Phe Asp Asn Gly Ala Ile Pro Asn Gln Val His Val Lys Glu
405 410 415

Leu Gln Ala Ile Ile Leu Asn Gln Ser Lys Tyr Tyr Pro Phe Leu Ala
420 425 430

Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr
435 440 445

Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Ser Phe Ala Trp Leu Gln
450 455 460

Arg Lys Ser Asp Glu Ala Ile Arg Pro Trp Asn Phe Glu Gln Val Val
465 470 475 480

Asp Met Glu Thr Ser Ala Ser Arg Phe Ile Glu Arg Met Thr Leu His
485 490 495

Asp Leu Tyr Leu Pro Asp Glu Lys Val Leu Pro Arg His Ser Leu Ile
500 505 510

Tyr Glu Lys Tyr Thr Val Phe Asn Glu Leu Thr Lys Val Arg Phe Thr

515 520 525

Pro Glu Gly Gly Lys Glu Val Tyr Phe Ser Lys Thr Asp Lys Glu Asn
530 535 540

Ile Phe Asp Ser Leu Phe Lys Arg Tyr Arg Lys Val Thr Lys Arg Lys
545 550 555 560

Leu Lys Asp Phe Ile Glu Lys Glu Leu Gly Tyr Gly Tyr Ile Asp Ile
565 570 575

Asp Asn Ile Lys Gly Val Glu Glu Gln Phe Asn Ala Ser Tyr Thr Thr
580 585 590

Tyr Gln Asp Leu Leu Lys Ile Ile Gly Asp Lys Glu Phe Leu Asp Asn
595 600 605

Glu Glu Asn Lys Asp Leu Leu Glu Glu Ile Ile Tyr Ile Leu Thr Val
610 615 620

Phe Glu Asp Arg Lys Met Ile Glu Lys Arg Leu Ser Glu Leu Asn Ile
625 630 635 640

Pro Phe Glu Asn Lys Ile Ile Lys Lys Leu Ala Arg Lys Lys Tyr Thr
645 650 655

Gly Trp Gly Asn Leu Ser Arg Lys Leu Ile Asp Gly Ile Arg Asn Arg
660 665 670

Glu Thr Asn Arg Thr Ile Leu Gly His Leu Ile Asp Asp Gly Phe Ser
675 680 685

Asn Arg Asn Leu Met Gln Leu Ile Asn Asp Asp Gly Leu Asp Phe Lys
690 695 700

Glu Ile Ile Arg Lys Ala Gln Thr Ile Glu Asn Ile Asp Thr Asn Gln
705 710 715 720

Ala Leu Val Ser Ser Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile

```
                725                 730                 735

Leu Gln Ser Leu Asn Ile Val Asp Glu Ile Ile Ala Ile Met Gly Tyr
            740                 745                 750

Ala Pro Thr Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Arg Asp Asn Ser Ala Gln Arg Leu Lys Lys Ile Glu Asp
    770                 775                 780

Gly Ile Lys Leu Gly Ser Asp Leu Leu Lys Gln Asn Pro Ile Gln Asp
785                 790                 795                 800

Asn Lys Asp Leu Gln Lys Glu Lys Leu Phe Leu Tyr Tyr Met Gln Asn
                805                 810                 815

Gly Ile Asp Leu Tyr Thr Gly Gln Pro Leu Asn Cys Asp Pro Asp Ser
            820                 825                 830

Leu Ala Phe Tyr Asp Val Asp His Ile Val Pro Arg Ser Tyr Ile Lys
        835                 840                 845

Asn Asp Ser Phe Asp Asn Lys Val Leu Thr Thr Ser Lys Gly Asn Arg
    850                 855                 860

Lys Lys Leu Asp Asp Val Pro Ala Lys Glu Val Val Glu Lys Met Glu
865                 870                 875                 880

Asn Thr Trp Arg Arg Leu His Ala Ala Gly Leu Ile Ser Asp Ile Lys
                885                 890                 895

Leu Ser Tyr Leu Met Lys Gly Glu Leu Thr Glu Glu Asp Lys Ala Gly
            900                 905                 910

Phe Ile Arg Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Arg Leu Leu Asp Glu Lys Leu Asn Arg Lys Lys Asn Glu Asn Gly
```

```
    930                 935                 940

Glu Lys Leu Arg Thr Thr Lys Ile Ile Thr Leu Lys Ser Val Phe Ala
945                 950                 955                 960

Ser Arg Phe Arg Ala Asn Phe Asp Leu Tyr Lys Leu Arg Glu Leu Asn
                965                 970                 975

His Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Gln
            980                 985                 990

Ala Leu Leu Lys Val Tyr Pro Lys  Phe Glu Arg Glu Leu  Val Tyr Gly
        995                 1000                1005

Ser Tyr  Val Lys Glu Ser Ile  Phe Ser Arg Lys Ala  Thr Glu Arg
    1010                1015                1020

Met Arg  Met Tyr Asn Asn Ile  Leu Lys Phe Ile Ser  Lys Asp Lys
    1025                1030                1035

Lys Asp  Gln Glu Thr Gly Glu  Ile Val Trp Asp Lys  Lys Glu Ile
    1040                1045                1050

Glu Asn  Ile Val Lys Lys Val  Ile Tyr Ser Ser Pro  Val Asn Ile
    1055                1060                1065

Val Lys  Lys Arg Glu Glu Gln  Ser Gly Ala Leu Phe  Lys Gln Ser
    1070                1075                1080

Asn Met  Ala Val Gly Tyr Asn  Asn Lys Leu Ile Pro  Arg Lys Lys
    1085                1090                1095

Asp Trp  Ser Val Asp Lys Tyr  Gly Gly Phe Ile Glu  Pro Ala Glu
    1100                1105                1110

Ser Tyr  Ser Leu Ala Ile Phe  Tyr Thr Asp Ile Asn  Gly Lys Lys
    1115                1120                1125

Pro Lys  Lys Lys Ser Thr Ile  Ile Ala Ile Ser Arg  Met Glu Lys
```

1130 1135 1140

Lys Asp Tyr Glu Lys Glu Pro Glu Arg Phe Leu Ala Gln Lys Gly
1145 1150 1155

Phe Glu Arg Val Glu Lys Thr Ile Lys Leu Pro Lys Tyr Ser Leu
1160 1165 1170

Phe Glu Met Glu Lys Gly Arg Arg Arg Leu Leu Ala Ser Ser Gly
1175 1180 1185

Glu Leu Gln Lys Gly Asn Gln Val Leu Leu Pro Glu His Leu Ile
1190 1195 1200

Arg Leu Leu Ser Tyr Ala Lys Lys Val Asp Val Leu Val Lys Ser
1205 1210 1215

Lys Asp Asp Asp Tyr Asp Leu Glu Glu His Arg Ala Glu Phe Ala
1220 1225 1230

Glu Leu Leu Asp Cys Ile Lys Lys Phe Asn Asp Met Tyr Ile Leu
1235 1240 1245

Ala Ser Ser Asn Met Ser Lys Ile Glu Glu Ile Tyr Gln Lys Asn
1250 1255 1260

Ile Asp Ala Pro Ile Glu Glu Val Ala Arg Ser Phe Val Leu Leu
1265 1270 1275

Asn Phe Thr Met Met Gly Ala Ala Thr Asp Phe Lys Phe Phe Gly
1280 1285 1290

Gln Ile Ile Pro Arg Lys Arg Tyr Pro Ser Thr Thr Glu Cys Leu
1295 1300 1305

Lys Ser Thr Leu Ile His Gln Ser Val Thr Gly Leu Tyr Glu Thr
1310 1315 1320

Arg Ile Asp Leu Ser Lys Leu Gly Glu Asn

1325 1330

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<211> 1361
<212> PRT
<213> Streptococcus mitis

<400> 219

Asn Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys His Phe Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65 70 75 80

Tyr Leu Gln Glu Ile Phe Thr Glu Glu Met Ser Lys Val Asp Ile Ser
85 90 95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Glu Glu Glu Lys Glu Tyr
115 120 125

His Lys Asn Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
130 135 140

Ser Lys Glu Lys Ala Asp Phe Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ser Phe Asp Ile
165 170 175

```
Lys Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Gly Ser Ser Leu Asn Gly Gln Asn Ala Gln Val
        195                 200                 205

Glu Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Asp Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Val Gln Ile Gly Asp Asp Phe Ala Asp
        275                 280                 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Asp Arg Tyr Glu Asn His Gln Lys Asp Leu Ala Ala Leu Lys
                325                 330                 335

Gln Phe Ile Lys Thr Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser
            340                 345                 350

Asp Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Leu Glu
    370                 375                 380
```

```
Gly Ala Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Asn Ala Ile Ile Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Gln Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
    450                 455                 460

Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Ile Val Asp Lys Ala Arg Ser Ala Glu Asp Phe Ile Asn Lys Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540

Lys Gln Gln Ile Val Thr Gln Leu Phe Lys Glu Lys Arg Lys Val Thr
545                 550                 555                 560

Glu Lys Asp Ile Ile Gln Tyr Leu His Asn Val Asp Ser Tyr Asp Gly
                565                 570                 575

Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr
            580                 585                 590
```

```
Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asp
        595                 600                 605

Ser Lys Asn Glu Ala Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala His Tyr Ala Ser
625                 630                 635                 640

Ile Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Tyr Asp Lys
            660                 665                 670

Gln Ser Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Glu Ile
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys
    690                 695                 700

Glu Ile Ile Gln Lys Ala Gln Val Val Gly Lys Thr Asn Asp Val Lys
705                 710                 715                 720

Gln Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Ile Lys Leu Val Asp Glu Leu Val Lys Val Met Gly His
            740                 745                 750

Ala Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp
    770                 775                 780

Ala Leu Lys Asn Leu Ala His Asn Ile Leu Lys Glu His Pro Thr Asp
785                 790                 795                 800
```

```
Asn Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Lys Asp Met Tyr Thr Gly Lys Ser Leu Asp Ile Asn Gln Leu Ser
            820                 825                 830

Ser Cys Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp
        835                 840                 845

Ser Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Leu Glu Ile Val Gln Lys Arg Lys Ala Phe
865                 870                 875                 880

Trp Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ala Arg Phe Asn Thr Glu Val Thr Glu Lys
    930                 935                 940

Asp Lys Lys Asp Arg Ser Val Lys Ile Ile Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Asn Phe Arg Lys Glu Phe Arg Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Pro Tyr Leu Asn Ala Val Val Ala
            980                 985                 990

Lys Ala Ile Leu Lys Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005
```

```
Gly Asp  Tyr Gln Lys Tyr Asp  Leu Thr Lys Asp Pro  Lys Glu Val
    1010                1015                1020

Glu Lys  Ala Thr Glu Lys Tyr  Phe Phe Tyr Ser Asn  Leu Leu Asn
    1025                1030                1035

Phe Phe  Lys Glu Glu Val His  Tyr Ala Asp Gly Thr  Ile Val Lys
    1040                1045                1050

Arg Glu  Asn Ile Glu Tyr Ser  Lys Asp Thr Gly Glu  Ile Ala Trp
    1055                1060                1065

Asn Lys  Glu Lys Asp Phe Ala  Thr Ile Lys Lys Val  Leu Ser Leu
    1070                1075                1080

Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu Glu Gln  Thr Gly Gly
    1085                1090                1095

Leu Phe  Asp Asn Asn Ile Val  Ser Lys Lys Lys Val  Val Asp Ala
    1100                1105                1110

Ser Lys  Leu Thr Pro Ile Lys  Ser Gly Leu Ser Pro  Glu Lys Tyr
    1115                1120                1125

Gly Gly  Tyr Ala Arg Pro Thr  Ile Ala Tyr Ser Val  Leu Val Ile
    1130                1135                1140

Ala Asp  Ile Glu Lys Gly Lys  Ala Lys Lys Leu Lys  Arg Ile Lys
    1145                1150                1155

Glu Met  Val Gly Ile Thr Val  Gln Asp Lys Lys Lys  Phe Glu Ala
    1160                1165                1170

Asn Pro  Ile Ala Tyr Leu Glu  Glu Cys Gly Tyr Lys  Asn Ile Asn
    1175                1180                1185

Pro Asn  Leu Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Phe
    1190                1195                1200
```

```
Asn Asn  Gly Gln Arg Arg Leu  Leu Ala Ser Ser Ile  Glu Leu Gln
    1205                 1210                 1215

Lys Gly  Asn Glu Leu Ile Val  Pro Tyr His Phe Thr  Ala Leu Leu
    1220                 1225                 1230

Tyr His  Ala Gln Arg Ile Asn  Lys Ile Ser Glu Pro  Ile His Lys
    1235                 1240                 1245

Gln Tyr  Val Glu Thr His Gln  Ser Glu Phe Lys Glu  Leu Leu Thr
    1250                 1255                 1260

Ala Ile  Ile Ser Leu Ser Lys  Lys Tyr Ile Gln Lys  Pro Asn Val
    1265                 1270                 1275

Glu Ser  Leu Leu Gln Gln Ala  Phe Asp Gln Ser Asp  Lys Asp Ile
    1280                 1285                 1290

Tyr Gln  Leu Ser Glu Ser Phe  Ile Ser Leu Leu Lys  Leu Ile Ser
    1295                 1300                 1305

Phe Gly  Ala Pro Gly Thr Phe  Lys Phe Leu Gly Val  Glu Ile Ser
    1310                 1315                 1320

Gln Ser  Asn Val Arg Tyr Gln  Ser Val Ser Ser Cys  Phe Asn Ala
    1325                 1330                 1335

Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile
    1340                 1345                 1350

Asp Leu  Ser Lys Leu Gly Glu  Asp
    1355                 1360
```

<210> 220
<211> 1359
<212> PRT
<213> Streptococcus mitis

<400> 220

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Lys Lys Gly Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15

Phe Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met Lys
            20                  25                  30

Val Leu Gly Asn Thr Asp Lys Arg Phe Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45

Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Ala Arg Arg Leu Lys
    50                  55                  60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg Tyr
65                  70                  75                  80

Leu Gln Glu Ile Phe Ser Glu Glu Met Ser Lys Val Asp Ser Ser Phe
                85                  90                  95

Phe His Arg Leu Asp Asp Ser Phe Leu Ile Pro Glu Asp Lys Arg Glu
            100                 105                 110

Ser Lys Tyr Pro Ile Phe Ala Thr Leu Thr Glu Glu Lys Glu Tyr His
        115                 120                 125

Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp Ser
    130                 135                 140

Lys Glu Lys Thr Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ala Phe Asp Ile Lys
                165                 170                 175

Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr Asp
            180                 185                 190

Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val Glu
        195                 200                 205
```

```
Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg Val
    210                 215                 220


Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu Phe
225                 230                 235                 240


Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe Asp
                245                 250                 255


Leu Glu Asp Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp Glu
            260                 265                 270


Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Thr Asp Leu
        275                 280                 285


Phe Val Ser Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly Ile
    290                 295                 300


Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320


Ile Glu Arg Tyr Glu Asn His Gln Asn Asp Leu Ala Ala Leu Lys Gln
                325                 330                 335


Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser Asp
            340                 345                 350


Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr Gln
        355                 360                 365


Glu Thr Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu Gly
    370                 375                 380


Thr Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400


Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gln
                405                 410                 415
```

```
Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu Tyr Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp Leu
    450                 455                 460

Thr Arg Asn Ser Asp Glu Ala Ile Arg Pro Trp Asn Phe Glu Glu Ile
465                 470                 475                 480

Val Asp Lys Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr Asn
                485                 490                 495

Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys Phe
        515                 520                 525

Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln Lys
    530                 535                 540

Lys Gln Ile Val Asn Gln Leu Phe Lys Glu Asn Arg Lys Val Thr Glu
545                 550                 555                 560

Lys Asp Ile Ile His Tyr Leu His Asn Val Asp Gly Tyr Asp Gly Ile
                565                 570                 575

Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asp Ala
        595                 600                 605

Lys Asn Glu Ala Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile Phe
    610                 615                 620
```

```
Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Ser Leu
625                 630                 635                 640

Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Cys Asp Lys Gln
            660                 665                 670

Thr Gly Asn Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Lys Ile Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys Glu
    690                 695                 700

Ile Ile Gln Lys Ala Gln Val Ile Gly Lys Thr Asp Asp Val Lys Gln
705                 710                 715                 720

Val Val Gln Glu Leu Ser Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Ala
            740                 745                 750

Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Ala
        755                 760                 765

Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp Ser
    770                 775                 780

Leu Lys Ile Leu Ala Ser Asn Ile Leu Lys Glu Asn Pro Thr Asp Asn
785                 790                 795                 800

Asn Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Lys Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asn Gln Leu Ser Ser
            820                 825                 830
```

```
Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser
        835                 840                 845

Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys Ser
    850                 855                 860

Asp Asn Val Pro Ser Ile Glu Val Val Gln Lys Arg Lys Ala Phe Trp
865                 870                 875                 880

Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn Asn
                885                 890                 895

Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val Gly
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Ile Leu Asp Ala Arg Tyr Asn Thr Glu Val Asn Glu Lys Asp
    930                 935                 940

Lys Lys Asn Arg Thr Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val
945                 950                 955                 960

Ser Asn Phe Arg Lys Glu Phe Arg Leu Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys
            980                 985                 990

Ala Ile Leu Lys Lys Tyr Pro Lys  Leu Glu Pro Glu Phe  Val Tyr Gly
        995                 1000                1005

Glu Tyr  Gln Lys Tyr Asp Leu  Ser Lys Asp Pro Lys  Glu Val Glu
    1010                1015                1020

Lys Ala  Thr Glu Lys Tyr Phe  Phe Tyr Ser Asn Leu  Leu Asn Phe
    1025                1030                1035
```

```
Phe Lys  Glu Glu Val His Tyr  Ala Asp Gly Thr Ile  Val Lys Arg
    1040                1045                1050

Glu Asn  Ile Glu Tyr Ser Lys  Asp Thr Gly Glu Ile  Ala Trp Asn
    1055                1060                1065

Lys Glu  Lys Asp Phe Ala Ile  Ile Lys Lys Val Leu  Ser Leu Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Arg Glu Val Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Pro  Lys Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Leu Leu Asp Thr Thr  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Val Ile  Ala Tyr Ser Ile Leu  Leu Ile Ala
    1130                1135                1140

Asp Ile  Glu Lys Gly Lys Ala  Lys Lys Leu Lys Thr  Val Lys Thr
    1145                1150                1155

Leu Val  Gly Ile Thr Ile Met  Glu Lys Ala Ala Phe  Glu Glu Asn
    1160                1165                1170

Pro Ile  Thr Phe Leu Glu Asn  Lys Gly Tyr His Asn  Val Arg Lys
    1175                1180                1185

Glu Asn  Ile Leu Cys Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Lys Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Ile Val Leu Pro  Val Tyr Leu Thr Thr  Leu Leu Tyr
    1220                1225                1230
```

```
His Ser  Lys Asn Val His Lys  Leu Asp Glu Pro Gly  His Leu Glu
    1235                 1240                 1245


Tyr Ile  Gln Lys His Arg Asn  Glu Phe Lys Asp Leu  Leu Asn Leu
    1250                 1255                 1260


Val Ser  Glu Phe Ser Gln Lys  Tyr Val Leu Ala Asp  Ala Asn Leu
    1265                 1270                 1275


Glu Lys  Ile Lys Ser Leu Tyr  Ala Asp Asn Glu Gln  Ala Asp Ile
    1280                 1285                 1290


Glu Ile  Leu Ala Asn Ser Phe  Ile Asn Leu Leu Thr  Phe Thr Ala
    1295                 1300                 1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Phe Phe Gly Lys  Asp Ile Asp
    1310                 1315                 1320


Arg Lys  Arg Tyr Thr Thr Val  Ser Glu Ile Leu Asn  Ala Thr Leu
    1325                 1330                 1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Trp  Ile Asp Leu
    1340                 1345                 1350


Ser Lys  Leu Gly Glu Asp
    1355


<210>  221
<211>  1345
<212>  PRT
<213>  Streptococcus mutans

<400>  221

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30
```

```
Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Glu Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240
```

```
Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Gly Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
        435                 440                 445
```

```
Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655
```

```
Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860
```

```
Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880


Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895


Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910


Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925


Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940


Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960


Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975


Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990


Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005


Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020


Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035


Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050


Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065
```

```
Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260
```

```
Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Asn  Lys Leu Gly Gly Asp
    1340                1345
```

<210> 222
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 222

```
Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Glu Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
```

```
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
```

290 295 300

Ile Leu Thr Val Thr Asp Val Gly Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
325 330 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser

```
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Ile Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
```

705 710 715 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
740 745 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
755 760 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
770 775 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785 790 795 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
820 825 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
835 840 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
850 855 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865 870 875 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
885 890 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
900 905 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr

915 920 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
930 935 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile

1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg
1145 1150 1155

Asp Pro Val Ala Phe Leu Glu Arg Lys Gly Tyr Arg Asn Val Gln
1160 1165 1170

Glu Glu Asn Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Lys Leu
1175 1180 1185

Glu Asn Gly Arg Lys Arg Leu Leu Ala Ser Ala Arg Glu Leu Gln
1190 1195 1200

Lys Gly Asn Glu Ile Val Leu Pro Asn His Leu Gly Thr Leu Leu
1205 1210 1215

Tyr His Ala Lys Asn Ile His Lys Val Asp Glu Pro Lys His Leu
1220 1225 1230

Asp Tyr Val Asp Lys His Lys Asp Glu Phe Lys Glu Leu Leu Asp
1235 1240 1245

Val Val Ser Asn Phe Ser Lys Lys Tyr Thr Leu Ala Glu Gly Asn
1250 1255 1260

Leu Glu Lys Ile Lys Glu Leu Tyr Ala Gln Asn Asn Gly Glu Asp
1265 1270 1275

Leu Lys Glu Leu Ala Ser Ser Phe Ile Asn Leu Leu Thr Phe Thr
1280 1285 1290

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr

1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1325 1330 1335

Leu Asn Lys Leu Gly Gly Asp
1340 1345

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<213> Streptococcus mutans

<400> 223

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys Asn
100 105 110

Phe Asp Ser Tyr Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala Tyr
115 120 125

His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
130 135 140

```
Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Lys Leu Phe Ala Asp Phe Val Gly Val Tyr
            180                 185                 190

Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Ser Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu Lys
    210                 215                 220

Leu Ile Asn Asn Tyr Pro Lys Glu Lys Lys Asn Thr Leu Phe Arg Asn
225                 230                 235                 240

Leu Val Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Ala Glu His His Glu Asp Leu Glu Lys Leu Lys
                325                 330                 335

Glu Phe Ile Lys Ala Asn Lys Pro Glu Leu Tyr His Asp Ile Phe Lys
            340                 345                 350
```

```
Asp Glu Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile Ala
    370                 375                 380

Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560
```

```
Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765
```

```
Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Gly Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975
```

```
Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu Tyr Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asp Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170
```

```
Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
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<212> PRT
<213> Streptococcus mutans

<400> 224

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190
```

```
Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400
```

```
Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605
```

```
Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815
```

```
Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020
```

```
Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215
```

```
Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Asn  Lys Leu Gly Gly Asp
    1340                 1345


<210>  225
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<212>  PRT
<213>  Streptococcus mutans

<400>  225

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30
```

```
Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240
```

```
Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445
```

```
Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655
```

```
Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Gln Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860
```

```
Gly Lys Ser Asp Asp Val Pro Ser Glu Asp Val Val Arg Lys Met Lys
865                 870                 875                 880


Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895


Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910


Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925


Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
    930                 935                 940


Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960


Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975


Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990


Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005


Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020


Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035


Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050


Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065
```

```
Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260
```

```
Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

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<212> PRT
<213> Streptococcus mutans

<400> 226

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
```

```
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
```

```
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
```

```
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
```

```
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
```

915 920 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
930 935 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile

1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg
1145 1150 1155

Asp Pro Val Ala Phe Leu Glu Arg Lys Gly Tyr Arg Asn Val Gln
1160 1165 1170

Glu Glu Asn Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Lys Leu
1175 1180 1185

Glu Asn Gly Arg Lys Arg Leu Leu Ala Ser Ala Arg Glu Leu Gln
1190 1195 1200

Lys Gly Asn Glu Ile Val Leu Pro Asn His Leu Gly Thr Leu Leu
1205 1210 1215

Tyr His Ala Lys Asn Ile His Lys Val Asp Glu Pro Lys His Leu
1220 1225 1230

Asp Tyr Val Asp Lys His Lys Asp Glu Phe Lys Glu Leu Leu Asp
1235 1240 1245

Val Val Ser Asn Phe Ser Lys Lys Tyr Thr Leu Ala Glu Gly Asn
1250 1255 1260

Leu Glu Lys Ile Lys Glu Leu Tyr Ala Gln Asn Asn Gly Glu Asp
1265 1270 1275

Leu Lys Glu Leu Ala Ser Ser Phe Ile Asn Leu Leu Thr Phe Thr
1280 1285 1290

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr

1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1325 1330 1335

Leu Ser Lys Leu Gly Gly Asp
1340 1345

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<400> 227

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
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Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

```
Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350
```

```
Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560
```

```
Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765
```

```
Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Pro Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975
```

```
Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Glu  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170
```

```
Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

<210> 228
<211> 1345

<212> PRT
<213> Streptococcus mutans

<400> 228

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190
```

```
Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400
```

```
Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605
```

```
Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Lys Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815
```

```
Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020
```

```
Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215
```

```
Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345


<210>  229
<211>  1345
<212>  PRT
<213>  Streptococcus mutans

<400>  229

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30
```

```
Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240
```

```
Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Thr Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445
```

```
Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655
```

```
Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Leu Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860
```

```
Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880


Pro Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895


Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910


Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925


Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940


Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960


Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975


Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990


Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005


Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Glu  Glu Asn Lys
    1010                1015                1020


Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035


Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050


Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065
```

```
Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260
```

```
Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ser Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

<210> 230
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 230

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
```

```
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
```

290 295 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
325 330 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser

```
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
```

705 710 715 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
740 745 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
755 760 765

Phe Thr Lys Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
770 775 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785 790 795 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
820 825 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
835 840 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
850 855 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865 870 875 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
885 890 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
900 905 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr

915 920 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
930 935 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Arg Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile

1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg
1145 1150 1155

Asp Pro Val Ala Phe Leu Glu Arg Lys Gly Tyr Arg Asn Val Gln
1160 1165 1170

Glu Glu Asn Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Lys Leu
1175 1180 1185

Glu Asn Gly Arg Lys Arg Leu Leu Ala Ser Ala Arg Glu Leu Gln
1190 1195 1200

Lys Gly Asn Glu Ile Val Leu Pro Asn His Leu Gly Thr Leu Leu
1205 1210 1215

Tyr His Ala Lys Asn Ile His Lys Val Asp Glu Pro Lys His Leu
1220 1225 1230

Asp Tyr Val Asp Lys His Lys Asp Glu Phe Lys Glu Leu Leu Asp
1235 1240 1245

Val Val Ser Asn Phe Ser Lys Lys Tyr Thr Leu Ala Glu Gly Asn
1250 1255 1260

Leu Glu Lys Ile Lys Glu Leu Tyr Ala Gln Asn Asn Gly Glu Asp
1265 1270 1275

Leu Lys Glu Leu Ala Ser Ser Phe Ile Asn Leu Leu Thr Phe Thr
1280 1285 1290

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr

1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1325 1330 1335

Leu Ser Lys Leu Gly Gly Asp
1340 1345

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<213> Streptococcus mutans

<400> 231

Met Lys Lys Ser Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys Asn
100 105 110

Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala Tyr
115 120 125

His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
130 135 140

```
Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Lys Leu Phe Ala Asp Phe Val Gly Val Tyr
            180                 185                 190

Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Ser Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu Lys
    210                 215                 220

Leu Ile Asn Asn Tyr Pro Lys Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Ala Glu His His Glu Asp Leu Glu Lys Leu Lys
                325                 330                 335

Glu Phe Ile Lys Ala Asn Lys Pro Glu Leu Tyr His Asp Ile Phe Lys
            340                 345                 350
```

```
Asp Glu Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile Ala
    370                 375                 380

Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asn Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr His Ser Asp Glu Ala Val Met Pro Trp Asn Phe Asp Gln
465                 470                 475                 480

Val Ile Asp Lys Glu Ser Ser Ala Gln Ala Phe Ile Glu His Met Thr
                485                 490                 495

Asn Asn Asp Leu Tyr Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Pro Leu Tyr Glu Lys Tyr Thr Val Tyr Asn Glu Leu Thr Lys Ile Lys
        515                 520                 525

Tyr Val Thr Glu Ile Gly Glu Ala Lys Phe Phe Asp Ala Asn Leu Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Leu Phe Lys His Glu Arg Lys Val Thr Lys
545                 550                 555                 560
```

```
Lys Lys Leu Arg Thr Phe Leu Asp Lys Asn Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Ile Gln Gly Leu Asp Lys Glu Thr Glu Thr Phe Asn Ala Ser
            580                 585                 590

Tyr Ala Thr Tyr Gln Asp Leu Leu Lys Val Ile Lys Asp Lys Val Phe
        595                 600                 605

Met Asp Asn Pro Glu Asn Ala Glu Ile Leu Glu Asn Ile Val Leu Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Lys
625                 630                 635                 640

Tyr Ala Asp Val Phe Asp Lys Lys Val Ile Asp Gln Leu Ala Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Leu Asn Gly Ile
            660                 665                 670

Arg Asp Lys Gln Ser Cys Lys Thr Ile Met Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Ala Gln Ser Asn Arg Asn Leu Met Gln Leu Ile Thr Asp Asp Asn Leu
    690                 695                 700

Thr Phe Lys Asp Asp Ile Val Lys Ala Gln Tyr Val Asp Asn Ser Asp
705                 710                 715                 720

Asp Leu His Gln Val Val Gln Ser Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Lys Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765
```

```
Gln Thr Thr Ala Lys Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Arg
    770                 775                 780

Leu Lys Glu Ala Ile Lys Asp Leu Asn His Lys Ile Leu Lys Glu His
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Asn Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ser Leu Asp Ile Asn
            820                 825                 830

Arg Leu Ser Asp Tyr Asp Ile Asp His Val Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Ala Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Glu Asp Val Val Asn Arg Met
865                 870                 875                 880

Arg Pro Phe Trp Asn Lys Leu Leu Ser Ser Gly Leu Ile Ser Gln Arg
                885                 890                 895

Lys Tyr Asn Asn Leu Thr Lys Lys Glu Leu Thr Pro Asp Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Arg Met Leu Asp Glu Arg Phe Asn Lys Glu Phe Asp Asp Asn
    930                 935                 940

Asn Lys Arg Ile Arg Arg Val Lys Ile Val Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Ser Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975
```

```
Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Val
           980                 985                 990

Lys Ala Leu Leu Val Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
       995                 1000                1005

Gly Glu  Tyr Pro Lys Tyr Asn  Ser Tyr Arg Glu Arg  Lys Ala Thr
    1010                1015                1020

Gln Lys  Met Phe Phe Tyr Ser  Asn Ile Met Asn Met  Phe Lys Ser
    1025                1030                1035

Lys Val  Lys Leu Ala Asp Asp  Gln Ile Val Glu Arg  Pro Met Ile
    1040                1045                1050

Glu Val  Asn Asp Glu Thr Gly  Glu Ile Ala Trp Asp  Lys Thr Lys
    1055                1060                1065

His Ile  Thr Thr Val Lys Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1070                1075                1080

Ile Val  Lys Lys Val Glu Glu  Gln Thr Gly Gly Leu  Phe Asp Pro
    1085                1090                1095

Lys Ser  Pro Leu Glu Lys Leu  Val Pro Leu Lys Lys  Ala Leu Asn
    1100                1105                1110

Pro Glu  Lys Tyr Gly Gly Tyr  Gln Lys Pro Thr Thr  Ala Tyr Pro
    1115                1120                1125

Ile Leu  Leu Ile Val Asp Thr  Lys Gln Leu Ile Pro  Ile Ser Val
    1130                1135                1140

Met Asp  Lys Lys Arg Phe Glu  Gln Asn Pro Val Lys  Phe Leu Lys
    1145                1150                1155

Asp Lys  Gly Tyr Gln Gln Ile  Glu Lys Asn Asn Phe  Val Lys Leu
    1160                1165                1170
```

```
Pro Lys  Tyr Thr Leu Val Asp  Ile Gly Asn Gly Ile  Lys Arg Leu
    1175                1180                1185

Trp Ala  Ser Ser Lys Glu Val  His Lys Gly Asn Gln  Leu Val Val
    1190                1195                1200

Ser Lys  Lys Ser Gln Asp Leu  Leu Tyr His Ala His  His Leu Asp
    1205                1210                1215

Asn Asp  Tyr Ser Asn Glu Tyr  Val Lys Asn His Tyr  Gln Gln Phe
    1220                1225                1230

Asp Ile  Leu Phe Asn Glu Ile  Thr Ser Phe Ser Lys  Lys Cys Lys
    1235                1240                1245

Leu Gly  Lys Glu His Ile Gln  Lys Ile Glu Glu Ala  Tyr Ser Lys
    1250                1255                1260

Glu Arg  Asp Ser Ala Ser Ile  Glu Glu Leu Ala Asp  Gly Phe Ile
    1265                1270                1275

Lys Leu  Leu Gly Phe Thr Gln  Leu Gly Ala Thr Ser  Pro Phe Ser
    1280                1285                1290

Phe Leu  Gly Ile Lys Leu Asn  Gln Lys Gln Tyr Thr  Gly Lys Lys
    1295                1300                1305

Asp Tyr  Leu Glu Ala Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1310                1315                1320

Tyr Glu  Thr Arg Ile Asp Leu  Asn Lys Leu Gly Gly  Asp
    1325                1330                1335
```

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<212> PRT
<213> Streptococcus mutans

<400> 232

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205
```

```
Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415
```

```
Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620
```

```
Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu His Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830
```

```
Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035
```

```
Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230
```

```
Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345


<210>  233
<211>  1345
<212>  PRT
<213>  Streptococcus mutans

<400>  233

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Glu Lys Asn Leu Leu
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Phe Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255
```

```
Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ser Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460
```

```
Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480


Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495


Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510


Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525


Tyr Lys Thr Glu Gln Gly Glu Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540


Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560


Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575


Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590


Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605


Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620


Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640


Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655


Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670
```

```
Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880
```

```
Pro Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
               885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
               965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Glu  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080
```

```
Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275
```

```
Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

<210> 234
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 234

```
Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys Asn
```

100 105 110

Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala Tyr
115 120 125

His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
130 135 140

Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Ala
165 170 175

Glu Asn Thr Asp Val Gln Lys Leu Phe Ala Asp Phe Val Gly Val Tyr
180 185 190

Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp Ala
195 200 205

Ser Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu Lys
210 215 220

Leu Ile Asn Asn Tyr Pro Lys Glu Lys Lys Asn Thr Leu Phe Gly Asn
225 230 235 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
245 250 255

Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
260 265 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
275 280 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
290 295 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser

305 310 315 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
325 330 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys

515 520 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
530 535 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545 550 555 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
565 570 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
580 585 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
595 600 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
610 615 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625 630 635 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
660 665 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
690 695 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705 710 715 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys

```
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Gly Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
```

```
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu Tyr Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asp Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
```

1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg
1145 1150 1155

Asp Pro Val Ala Phe Leu Glu Arg Lys Gly Tyr Arg Asn Val Gln
1160 1165 1170

Glu Glu Asn Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Lys Leu
1175 1180 1185

Glu Asn Gly Arg Lys Arg Leu Leu Ala Ser Ala Arg Glu Leu Gln
1190 1195 1200

Lys Gly Asn Glu Ile Val Leu Pro Asn His Leu Gly Thr Leu Leu
1205 1210 1215

Tyr His Ala Lys Asn Ile His Lys Val Asp Glu Pro Lys His Leu
1220 1225 1230

Asp Tyr Val Asp Lys His Lys Asp Glu Phe Lys Glu Leu Leu Asp
1235 1240 1245

Val Val Ser Asn Phe Ser Lys Lys Tyr Thr Leu Ala Glu Gly Asn
1250 1255 1260

Leu Glu Lys Ile Lys Glu Leu Tyr Ala Gln Asn Asn Gly Glu Asp
1265 1270 1275

Leu Lys Glu Leu Ala Ser Ser Phe Ile Asn Leu Leu Thr Phe Thr
1280 1285 1290

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr
1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp

1325 1330 1335

Leu Ser Lys Leu Gly Gly Asp
1340 1345

<210> 235
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 235

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

```
Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365
```

```
Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575
```

```
Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Lys Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780
```

```
Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990
```

```
Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005


Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020


Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035


Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050


Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065


Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080


Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095


Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110


Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125


Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140


Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155


Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170


Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185
```

```
Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                 1195                 1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                 1210                 1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335

Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345
```

<210> 236
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 236

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205
```

```
Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415
```

```
Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620
```

```
Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830
```

```
Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035
```

```
Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230
```

```
Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ser Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345


<210>  237
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<212>  PRT
<213>  Streptococcus mutans

<400>  237

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys Asn
            100                 105                 110

Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala Tyr
        115                 120                 125

His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Lys Leu Phe Ala Asp Phe Val Gly Val Tyr
            180                 185                 190

Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Ser Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu Lys
    210                 215                 220

Leu Ile Asn Asn Tyr Pro Lys Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255
```

```
Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Ala Glu His His Glu Asp Leu Glu Lys Leu Lys
                325                 330                 335

Glu Phe Ile Lys Ala Asn Lys Pro Glu Leu Tyr His Asp Ile Phe Lys
            340                 345                 350

Asp Glu Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile Thr
    370                 375                 380

Gly Ser Asp Tyr Phe Leu Asp Gln Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asn Ser Arg Phe Ala Trp
    450                 455                 460
```

```
Ala Glu Tyr His Ser Asp Glu Ala Val Thr Pro Trp Asn Phe Asp Gln
465                 470                 475                 480


Val Ile Asp Lys Glu Ser Ser Ala Gln Ala Phe Ile Glu His Met Thr
                485                 490                 495


Asn Asn Asp Leu Tyr Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510


Pro Leu Tyr Glu Lys Tyr Thr Val Tyr Asn Glu Leu Thr Lys Ile Lys
        515                 520                 525


Tyr Val Thr Glu Ile Gly Glu Ala Lys Phe Phe Asp Ala Asn Leu Lys
    530                 535                 540


Gln Glu Ile Phe Asp Gly Leu Phe Lys His Glu Arg Lys Val Thr Lys
545                 550                 555                 560


Lys Lys Leu Arg Thr Phe Leu Asp Lys Asn Phe Asp Glu Phe Arg Ile
                565                 570                 575


Val Asp Ile Gln Gly Leu Asp Lys Glu Thr Glu Thr Phe Asn Ala Ser
            580                 585                 590


Tyr Ala Thr Tyr Gln Asp Leu Leu Lys Val Ile Lys Asp Lys Val Phe
        595                 600                 605


Met Asp Asn Pro Glu Asn Ala Glu Ile Leu Glu Asn Ile Val Leu Thr
    610                 615                 620


Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Lys
625                 630                 635                 640


Tyr Ala Asp Val Phe Asp Lys Lys Val Ile Asp Gln Leu Ala Arg Arg
                645                 650                 655


His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Leu Asn Gly Ile
            660                 665                 670
```

```
Arg Asp Lys Gln Ser Cys Lys Thr Ile Met Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Ala Gln Ser Asn Arg Asn Leu Met Gln Leu Ile Thr Asp Asp Asn Leu
    690                 695                 700

Thr Phe Lys Asp Asp Ile Val Lys Ala Gln Tyr Val Asp Asn Ser Asp
705                 710                 715                 720

Asp Leu His Gln Val Val Gln Ser Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Lys Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Ala Lys Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Arg
    770                 775                 780

Leu Lys Glu Ala Ile Lys Asp Leu Asn His Lys Ile Leu Lys Glu His
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Asn Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ser Leu Asp Ile Asn
            820                 825                 830

Arg Leu Ser Asp Tyr Asp Ile Asp His Val Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Ala Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Glu Asp Val Val Asn Arg Met
865                 870                 875                 880
```

```
Arg Pro Phe Trp Asn Lys Leu Leu Ser Ser Gly Leu Ile Ser Gln Arg
                885                 890                 895

Lys Tyr Asn Asn Leu Thr Lys Lys Glu Leu Thr Leu Asp Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Arg Met Leu Asp Glu Arg Phe Asn Lys Glu Phe Asp Asp Asn
    930                 935                 940

Asn Lys Arg Ile Arg Arg Val Lys Ile Val Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Ser Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Val
            980                 985                 990

Lys Ala Leu Leu Val Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Tyr Asn  Ser Tyr Arg Glu Arg  Lys Ala Thr
    1010                1015                1020

Gln Lys  Met Phe Phe Tyr Ser  Asn Ile Met Asn Met  Phe Lys Ser
    1025                1030                1035

Lys Val  Lys Leu Ala Asp Asp  Gln Ile Val Glu Arg  Pro Met Ile
    1040                1045                1050

Glu Val  Asn Asp Glu Thr Gly  Glu Ile Ala Trp Asp  Lys Thr Lys
    1055                1060                1065

His Ile  Thr Thr Val Lys Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1070                1075                1080
```

```
Ile Val  Lys Lys Val Glu Glu  Gln Thr Gly Gly Leu  Phe Asp Pro
    1085                1090                1095

Lys Ser  Pro Leu Glu Lys Leu  Val Pro Leu Lys Lys  Ala Leu Asn
    1100                1105                1110

Pro Glu  Lys Tyr Gly Gly Tyr  Gln Lys Pro Thr Thr  Ala Tyr Pro
    1115                1120                1125

Ile Leu  Leu Ile Val Asp Thr  Lys Gln Leu Ile Pro  Ile Ser Val
    1130                1135                1140

Met Asp  Lys Lys Arg Phe Glu  Gln Asn Pro Val Lys  Phe Leu Lys
    1145                1150                1155

Asp Lys  Gly Tyr Gln Gln Ile  Glu Lys Asn Asn Phe  Val Lys Leu
    1160                1165                1170

Pro Lys  Tyr Thr Leu Val Asp  Ile Gly Asn Gly Ile  Lys Arg Leu
    1175                1180                1185

Trp Ala  Ser Ser Lys Glu Val  His Lys Gly Asn Gln  Leu Val Val
    1190                1195                1200

Ser Lys  Lys Ser Gln Asp Leu  Leu Tyr His Ala His  His Leu Asp
    1205                1210                1215

Asn Asp  Tyr Ser Asn Glu Tyr  Val Lys Asn His Tyr  Gln Gln Phe
    1220                1225                1230

Asp Ile  Leu Phe Asn Glu Ile  Thr Ser Phe Ser Lys  Lys Cys Lys
    1235                1240                1245

Leu Gly  Lys Glu His Ile Gln  Lys Ile Glu Glu Ala  Tyr Ser Lys
    1250                1255                1260

Glu Arg  Asp Phe Ala Ser Ile  Glu Glu Leu Ala Asp  Gly Phe Ile
    1265                1270                1275
```

Lys Leu Leu Gly Phe Thr Gln Leu Gly Ala Thr Ser Pro Phe Ser
1280 1285 1290

Phe Leu Gly Ile Lys Leu Asn Gln Lys Gln Tyr Thr Gly Lys Lys
1295 1300 1305

Asp Tyr Leu Glu Ala Thr Leu Ile His Gln Ser Ile Thr Gly Leu
1310 1315 1320

Tyr Glu Thr Arg Ile Asp Leu Ser Lys Leu Gly Gly Asp
1325 1330 1335

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Glu Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr

```
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Gly Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
```

325 330 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys

530 535 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545 550 555 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
565 570 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
580 585 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
595 600 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
610 615 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625 630 635 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
660 665 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
690 695 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705 710 715 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met

740 745 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
755 760 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
770 775 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785 790 795 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
820 825 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
835 840 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
850 855 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865 870 875 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
885 890 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
900 905 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
915 920 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
930 935 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser

945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Ile Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile
1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg

```
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Ser  Lys Leu Gly Gly Asp
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1340 1345

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<211> 1345
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<400> 239

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

```
Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380
```

```
Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590
```

```
Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800
```

```
Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005
```

```
Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200
```

```
Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                 1210                 1215


Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345


<210>  240
<211>  1345
<212>  PRT
<213>  Streptococcus mutans

<400>  240

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Ser Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220
```

```
Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430
```

```
Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640
```

```
Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu His Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845
```

```
Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Thr His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050
```

```
Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245
```

```
Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345


<210>  241
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<212>  PRT
<213>  Streptococcus mutans

<400>  241

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
            260                 265                 270
```

```
Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480
```

```
Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685
```

```
Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895
```

```
Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Tyr Lys Leu
    1085                1090                1095
```

```
Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290
```

```
Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

<210> 242
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 242

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110


Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
```

115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
180 185 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
195 200 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
210 215 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Cys Phe Ala Glu
225 230 235 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
245 250 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
260 265 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
275 280 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
290 295 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Thr Gln Leu Lys

325 330 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Ser Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys

530 535 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545 550 555 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
565 570 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
580 585 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
595 600 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
610 615 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625 630 635 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
660 665 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
690 695 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705 710 715 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met

```
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
```

945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile
1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg

1145 1150 1155

Asp Pro Val Ala Phe Leu Glu Arg Lys Gly Tyr Arg Asn Val Gln
1160 1165 1170

Glu Glu Asn Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Lys Leu
1175 1180 1185

Glu Asn Gly Arg Lys Arg Leu Leu Ala Ser Ala Arg Glu Leu Gln
1190 1195 1200

Lys Gly Asn Glu Ile Val Leu Pro Asn His Leu Gly Thr Leu Leu
1205 1210 1215

Tyr His Ala Lys Asn Ile His Lys Val Asp Glu Pro Lys His Leu
1220 1225 1230

Asp Tyr Val Asp Lys His Lys Asp Glu Phe Lys Glu Leu Leu Asp
1235 1240 1245

Val Val Ser Asn Phe Ser Lys Lys Tyr Thr Leu Ala Glu Gly Asn
1250 1255 1260

Leu Glu Lys Ile Lys Glu Leu Tyr Ala Gln Asn Asn Gly Glu Asp
1265 1270 1275

Leu Lys Glu Leu Ala Ser Ser Phe Ile Asn Leu Leu Thr Phe Thr
1280 1285 1290

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr
1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1325 1330 1335

Leu Ser Lys Leu Gly Gly Asp

1340 1345

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<212> PRT
<213> Streptococcus mutans

<400> 243

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

```
Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380
```

```
Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590
```

```
Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Leu Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800
```

```
Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Gly Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005
```

```
Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu Tyr Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Phe  Lys Glu Ser Ile Leu  Pro Lys Gly Asp Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200
```

```
Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                 1210                 1215


Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345


<210>  244
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<212>  PRT
<213>  Streptococcus mutans

<400>  244

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asn Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220
```

```
Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430
```

```
Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640
```

```
Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Lys Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845
```

```
Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050
```

```
Lys Lys  Asp Glu Tyr Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Ile Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245
```

```
Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345


<210>  245
<211>  1345
<212>  PRT
<213>  Streptococcus mutans

<400>  245

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Gly Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
            260                 265                 270
```

```
Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480
```

```
Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685
```

```
Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895
```

```
Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095
```

```
Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290
```

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr
1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1325 1330 1335

Leu Ser Lys Leu Gly Gly Asp
1340 1345

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Met Gln Val Asp Glu Ser
85 90 95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Glu Glu Asp Lys Arg
100 105 110

Gly Ser Arg Tyr Pro Ile Phe Gly Thr Leu Lys Glu Glu Lys Lys Tyr

115 120 125

His Lys Glu Phe Lys Thr Ile Tyr His Leu Arg Glu Lys Leu Ala Asn
130 135 140

Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ser Leu Ala His
145 150 155 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gln Leu Lys Ala
165 170 175

Glu Asn Thr Asn Val Gln Ala Leu Phe Lys Asp Phe Val Glu Val Tyr
180 185 190

Asp Lys Thr Val Glu Glu Ser His Leu Ser Glu Met Thr Val Asp Ala
195 200 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
210 215 220

Leu Val Glu Cys Tyr Pro Thr Glu Lys Lys Asn Thr Leu Phe Gly Asn
225 230 235 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
245 250 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
260 265 270

Glu Asp Leu Glu Gly Leu Leu Gly Glu Ile Gly Asp Glu Tyr Ala Asp
275 280 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
290 295 300

Ile Leu Ala Val Asp Asp Asn Thr Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Val Lys Arg Tyr Lys Glu His Lys Glu Glu Leu Ala Ala Phe Lys

325 330 335

Arg Phe Ile Lys Glu Lys Leu Pro Lys Lys Tyr Glu Glu Ile Phe Lys
340 345 350

Asp Asp Thr Lys Asn Gly Tyr Ala Gly Tyr Val Gly Ala Asp Ala Thr
355 360 365

Glu Glu Glu Phe Tyr Lys Tyr Val Lys Gly Ile Leu Asn Lys Val Glu
370 375 380

Gly Ala Asp Val Trp Leu Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
420 425 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Val Arg Lys Gly Ser Arg Phe Ala Trp
450 455 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465 470 475 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
485 490 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Ala Asn Met Lys

```
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Asn Lys Glu Phe Glu Glu Phe Arg Ile
                565                 570                 575

Val Asn Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ser Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asn Lys Ser Phe Leu
        595                 600                 605

Asp Asn Lys Glu Asn Glu Gln Ile Ile Glu Asp Ile Ile Gln Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asp Lys Gln Ser Asn Lys Thr Ile Leu Gly Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Tyr Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Met Asp Gly
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met
```

```
            740                 745                 750

Gly His Asn Pro Ala Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Ala Lys Gly Arg Arg Ser Ser Gln Lys Arg Tyr Lys Arg Leu
    770                 775                 780

Glu Glu Ala Ile Lys Asp Leu Asn His Lys Ile Leu Lys Glu His Pro
785                 790                 795                 800

Thr Asp Asn Gln Ala Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Glu Asp Pro Leu Asp Ile Asn Arg
            820                 825                 830

Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Arg Ser Asp Lys Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Glu Glu Val Val His Lys Met Lys
865                 870                 875                 880

Pro Phe Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
```

945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Gly Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile
1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg

```
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Glu  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Asn  Lys Leu Gly Gly Asp
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1340 1345

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<400> 247

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
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Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Asp Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

```
Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380
```

```
Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590
```

```
Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Lys Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800
```

```
Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005
```

```
Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200
```

```
Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                 1210                 1215


Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345


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<212>  PRT
<213>  Streptococcus mutans

<400>  248

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
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```
Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Lys Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220
```

```
Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Leu Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430
```

```
Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640
```

```
Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Leu Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845
```

```
Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050
```

```
Lys Lys  Asp Glu Tyr Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Ile Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245
```

```
Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345
```

<210> 249
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 249

```
Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
            260                 265                 270
```

```
Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480
```

```
Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685
```

```
Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Leu Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895
```

```
Phe Asp Asn Leu Thr Lys Gly Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys His Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu Tyr Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Phe  Lys Glu Ser Ile Leu  Pro Lys Gly Asp Ser  Asp Lys Leu
    1085                1090                1095
```

```
Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290
```

```
Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

<210> 250
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 250

```
Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110


Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
```

115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
180 185 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
195 200 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
210 215 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225 230 235 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
245 250 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
260 265 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
275 280 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
290 295 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys

325 330 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys

```
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Leu Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
```

740 745 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
755 760 765

Phe Thr Asn Gln Gly Gln Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
770 775 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785 790 795 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
820 825 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
835 840 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
850 855 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865 870 875 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
885 890 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
900 905 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
915 920 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
930 935 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser

945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu Tyr Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asp Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile
1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg

```
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asp His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Ser  Lys Leu Gly Gly Asp
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1340 1345

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<212> PRT
<213> Streptococcus mutans

<400> 251

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

```
Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380
```

```
Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590
```

```
Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800
```

```
Val Lys His Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005
```

```
Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200
```

```
Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                 1210                 1215


Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345


<210>  252
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<213>  Streptococcus mutans

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Asp Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220
```

```
Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430
```

```
Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625                 630                 635                 640
```

```
Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845
```

```
Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Tyr Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050
```

```
Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245
```

```
Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345
```

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<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 253

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270
```

```
Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480
```

```
Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685
```

```
Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895
```

```
Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095
```

```
Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290
```

```
Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

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<213> Streptococcus mutans

<400> 254

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Glu Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110


Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
```

```
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Ile Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Gly Thr Gln Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
```

```
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
```

530 535 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545 550 555 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
565 570 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
580 585 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
595 600 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
610 615 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625 630 635 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
660 665 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
690 695 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705 710 715 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met

740 745 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
755 760 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
770 775 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785 790 795 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
820 825 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
835 840 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
850 855 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865 870 875 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
885 890 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
900 905 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
915 920 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
930 935 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser

945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile
1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg

```
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Asn  Lys Leu Gly Gly Asp
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1340 1345

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

```
Arg Asn Asn Asp Val Gln Lys Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Leu Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380
```

```
Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Val Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590
```

```
Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Leu Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800
```

```
Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005
```

```
Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu Tyr Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Ile Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200
```

```
Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                 1210                 1215


Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345


<210>  256
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<212>  PRT
<213>  Streptococcus mutans

<400>  256

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Cys His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220
```

```
Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Thr Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Asn Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430
```

```
Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640
```

```
Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Leu Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845
```

```
Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Pro Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Glu  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050
```

```
Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245
```

```
Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ser Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                 1345
```

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<212> PRT
<213> Streptococcus mutans

<400> 257

```
Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Glu Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Val Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270
```

```
Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Gly Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480
```

```
Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685
```

```
Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895
```

```
Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095
```

```
Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290
```

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr
1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1325 1330 1335

Leu Asn Lys Leu Gly Gly Asp
1340 1345

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<213> Streptococcus mutans

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr

115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
180 185 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
195 200 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
210 215 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225 230 235 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
245 250 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Ile Tyr Glu
260 265 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
275 280 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
290 295 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys

325 330 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys

530 535 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545 550 555 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
565 570 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
580 585 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
595 600 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
610 615 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Lys Asn Tyr
625 630 635 640

Ser Asp Leu Leu Thr Lys Glu Gln Leu Lys Lys Leu Glu Arg Arg His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
660 665 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
690 695 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705 710 715 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Leu Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Asn Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met

740 745 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
755 760 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
770 775 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785 790 795 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
820 825 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
835 840 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
850 855 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865 870 875 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
885 890 895

Phe Asp Asn Leu Thr Lys Gly Glu Arg Gly Gly Leu Thr Asp Asp Asp
900 905 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
915 920 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
930 935 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser

945 950 955 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu Tyr Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Phe Lys Glu Ser Ile Leu Pro Lys Gly Asp Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile
1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg

```
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305

Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320

Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335

Leu Ser  Lys Leu Gly Gly Asp
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1340 1345

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<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 259

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Glu Lys Asn Leu Leu
35 40 45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
85 90 95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
100 105 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
115 120 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
130 135 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
165 170 175

```
Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Gly Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380
```

```
Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590
```

```
Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800
```

```
Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005
```

```
Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Ser Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200
```

```
Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                 1210                 1215


Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                 1225                 1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                 1240                 1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                 1255                 1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                 1270                 1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                 1285                 1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                 1300                 1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                 1315                 1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                 1330                 1335


Leu Asn  Lys Leu Gly Gly Asp
    1340                 1345


<210>  260
<211>  1336
<212>  PRT
<213>  Streptococcus mutans

<400>  260

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys Asn
            100                 105                 110

Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala Tyr
        115                 120                 125

His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Lys Leu Phe Ala Asp Phe Val Gly Val Tyr
            180                 185                 190

Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Ser Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu Lys
    210                 215                 220
```

```
Leu Ile Asn Asn Tyr Pro Lys Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Ala Glu His His Glu Asp Leu Glu Lys Leu Lys
                325                 330                 335

Glu Phe Ile Lys Ala Asn Lys Pro Glu Leu Tyr His Asp Ile Phe Lys
            340                 345                 350

Asp Glu Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile Thr
    370                 375                 380

Gly Ser Asp Tyr Phe Leu Asp Gln Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro Phe
            420                 425                 430
```

```
Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asn Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr His Ser Asp Glu Ala Val Thr Pro Trp Asn Phe Asp Gln
465                 470                 475                 480

Val Ile Asp Lys Glu Ser Ser Ala Gln Ala Phe Ile Glu His Met Thr
                485                 490                 495

Asn Asn Asp Leu Tyr Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Pro Leu Tyr Glu Lys Tyr Thr Val Tyr Asn Glu Leu Thr Lys Ile Lys
        515                 520                 525

Tyr Val Thr Glu Ile Gly Glu Ala Lys Phe Phe Asp Ala Asn Leu Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Leu Phe Lys His Glu Arg Lys Val Thr Lys
545                 550                 555                 560

Lys Lys Leu Arg Thr Phe Leu Asp Lys Asn Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Ile Gln Gly Leu Asp Lys Glu Thr Glu Thr Phe Asn Ala Ser
            580                 585                 590

Tyr Ala Thr Tyr Gln Asp Leu Leu Lys Val Ile Lys Asp Lys Val Phe
        595                 600                 605

Met Asp Asn Pro Glu Asn Ala Glu Ile Leu Glu Asn Ile Val Leu Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Lys
625                 630                 635                 640
```

```
Tyr Ala Asp Val Phe Asp Lys Lys Val Ile Asp Gln Leu Ala Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Leu Asn Gly Ile
            660                 665                 670

Arg Asp Lys Gln Ser Cys Lys Thr Ile Met Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Ala Gln Ser Asn Arg Asn Leu Met Gln Leu Ile Thr Asp Asp Asn Leu
    690                 695                 700

Thr Phe Lys Asp Asp Ile Val Lys Ala Gln Tyr Val Asp Asn Ser Asp
705                 710                 715                 720

Asp Leu His Gln Val Val Gln Ser Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Lys Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Ala Lys Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Arg
    770                 775                 780

Leu Lys Glu Ala Ile Lys Asp Leu Asn His Lys Ile Leu Lys Glu His
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Asn Arg Leu Phe Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ser Leu Asp Ile Asn
            820                 825                 830

Arg Leu Ser Asp Tyr Asp Ile Asp His Val Ile Pro Gln Ala Phe Ile
        835                 840                 845
```

```
Lys Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Ala Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Glu Asp Val Val Asn Arg Met
865                 870                 875                 880

Arg Pro Phe Trp Asn Lys Leu Leu Ser Ser Gly Leu Ile Ser Gln Arg
                885                 890                 895

Lys Tyr Asn Asn Leu Thr Lys Lys Glu Leu Thr Leu Asp Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Arg Met Leu Asp Glu Arg Phe Asn Lys Glu Phe Asp Asp Asn
    930                 935                 940

Asn Lys Arg Ile Arg Arg Val Lys Ile Val Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Ser Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Val
            980                 985                 990

Lys Ala Leu Leu Val Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Leu Lys Tyr Asn  Ser Tyr Arg Glu Arg  Lys Ala Thr
    1010                1015                1020

Gln Lys  Met Phe Phe Tyr Ser  Asn Ile Met Asn Met  Phe Lys Ser
    1025                1030                1035

Lys Val  Lys Leu Ala Asp Asp  Gln Ile Val Glu Arg  Pro Met Ile
    1040                1045                1050
```

```
Glu Val  Asn Asp Glu Thr Gly  Glu Ile Ala Trp Asp  Lys Thr Lys
    1055                1060                1065

His Ile  Thr Thr Val Lys Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1070                1075                1080

Ile Val  Lys Lys Val Glu Glu  Gln Thr Gly Gly Leu  Phe Asp Pro
    1085                1090                1095

Lys Ser  Pro Leu Glu Lys Leu  Val Pro Leu Lys Lys  Ala Leu Asn
    1100                1105                1110

Pro Glu  Lys Tyr Gly Gly Tyr  Gln Lys Pro Thr Thr  Ala Tyr Pro
    1115                1120                1125

Ile Leu  Leu Ile Val Asp Thr  Lys Gln Leu Ile Pro  Ile Ser Val
    1130                1135                1140

Met Asp  Lys Lys Arg Phe Glu  Gln Asn Pro Val Lys  Phe Leu Lys
    1145                1150                1155

Asp Lys  Gly Tyr Gln Gln Ile  Glu Lys Asn Asn Phe  Val Lys Leu
    1160                1165                1170

Pro Lys  Tyr Thr Leu Val Asp  Ile Gly Asn Gly Ile  Lys Arg Leu
    1175                1180                1185

Trp Ala  Ser Ser Lys Glu Val  His Lys Gly Asn Gln  Leu Val Val
    1190                1195                1200

Ser Lys  Lys Ser Gln Asp Leu  Leu Tyr His Ala His  His Leu Asp
    1205                1210                1215

Asn Asp  Tyr Ser Asn Glu Tyr  Val Lys Asn His Tyr  Gln Gln Phe
    1220                1225                1230

Asp Ile  Leu Phe Asn Glu Ile  Thr Ser Phe Ser Lys  Lys Cys Lys
    1235                1240                1245
```

```
Leu Gly  Lys Glu His Ile Gln  Lys Ile Glu Glu Ala  Tyr Ser Lys
    1250                1255                1260


Glu Arg  Asp Phe Ala Ser Ile  Glu Glu Leu Ala Asp  Gly Phe Ile
    1265                1270                1275


Lys Leu  Leu Gly Phe Thr Gln  Leu Gly Ala Thr Ser  Pro Phe Ser
    1280                1285                1290


Phe Leu  Gly Ile Lys Leu Asn  Gln Lys Gln Tyr Thr  Gly Lys Lys
    1295                1300                1305


Asp Tyr  Leu Glu Ala Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1310                1315                1320


Tyr Glu  Thr Arg Ile Asp Leu  Ser Lys Leu Gly Gly  Asp
    1325                1330                1335
```

<210> 261
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 261

```
Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80
```

```
Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285
```

```
Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Val Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495
```

```
Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Ala Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700
```

```
Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu His Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asn Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910
```

```
Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe His Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110
```

```
Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275

Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290

Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305
```

```
Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345
```

<210> 262
<211> 1345
<212> PRT
<213> Streptococcus mutans

<400> 262

```
Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110


Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125


His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
```

```
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Thr Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
```

340 345 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
370 375 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
420 425 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Ser Gly Lys Ser Asp Phe Ala Trp
450 455 460

Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465 470 475 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
530 535 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys

```
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
```

```
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
```

965 970 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
980 985 990

Ile Gly Lys Ala Leu Leu Gly Val Tyr Pro Gln Leu Glu Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro His Phe His Gly His Lys Glu Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Lys Asp Asp Val Arg Thr Asp Lys Asn Gly Glu Ile Ile Trp
1040 1045 1050

Lys Lys Asp Glu His Ile Ser Asn Ile Lys Lys Val Leu Ser Tyr
1055 1060 1065

Pro Gln Val Asn Ile Val Lys Lys Val Glu Glu Gln Thr Gly Gly
1070 1075 1080

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1085 1090 1095

Ile Pro Arg Lys Thr Lys Lys Phe Tyr Trp Asp Thr Lys Lys Tyr
1100 1105 1110

Gly Gly Phe Asp Ser Pro Ile Val Ala Tyr Ser Ile Leu Val Ile
1115 1120 1125

Ala Asp Ile Glu Lys Gly Lys Ser Lys Lys Leu Lys Thr Val Lys
1130 1135 1140

Ala Leu Val Gly Val Thr Ile Met Glu Lys Met Thr Phe Glu Arg
1145 1150 1155

Asp Pro Val Ala Phe Leu Glu Arg Lys Gly Tyr Arg Asn Val Gln

1160 1165 1170

Glu Glu Asn Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Lys Leu
1175 1180 1185

Glu Asn Gly Arg Lys Arg Leu Leu Ala Ser Ala Arg Glu Leu Gln
1190 1195 1200

Lys Gly Asn Glu Ile Val Leu Pro Asn His Leu Gly Thr Leu Leu
1205 1210 1215

Tyr His Ala Lys Asn Ile His Lys Val Asp Glu Pro Lys His Leu
1220 1225 1230

Asp Tyr Val Asp Lys His Lys Asp Glu Phe Lys Glu Leu Leu Asp
1235 1240 1245

Val Val Ser Asn Phe Ser Lys Lys Tyr Thr Leu Ala Glu Gly Asn
1250 1255 1260

Leu Glu Lys Ile Lys Glu Leu Tyr Ala Gln Asn Asn Gly Glu Asp
1265 1270 1275

Leu Lys Glu Leu Ala Ser Ser Phe Ile Asn Leu Leu Thr Phe Thr
1280 1285 1290

Ala Ile Gly Ala Pro Ala Thr Phe Lys Phe Phe Asp Lys Asn Ile
1295 1300 1305

Asp Arg Lys Arg Tyr Thr Ser Thr Thr Glu Ile Leu Asn Ala Thr
1310 1315 1320

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1325 1330 1335

Leu Ser Lys Leu Gly Gly Asp
1340 1345

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<212> PRT
<213> Streptococcus mutans

<400> 263

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Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Asn Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Glu Ser Phe Leu Thr Asp Asp Asp Lys Asn
            100                 105                 110

Phe Asp Ser His Pro Ile Phe Gly Asn Lys Ala Glu Glu Asp Ala Tyr
        115                 120                 125

His Gln Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ser Thr Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Ala
                165                 170                 175

Glu Asn Thr Asp Val Gln Lys Leu Phe Ala Asp Phe Val Gly Val Tyr
            180                 185                 190
```

```
Asp Arg Thr Phe Asp Asp Ser His Leu Ser Glu Ile Thr Val Asp Ala
        195                 200                 205

Ser Ser Ile Leu Thr Glu Lys Ile Ser Lys Ser Arg Arg Leu Glu Lys
    210                 215                 220

Leu Ile Asn Asn Tyr Pro Lys Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Lys Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Lys Arg Tyr Ala Glu His His Glu Asp Leu Glu Lys Leu Lys
                325                 330                 335

Glu Phe Ile Lys Ala Asn Lys Pro Glu Leu Tyr His Asp Ile Phe Lys
            340                 345                 350

Asp Glu Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Asn Thr Leu Ser Lys Ile Ala
    370                 375                 380

Gly Ser Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400
```

```
Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Gly Asp Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Asn Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr His Ser Asp Glu Ala Val Thr Pro Trp Asn Phe Asp Gln
465                 470                 475                 480

Val Ile Asp Lys Glu Ser Ser Ala Gln Ala Phe Ile Glu His Met Thr
                485                 490                 495

Asn Asn Asp Leu Tyr Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Pro Leu Tyr Glu Lys Tyr Thr Val Tyr Asn Glu Leu Thr Lys Ile Lys
        515                 520                 525

Tyr Val Thr Glu Ile Gly Glu Ala Lys Phe Phe Asp Ala Asn Leu Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Leu Phe Lys His Glu Arg Lys Val Thr Lys
545                 550                 555                 560

Lys Lys Leu Arg Thr Phe Leu Asp Lys Asn Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Ile Gln Gly Leu Asp Lys Glu Thr Glu Thr Phe Asn Ala Ser
            580                 585                 590

Tyr Ala Thr Tyr Gln Asp Leu Leu Lys Val Ile Lys Asp Lys Val Phe
        595                 600                 605
```

```
Met Asp Asn Pro Glu Asn Ala Glu Ile Leu Glu Asn Ile Val Leu Thr
    610                 615                 620

Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Lys
625                 630                 635                 640

Tyr Ala Asp Val Phe Asp Lys Lys Val Ile Asp Gln Leu Ala Arg Arg
                645                 650                 655

His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Leu Asn Gly Ile
            660                 665                 670

Arg Asp Lys Gln Ser Cys Lys Thr Ile Met Asp Tyr Leu Ile Asp Asp
        675                 680                 685

Ala Gln Ser Asn Arg Asn Leu Met Gln Leu Ile Thr Asp Asp Asn Leu
    690                 695                 700

Thr Phe Lys Asp Asp Ile Val Lys Ala Gln Tyr Val Asp Asn Ser Asp
705                 710                 715                 720

Asp Leu His Gln Val Val Gln Ser Leu Ala Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val
            740                 745                 750

Met Gly Lys Glu Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Ala Lys Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Arg
    770                 775                 780

Leu Lys Glu Ala Ile Lys Asp Leu Asn His Lys Ile Leu Lys Glu His
785                 790                 795                 800

Pro Thr Asp Asn Gln Ala Leu Gln Asn Asn Arg Leu Phe Leu Tyr Tyr
                805                 810                 815
```

```
Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Ser Leu Asp Ile Asn
            820                 825                 830

Arg Leu Ser Asp Tyr Asp Ile Asp His Val Ile Pro Gln Ala Phe Ile
        835                 840                 845

Lys Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Ala Asn
    850                 855                 860

Arg Gly Lys Ser Asp Asp Val Pro Ser Glu Asp Val Val Asn Arg Met
865                 870                 875                 880

Arg Pro Phe Trp Asn Lys Leu Leu Ser Ser Gly Leu Ile Ser Gln Arg
                885                 890                 895

Lys Tyr Asn Asn Leu Thr Lys Lys Glu Leu Thr Leu Asp Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Arg Met Leu Asp Glu Arg Phe Asn Lys Glu Phe Asp Asp Asn
    930                 935                 940

Asn Lys Arg Ile Arg Arg Val Lys Ile Val Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Ser Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Val
            980                 985                 990

Lys Ala Leu Leu Val Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Tyr Asn  Ser Tyr Arg Glu Arg  Lys Ala Thr
    1010                1015                1020
```

```
Gln Lys  Met Phe Phe Tyr Ser  Asn Ile Met Asn Met  Phe Lys Ser
    1025                1030                1035

Lys Val  Lys Leu Ala Asp Asp  Gln Ile Val Glu Arg  Pro Met Ile
    1040                1045                1050

Glu Val  Asn Asp Glu Thr Gly  Glu Ile Ala Trp Asp  Lys Thr Lys
    1055                1060                1065

His Ile  Thr Thr Val Lys Lys  Val Leu Ser Tyr Pro  Gln Val Asn
    1070                1075                1080

Ile Val  Lys Lys Val Glu Glu  Gln Thr Gly Gly Leu  Phe Asp Pro
    1085                1090                1095

Lys Ser  Pro Leu Glu Lys Leu  Val Pro Leu Lys Lys  Ala Leu Asn
    1100                1105                1110

Pro Glu  Lys Tyr Gly Gly Tyr  Gln Lys Pro Thr Thr  Ala Tyr Pro
    1115                1120                1125

Ile Leu  Leu Ile Val Asp Thr  Lys Gln Leu Ile Pro  Ile Ser Val
    1130                1135                1140

Met Asp  Lys Lys Arg Phe Glu  Gln Asn Pro Val Lys  Phe Leu Lys
    1145                1150                1155

Asp Lys  Gly Tyr Gln Gln Ile  Glu Lys Asn Asn Phe  Val Lys Leu
    1160                1165                1170

Pro Lys  Tyr Thr Leu Val Asp  Ile Gly Asn Gly Ile  Lys Arg Leu
    1175                1180                1185

Trp Ala  Ser Ser Lys Glu Val  His Lys Gly Asn Gln  Leu Val Val
    1190                1195                1200

Ser Lys  Lys Ser Gln Asp Leu  Leu Tyr His Ala His  His Leu Asp
    1205                1210                1215
```

```
Asn Asp  Tyr Ser Asn Glu Tyr  Val Lys Asn His Tyr  Gln Gln Phe
    1220                 1225                 1230


Asp Ile  Leu Phe Asn Glu Ile  Thr Ser Phe Ser Lys  Lys Cys Lys
    1235                 1240                 1245


Leu Gly  Lys Glu His Ile Gln  Lys Ile Glu Glu Ala  Tyr Ser Lys
    1250                 1255                 1260


Glu Arg  Asp Ser Ala Ser Ile  Glu Glu Leu Ala Asp  Gly Phe Ile
    1265                 1270                 1275


Lys Leu  Leu Gly Phe Thr Gln  Leu Gly Ala Thr Ser  Pro Phe Ser
    1280                 1285                 1290


Phe Leu  Gly Ile Lys Leu Asn  Gln Lys Gln Tyr Thr  Gly Lys Lys
    1295                 1300                 1305


Asp Tyr  Leu Glu Ala Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1310                 1315                 1320


Tyr Glu  Thr Arg Ile Asp Leu  Ser Lys Leu Gly Gly  Asp
    1325                 1330                 1335


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<213>  Streptococcus mutans

<400>  264

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

Tyr Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Val Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255
```

```
Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Thr Leu Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Ala Asp Asp Ser Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Ala Gln Leu Lys
                325                 330                 335

Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350

Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380

Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460
```

```
Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670
```

```
Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880
```

```
Pro Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
               885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
               965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Glu  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080
```

```
Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125

Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140

Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155

Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170

Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185

Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200

Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215

Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230

Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245

Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260

Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275
```

```
Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Asn Ala Thr
    1310                1315                1320


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1325                1330                1335


Leu Ser  Lys Leu Gly Gly Asp
    1340                1345


<210>  265
<211>  1345
<212>  PRT
<213>  Streptococcus mutans

<400>  265

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Ser His Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Asn Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Glu Glu Met Gly Lys Val Asp Asp Ser
                85                  90                  95
```

```
Phe Phe His Arg Leu Glu Asp Ser Phe Leu Val Thr Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Leu Glu Glu Glu Val Lys Tyr
        115                 120                 125

His Glu Asn Phe Pro Thr Ile Tyr His Leu Arg Gln Tyr Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Thr Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Phe Asp Thr
                165                 170                 175

Arg Asn Asn Asp Val Gln Arg Leu Phe Gln Glu Phe Leu Ala Val Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Asn Ser Ser Leu Gln Glu Gln Asn Val Gln Val
        195                 200                 205

Glu Glu Ile Leu Thr Asp Lys Ile Ser Lys Ser Ala Lys Lys Asp Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asn Glu Lys Ser Asn Gly Arg Phe Ala Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Glu Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Val Leu Leu Ala Gln Ile Gly Asp Asn Tyr Ala Glu
        275                 280                 285

Leu Phe Leu Ser Ala Lys Lys Leu Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300
```

```
Ile Leu Thr Val Thr Asp Val Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320


Met Ile Gln Arg Tyr Asn Glu His Gln Met Asp Leu Thr Gln Leu Lys
                325                 330                 335


Gln Phe Ile Arg Gln Lys Leu Ser Asp Lys Tyr Asn Glu Val Phe Ser
            340                 345                 350


Asp Val Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn
        355                 360                 365


Gln Glu Ala Phe Tyr Lys Tyr Leu Lys Gly Leu Leu Asn Lys Ile Glu
    370                 375                 380


Gly Ser Gly Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400


Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415


Gln Glu Met Arg Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430


Leu Ala Asp Asn Gln Asp Arg Ile Glu Lys Leu Leu Thr Phe Arg Ile
        435                 440                 445


Pro Tyr Tyr Val Gly Pro Leu Ala Ser Gly Lys Ser Asp Phe Ala Trp
    450                 455                 460


Leu Ser Arg Lys Ser Ala Asp Lys Ile Thr Pro Trp Asn Phe Asp Glu
465                 470                 475                 480


Ile Val Asp Lys Glu Ser Ser Ala Glu Ala Phe Ile Asn Arg Met Thr
                485                 490                 495


Asn Tyr Asp Leu Tyr Leu Pro Asn Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510
```

```
Leu Leu Tyr Glu Lys Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Lys Thr Glu Gln Gly Lys Thr Ala Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Met Asp Phe Leu Glu Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ala Ser
            580                 585                 590

Tyr Gly Thr Tyr His Asp Leu Cys Lys Ile Leu Asp Lys Asp Phe Leu
        595                 600                 605

Asp Asn Ser Lys Asn Glu Lys Ile Leu Glu Asp Ile Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Asn Tyr
625                 630                 635                 640

Ser Asp Leu Leu Thr Lys Glu Gln Val Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Glu Leu Ile His Gly Ile Arg
            660                 665                 670

Asn Lys Glu Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Asn Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asn
705                 710                 715                 720
```

```
Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Ile Met
            740                 745                 750

Gly His Gln Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Gly Leu
    770                 775                 780

Thr Asp Ser Ile Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro
785                 790                 795                 800

Val Glu Asn Ser Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Glu Glu Leu Asp Ile Asp Tyr
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Lys Asp Val Val Arg Lys Met Lys
865                 870                 875                 880

Ser Tyr Trp Ser Lys Leu Leu Ser Ala Lys Leu Ile Thr Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Asp Asp
            900                 905                 910

Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925
```

```
Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Thr Glu Thr Asp
    930                 935                 940

Glu Asn Asn Lys Lys Ile Arg Gln Val Lys Ile Val Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Ile Gly Lys Ala Leu Leu Gly Val  Tyr Pro Gln Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro His  Phe His Gly His Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Lys Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Lys  Asp Asp Val Arg Thr  Asp Lys Asn Gly Glu  Ile Ile Trp
    1040                1045                1050

Lys Lys  Asp Glu His Ile Ser  Asn Ile Lys Lys Val  Leu Ser Tyr
    1055                1060                1065

Pro Gln  Val Asn Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1070                1075                1080

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1085                1090                1095

Ile Pro  Arg Lys Thr Lys Lys  Phe Tyr Trp Asp Thr  Lys Lys Tyr
    1100                1105                1110

Gly Gly  Phe Asp Ser Pro Ile  Val Ala Tyr Ser Ile  Leu Val Ile
    1115                1120                1125
```

```
Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Lys Leu Lys  Thr Val Lys
    1130                1135                1140


Ala Leu  Val Gly Val Thr Ile  Met Glu Lys Met Thr  Phe Glu Arg
    1145                1150                1155


Asp Pro  Val Ala Phe Leu Glu  Arg Lys Gly Tyr Arg  Asn Val Gln
    1160                1165                1170


Glu Glu  Asn Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Leu
    1175                1180                1185


Glu Asn  Gly Arg Lys Arg Leu  Leu Ala Ser Ala Arg  Glu Leu Gln
    1190                1195                1200


Lys Gly  Asn Glu Ile Val Leu  Pro Asn His Leu Gly  Thr Leu Leu
    1205                1210                1215


Tyr His  Ala Lys Asn Ile His  Lys Val Asp Glu Pro  Lys His Leu
    1220                1225                1230


Asp Tyr  Val Asp Lys His Lys  Asp Glu Phe Lys Glu  Leu Leu Asp
    1235                1240                1245


Val Val  Ser Asn Phe Ser Lys  Lys Tyr Thr Leu Ala  Glu Gly Asn
    1250                1255                1260


Leu Glu  Lys Ile Lys Glu Leu  Tyr Ala Gln Asn Asn  Gly Glu Asp
    1265                1270                1275


Leu Lys  Glu Leu Ala Ser Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1280                1285                1290


Ala Ile  Gly Ala Pro Ala Thr  Phe Lys Phe Phe Asp  Lys Asn Ile
    1295                1300                1305


Asp Arg  Lys Arg Tyr Thr Ser  Thr Thr Glu Ile Leu  Lys Ala Thr
    1310                1315                1320
```

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
    1325   1330   1335

Leu Ser Lys Leu Gly Gly Asp
    1340   1345

<210> 266
<211> 1338
<212> PRT
<213> Streptococcus mutans

<400> 266

Met Asp Leu Ile Gly Thr Asn Ser Val Gly Trp Ala Val Val Thr Asp
1   5   10   15

Asp Tyr Lys Val Pro Ala Lys Lys Met Lys Val Leu Gly Asn Thr Asp
            20   25   30

Lys Ser His Ile Lys Lys Asn Leu Leu Gly Ala Leu Leu Phe Asp Ser
        35   40   45

Gly Asn Thr Ala Ala Asp Arg Arg Leu Lys Arg Thr Ala Arg Arg Arg
    50   55   60

Tyr Thr Arg Arg Arg Asn Arg Ile Leu Tyr Leu Gln Glu Ile Phe Ala
65   70   75   80

Glu Glu Met Ser Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Asp
                85   90   95

Ser Phe Leu Val Thr Glu Asp Lys Arg Gly Glu Arg His Pro Ile Phe
            100   105   110

Gly Asn Leu Glu Glu Glu Val Lys Tyr His Glu Asn Phe Pro Thr Ile
        115   120   125

Tyr His Leu Arg Gln Tyr Leu Ala Asp Asn Pro Glu Lys Val Asp Leu
    130   135   140

Arg Leu Val Tyr Leu Ala Leu Ala His Ile Ile Lys Phe Arg Gly His

145 150 155 160

Phe Leu Ile Glu Gly Lys Phe Asp Thr Arg Asn Asn Asp Val Gln Arg
165 170 175

Leu Phe Gln Glu Phe Leu Ala Val Tyr Asp Asn Thr Phe Glu Asn Ser
180 185 190

Ser Leu Gln Glu Gln Asn Val Gln Val Glu Glu Ile Leu Thr Asp Lys
195 200 205

Ile Ser Lys Ser Ala Lys Lys Asp Arg Val Leu Lys Leu Phe Pro Asn
210 215 220

Glu Lys Ser Asn Gly Arg Phe Ala Glu Phe Leu Lys Leu Ile Val Gly
225 230 235 240

Asn Gln Ala Asp Phe Lys Lys His Phe Glu Leu Glu Glu Lys Ala Pro
245 250 255

Leu Gln Phe Ser Lys Asp Thr Tyr Glu Glu Glu Leu Glu Val Leu Leu
260 265 270

Ala Gln Ile Gly Asp Asn Tyr Ala Glu Leu Phe Leu Ser Ala Lys Lys
275 280 285

Leu Tyr Asp Ser Ile Leu Leu Ser Gly Ile Leu Thr Val Thr Asp Val
290 295 300

Ser Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Gln Arg Tyr Asn Glu
305 310 315 320

His Gln Met Asp Leu Ala Gln Leu Lys Gln Phe Ile Arg Gln Lys Leu
325 330 335

Ser Asp Lys Tyr Asn Glu Val Phe Ser Asp Val Ser Lys Asp Gly Tyr
340 345 350

Ala Gly Tyr Ile Asp Gly Lys Thr Asn Gln Glu Ala Phe Tyr Lys Tyr

```
        355                 360                 365

Leu Lys Gly Leu Leu Asn Lys Ile Glu Gly Ser Gly Tyr Phe Leu Asp
    370                 375                 380

Lys Ile Glu Arg Glu Asp Phe Leu Arg Lys Gln Arg Thr Phe Asp Asn
385                 390                 395                 400

Gly Ser Ile Pro His Gln Ile His Leu Gln Glu Met Arg Ala Ile Ile
                405                 410                 415

Arg Arg Gln Ala Glu Phe Tyr Pro Phe Leu Ala Asp Asn Gln Asp Arg
            420                 425                 430

Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu
        435                 440                 445

Ala Arg Gly Lys Ser Asp Phe Ala Trp Leu Ser Arg Lys Ser Ala Asp
    450                 455                 460

Lys Ile Thr Pro Trp Asn Phe Asp Glu Ile Val Asp Lys Glu Ser Ser
465                 470                 475                 480

Ala Glu Ala Phe Ile Asn Arg Met Thr Asn Tyr Asp Leu Tyr Leu Pro
                485                 490                 495

Asn Gln Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu Lys Phe Thr
            500                 505                 510

Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Lys Thr Glu Gln Gly Lys
        515                 520                 525

Thr Ala Phe Phe Asp Ala Asn Met Lys Gln Glu Ile Phe Asp Gly Val
    530                 535                 540

Phe Lys Val Tyr Arg Lys Val Thr Lys Asp Lys Leu Met Asp Phe Leu
545                 550                 555                 560

Glu Lys Glu Phe Asp Glu Phe Arg Ile Val Asp Leu Thr Gly Leu Asp
```

565 570 575

Lys Glu Asn Lys Ala Phe Asn Ala Ser Tyr Gly Thr Tyr His Asp Leu
580 585 590

Arg Lys Ile Leu Asp Lys Asp Phe Leu Asp Asn Ser Lys Asn Glu Lys
595 600 605

Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu
610 615 620

Met Ile Arg Lys Arg Leu Glu Asn Tyr Ser Asp Leu Leu Thr Lys Glu
625 630 635 640

Gln Val Lys Lys Leu Glu Arg Arg His Tyr Thr Gly Trp Gly Arg Leu
645 650 655

Ser Ala Glu Leu Ile His Gly Ile Arg Asn Lys Glu Ser Arg Lys Thr
660 665 670

Ile Leu Asp Tyr Leu Ile Asp Asp Gly Asn Ser Asn Arg Asn Phe Met
675 680 685

Gln Leu Ile Asn Asp Asp Ala Leu Ser Phe Lys Glu Glu Ile Ala Lys
690 695 700

Ala Gln Val Ile Gly Glu Thr Asp Asn Leu Asn Gln Val Val Ser Asp
705 710 715 720

Ile Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln Ser Leu Lys
725 730 735

Ile Val Asp Glu Leu Val Lys Ile Met Gly His Gln Pro Glu Asn Ile
740 745 750

Val Val Glu Met Ala Arg Glu Asn Gln Phe Thr Asn Gln Gly Arg Arg
755 760 765

Asn Ser Gln Gln Arg Leu Lys Gly Leu Thr Asp Ser Ile Lys Glu Phe

```
    770                 775                 780

Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu His Ser Gln Leu Gln
785                 790                 795                 800

Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn Gly Arg Asp Met Tyr
                805                 810                 815

Thr Gly Glu Glu Leu Asp Ile Asp Tyr Leu Ser Gln Tyr Asp Ile Asp
            820                 825                 830

His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asn Ser Ile Asp Asn Arg
        835                 840                 845

Val Leu Thr Ser Ser Lys Glu Asn Arg Gly Lys Ser Asp Asp Val Pro
    850                 855                 860

Ser Lys Asn Val Val Arg Lys Met Lys Ser Tyr Trp Ser Lys Leu Leu
865                 870                 875                 880

Ser Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp Asn Leu Thr Lys Ala
                885                 890                 895

Glu Arg Gly Gly Leu Thr Asp Asp Asp Lys Ala Gly Phe Ile Lys Arg
            900                 905                 910

Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Arg Ile Leu
        915                 920                 925

Asp Glu Arg Phe His Thr Glu Thr Asp Glu Asn Asn Lys Lys Ile Arg
    930                 935                 940

Gln Val Lys Ile Val Thr Leu Lys Ser Asn Leu Val Ser Asn Phe Arg
945                 950                 955                 960

Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr His His
                965                 970                 975

Ala His Asp Ala Tyr Leu Asn Ala Val Ile Gly Lys Ala Leu Leu Gly
```

```
           980                 985                 990

Val Tyr Pro Gln Leu Glu Pro Glu  Phe Val Tyr Gly Asp  Tyr Pro His
        995                1000                1005

Phe His  Gly His Lys Glu Asn  Lys Ala Thr Ala Lys  Lys Phe Phe
    1010                1015                1020

Tyr Ser  Asn Ile Met Asn Phe  Phe Lys Lys Asp Asp  Val Arg Thr
    1025                1030                1035

Asp Lys  Asn Gly Glu Ile Ile  Trp Lys Lys Asp Glu  His Ile Ser
    1040                1045                1050

Asn Ile  Lys Lys Val Leu Ser  Tyr Pro Gln Val Asn  Ile Val Lys
    1055                1060                1065

Lys Val  Glu Glu Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1070                1075                1080

Pro Lys  Gly Asn Ser Asp Lys  Leu Ile Pro Arg Lys  Thr Lys Lys
    1085                1090                1095

Phe Tyr  Trp Asp Thr Lys Lys  Tyr Gly Gly Phe Asp  Ser Pro Ile
    1100                1105                1110

Val Ala  Tyr Ser Ile Leu Val  Ile Ala Asp Ile Glu  Lys Gly Lys
    1115                1120                1125

Ser Lys  Lys Leu Lys Thr Val  Lys Ala Leu Val Gly  Val Thr Ile
    1130                1135                1140

Met Glu  Lys Met Thr Phe Glu  Arg Asp Pro Val Ala  Phe Leu Glu
    1145                1150                1155

Arg Lys  Gly Tyr Arg Asn Val  Gln Glu Glu Asn Ile  Ile Lys Leu
    1160                1165                1170

Pro Lys  Tyr Ser Leu Phe Lys  Leu Glu Asn Gly Arg  Lys Arg Leu
```

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    1175                1180                1185

Leu Ala  Ser Ala Arg Glu Leu  Gln Lys Gly Asn Glu  Ile Val Leu
    1190                1195                1200

Pro Asn  His Leu Gly Thr Leu  Leu Tyr His Ala Lys  Asn Ile His
    1205                1210                1215

Lys Val  Asp Glu Pro Lys His  Leu Asp Tyr Val Asp  Lys His Lys
    1220                1225                1230

Asp Glu  Phe Lys Glu Leu Leu  Asp Val Val Ser Asn  Phe Ser Lys
    1235                1240                1245

Lys Tyr  Thr Leu Ala Glu Gly  Asn Leu Glu Lys Ile  Lys Glu Leu
    1250                1255                1260

Tyr Ala  Gln Asn Asn Gly Glu  Asp Leu Lys Glu Leu  Ala Ser Ser
    1265                1270                1275

Phe Ile  Asn Leu Leu Thr Phe  Thr Ala Ile Gly Ala  Pro Ala Thr
    1280                1285                1290

Phe Lys  Phe Phe Asp Lys Asn  Ile Asp Arg Lys Arg  Tyr Thr Ser
    1295                1300                1305

Thr Thr  Glu Ile Leu Asn Ala  Thr Leu Ile His Gln  Ser Ile Thr
    1310                1315                1320

Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser Lys Leu  Gly Gly Asp
    1325                1330                1335


<210>  267
<211>  1362
<212>  PRT
<213>  Streptococcus oralis

<400>  267

Glu Asn Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Arg Phe Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Ala Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Ser Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Ile Pro Glu Asp Lys Lys
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Ile Glu Glu Lys Glu Tyr
        115                 120                 125

His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Lys Glu Lys Thr Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Asp Thr Phe Asp Ile
                165                 170                 175

Lys Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr
            180                 185                 190

Asn Asn Thr Phe Glu Gly Asn Ser Leu Ser Gly Gln Asn Val Gln Val
        195                 200                 205

Glu Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg
    210                 215                 220
```

```
Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Asp Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Arg Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp
        275                 280                 285

Leu Phe Val Ala Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Glu Arg Tyr Glu Asn His Gln Lys Asp Leu Ala Thr Leu Lys
                325                 330                 335

Gln Phe Ile Lys Thr Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser
            340                 345                 350

Asp Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr
        355                 360                 365

Gln Glu Ser Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Leu Glu Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430
```

```
Leu Lys Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
    450                 455                 460

Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Ile Val Asp Lys Ala Ser Ser Ala Glu Ser Phe Ile Asn Lys Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Arg Gln
    530                 535                 540

Lys Lys Asp Ile Phe Tyr Thr Leu Phe Lys Ala Glu Asp Lys Arg Lys
545                 550                 555                 560

Val Thr Glu Lys Asp Ile Ile Gln Tyr Leu His Thr Val Asp Gly Tyr
                565                 570                 575

Asp Gly Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu
            580                 585                 590

Ser Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met
        595                 600                 605

Asp Asp Pro Asn Asn Glu Glu Ile Leu Glu Asn Ile Val His Thr Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr
625                 630                 635                 640
```

```
Asp Ser Leu Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Lys Leu Ser Ser Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asp Lys Gln Thr Gly Lys Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly
        675                 680                 685

Tyr Asn Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Glu Leu Ser
    690                 695                 700

Phe Lys Glu Ile Ile Lys Lys Ala Gln Val Val Gly Lys Thr Asp Asp
705                 710                 715                 720

Val Lys Gln Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Ile Lys Leu Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Glu Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Ala Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile
    770                 775                 780

Glu Asp Ser Leu Lys Ile Leu Ala Ser Lys Ile Leu Lys Glu His Pro
785                 790                 795                 800

Thr Asp Asn Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Lys Pro Leu Asp Ile Asn Gln
            820                 825                 830

Leu Ser Ser Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile Lys
        835                 840                 845
```

```
Asp Asp Ser Leu Asp Asn Arg Val Leu Thr Ser Leu Lys Asp Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asn Val Pro Ser Leu Glu Val Val Glu Lys Met Lys
865                 870                 875                 880

Thr Phe Trp Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Tyr Arg Lys
                885                 890                 895

Phe Asn Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp
            900                 905                 910

Lys Val Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Gln Ile Leu Asp Ala Arg Tyr Asn Thr Glu Val Asn
    930                 935                 940

Glu Lys Asp Lys Lys Asn Arg Thr Val Lys Ile Ile Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Arg Leu Tyr Lys Ile Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Val Ala Lys Ala Ile Leu Lys Lys  Tyr Pro Lys Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Gln Lys  Tyr Asp Leu Ser Lys  Asp Pro Lys
    1010                1015                1020

Glu Ile  Glu Lys Ala Thr Glu  Lys Tyr Phe Phe Tyr  Ser Asn Leu
    1025                1030                1035

Leu Asn  Phe Phe Lys Glu Glu  Val His Tyr Ala Asp  Gly Thr Ile
    1040                1045                1050
```

```
Val Lys  Arg Glu Asn Ile Glu  Tyr Ser Lys Asp Thr  Gly Glu Ile
    1055                1060                1065

Ala Trp  Asn Lys Glu Lys Asp  Phe Ala Thr Ile Lys  Lys Val Leu
    1070                1075                1080

Ser Leu  Pro Gln Val Asn Ile  Val Lys Lys Arg Glu  Val Gln Thr
    1085                1090                1095

Gly Gly  Phe Ser Lys Glu Ser  Ile Leu Pro Lys Gly  Asn Ser Asp
    1100                1105                1110

Lys Leu  Ile Pro Arg Lys Thr  Lys Asp Ile Leu Trp  Asp Thr Thr
    1115                1120                1125

Lys Tyr  Gly Gly Phe Asp Ser  Pro Val Ile Ala Tyr  Ser Ile Leu
    1130                1135                1140

Leu Ile  Ala Asp Ile Glu Lys  Gly Lys Ala Lys Arg  Leu Lys Thr
    1145                1150                1155

Val Lys  Thr Leu Val Gly Ile  Thr Ile Met Glu Lys  Ala Thr Phe
    1160                1165                1170

Glu Lys  Ser Pro Ile Ala Phe  Leu Glu Asn Lys Gly  Tyr His Asn
    1175                1180                1185

Val Arg  Lys Glu Asn Ile Leu  Cys Leu Pro Lys Tyr  Ser Leu Phe
    1190                1195                1200

Glu Leu  Lys Asn Gly Arg Arg  Arg Met Leu Ala Ser  Ala Lys Glu
    1205                1210                1215

Leu Gln  Lys Gly Asn Glu Ile  Val Leu Pro Val His  Leu Thr Thr
    1220                1225                1230

Leu Leu  Tyr His Ala Lys Asn  Ile His Arg Leu Asp  Glu Pro Glu
    1235                1240                1245
```

```
His Leu  Glu Tyr Ile Gln Lys  His Arg Asn Glu Phe  Lys Gly Leu
    1250                 1255                 1260


Leu Asn  Leu Val Ser Glu Phe  Ser Gln Lys Tyr Val  Leu Ala Asp
    1265                 1270                 1275


Ala Asn  Leu Glu Lys Ile Lys  Asn Leu Tyr Ala Asp  Asn Glu Gln
    1280                 1285                 1290


Ala Asp  Ile Glu Ile Leu Ala  Asn Ser Phe Ile Asn  Leu Leu Thr
    1295                 1300                 1305


Phe Thr  Ala Leu Gly Ala Pro  Ala Ala Phe Lys Phe  Phe Gly Lys
    1310                 1315                 1320


Asp Val  Asp Arg Lys Arg Tyr  Thr Thr Val Ser Glu  Ile Leu Asn
    1325                 1330                 1335


Ala Thr  Leu Ile His Gln Ser  Ile Thr Gly Leu Tyr  Glu Thr Arg
    1340                 1345                 1350


Ile Asp  Leu Ser Lys Leu Gly  Glu Asp
    1355                 1360


<210>  268
<211>  1360
<212>  PRT
<213>  Streptococcus oralis

<400>  268

Glu Asn Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Arg Phe Ile Lys Lys Asn Leu Ile
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Ala Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Ser Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Ile Pro Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Ala Glu Glu Lys Glu Tyr
        115                 120                 125

His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Lys Glu Lys Thr Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Asp Thr Phe Asp Ile
                165                 170                 175

Lys Asn Asn Asp Ile Gln Lys Ile Phe Ser Glu Phe Ile Ser Ile Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val
        195                 200                 205

Glu Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255
```

```
Asp Leu Gly Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp
        275                 280                 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Glu Arg Tyr Glu Asn His Gln Lys Asp Leu Ala Val Leu Lys
                325                 330                 335

Gln Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser
            340                 345                 350

Asp Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu
    370                 375                 380

Gly Thr Asp Tyr Phe Leu Glu Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Asp Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
    450                 455                 460
```

```
Leu Thr Arg Asn Ser Asp Glu Ala Ile Arg Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Ile Val Asp Lys Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540

Lys Lys Gln Ile Val Thr Gln Leu Phe Lys Glu Lys Arg Lys Val Thr
545                 550                 555                 560

Glu Lys Asp Ile Ile Gln Phe Leu His Asn Val Asp Gly Tyr Asp Gly
                565                 570                 575

Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asp
        595                 600                 605

Ser Lys Asn Glu Glu Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Ser
625                 630                 635                 640

Leu Phe Asp Glu Lys Val Ile Lys Ala Leu Ile Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asp Gly Ile Cys Asp Lys
            660                 665                 670
```

```
Gln Thr Gly Asn Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Lys Asn
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys
    690                 695                 700

Glu Ile Thr Gln Lys Ala Gln Val Val Gly Lys Thr Asp Asp Val Lys
705                 710                 715                 720

Gln Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His
            740                 745                 750

Thr Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp
    770                 775                 780

Ala Leu Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu His Pro Thr Asn
785                 790                 795                 800

Asn Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Thr Gly Lys Pro Leu Asp Ile Asn Gln Leu Ser
            820                 825                 830

Ser Tyr Asp Ile Asp His Ile Val Pro Gln Ala Phe Ile Lys Asp Asp
        835                 840                 845

Ser Leu Asp Asn Arg Val Leu Thr Ser Leu Lys Asp Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Ile Glu Val Val Gln Lys Arg Lys Ala Phe
865                 870                 875                 880
```

```
Trp Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ala Arg Phe Asn Lys Glu Val Asn Glu Lys
    930                 935                 940

Asp Lys Lys Asn Arg Thr Val Lys Ile Ile Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Asn Phe Arg Lys Glu Phe Arg Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala
            980                 985                 990

Lys Ala Ile Leu Lys Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Gln Lys Tyr Asp  Leu Ser Arg Asn Pro  Lys Glu Val
    1010                1015                1020

Glu Lys  Ala Thr Glu Lys Tyr  Phe Phe Tyr Ser Asn  Leu Leu Asn
    1025                1030                1035

Phe Phe  Lys Glu Glu Val His  Tyr Ala Asp Gly Thr  Ile Val Lys
    1040                1045                1050

Arg Glu  Asn Ile Glu Tyr Ser  Lys Asp Thr Gly Glu  Ile Ala Trp
    1055                1060                1065

Asn Lys  Glu Lys Asp Phe Ala  Thr Ile Lys Lys Val  Leu Ser Tyr
    1070                1075                1080
```

```
Pro Gln  Val Asn Ile Val Lys  Lys Arg Glu Val Gln  Thr Gly Gly
    1085                1090                1095

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1100                1105                1110

Ile Pro  Arg Lys Thr Lys Asp  Ile Leu Trp Glu Thr  Thr Lys Tyr
    1115                1120                1125

Gly Gly  Phe Asp Ser Pro Val  Ile Ala Tyr Ser Ile  Leu Leu Ile
    1130                1135                1140

Ala Asp  Ile Glu Lys Gly Lys  Ala Lys Lys Leu Lys  Thr Val Lys
    1145                1150                1155

Thr Leu  Val Gly Ile Thr Ile  Met Glu Lys Ala Ala  Phe Glu Glu
    1160                1165                1170

Asn Pro  Ile Thr Phe Leu Glu  Asn Lys Gly Tyr His  Asn Val Arg
    1175                1180                1185

Lys Glu  Asn Ile Leu Cys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu
    1190                1195                1200

Glu Asn  Gly Arg Arg Arg Leu  Leu Ala Ser Ala Lys  Glu Leu Gln
    1205                1210                1215

Lys Gly  Asn Glu Ile Val Leu  Pro Val Tyr Leu Thr  Thr Leu Leu
    1220                1225                1230

Tyr His  Ser Lys Asn Val His  Lys Leu Asp Glu Pro  Glu His Leu
    1235                1240                1245

Glu Tyr  Ile Gln Lys His Arg  Asn Glu Phe Lys Asp  Leu Leu Asn
    1250                1255                1260

Leu Val  Ser Glu Phe Ser Gln  Lys Tyr Val Leu Ala  Asp Ala Asn
    1265                1270                1275
```

```
Leu Glu  Lys Ile Gln Asn Leu  Tyr Ala Asp Asn Glu  Gln Ala Asp
    1280                1285                1290


Ile Glu  Ile Leu Ala Asn Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1295                1300                1305


Ala Leu  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Gly  Lys Asp Ile
    1310                1315                1320


Asp Arg  Lys Arg Tyr Thr Thr  Val Ser Glu Ile Leu  Asn Ala Thr
    1325                1330                1335


Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1340                1345                1350


Leu Ser  Lys Leu Gly Glu Asp
    1355                1360


<210>  269
<211>  1358
<212>  PRT
<213>  Streptococcus parasanguinis

<400>  269

Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                   10                  15


Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met Lys
            20                  25                  30


Val Leu Gly Asn Thr Asn Lys Glu Ser Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45


Ala Leu Leu Phe Asp Ala Gly Asn Thr Ala Ala Asp Arg Arg Leu Lys
    50                  55                  60


Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu Tyr
65                  70                  75                  80
```

```
Leu Gln Glu Ile Phe Ala Ala Glu Met Asn Lys Val Asp Glu Ser Phe
                85                  90                  95

Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Arg Gly
            100                 105                 110

Ser Lys Tyr Pro Ile Phe Gly Thr Leu Glu Glu Glu Lys Glu Tyr His
        115                 120                 125

Lys Gln Phe Pro Thr Ile Tyr Tyr Leu Arg Lys Ile Leu Ala Asp Ser
    130                 135                 140

Lys Glu Lys Val Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Ile
145                 150                 155                 160

Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Asp Ser Phe Asp Ile Lys
                165                 170                 175

Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Thr Ile Leu Tyr Asp
            180                 185                 190

Asn Thr Phe Glu Glu Ser Ser Leu Ser Lys Gly Asn Ala Gln Val Glu
        195                 200                 205

Glu Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Asp Arg Val
    210                 215                 220

Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu Phe
225                 230                 235                 240

Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe Asp
                245                 250                 255

Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Glu Glu
            260                 265                 270

Asp Leu Glu Ser Leu Leu Gly Gln Ile Gly Asp Val Tyr Ala Asp Leu
        275                 280                 285
```

```
Phe Val Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ala Gly Ile
    290                 295                 300

Leu Ser Val Lys Asp Pro Gly Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Glu Arg Tyr Asp Asn His Gln Asn Asp Leu Ser Ala Leu Lys Gln
                325                 330                 335

Phe Val Arg Arg Asn Leu Pro Glu Lys Tyr Ala Glu Val Phe Ser Asp
            340                 345                 350

Asp Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr Gln
        355                 360                 365

Glu Gly Phe Tyr Lys Tyr Ile Lys Asn Leu Ile Ser Lys Ile Glu Gly
    370                 375                 380

Ala Glu Tyr Phe Leu Glu Lys Ile Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gln
                405                 410                 415

Glu Met Asn Ala Ile Leu Arg His Gln Gly Glu Tyr Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Asn Lys Asp Lys Ile Glu Gln Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Asp Phe Ala Trp Leu
    450                 455                 460

Ser Arg Asn Ser Asp Glu Ala Ile Arg Pro Trp Asn Phe Glu Glu Met
465                 470                 475                 480

Val Asp Lys Ser Ser Ser Ala Glu Asp Phe Ile His Arg Met Thr Asn
                485                 490                 495
```

```
Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Ile Ala Glu Gly Met Lys Asp Tyr Gln Phe Leu Asp Ser Gly Gln Lys
    530                 535                 540

Lys Gln Ile Val Asn Gln Leu Phe Lys Glu Lys Arg Lys Val Thr Glu
545                 550                 555                 560

Lys Asp Ile Ile His Tyr Leu His Asn Val Asp Gly Tyr Asp Gly Ile
                565                 570                 575

Glu Leu Lys Gly Ile Glu Lys His Phe Asn Ser Ser Leu Ser Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asp Pro
        595                 600                 605

Lys Asn Glu Glu Ile Phe Glu Asn Ile Val His Thr Leu Thr Ile Phe
    610                 615                 620

Glu Asp Arg Val Met Ile Lys Gln Arg Leu Asn Gln Tyr Asp Ser Ile
625                 630                 635                 640

Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asp Lys Lys
            660                 665                 670

Thr Ser Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Tyr Ser Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys Glu
    690                 695                 700
```

```
Thr Ile Gln Lys Ala Gln Val Val Gly Glu Thr Asn Asp Val Lys Gln
705                 710                 715                 720

Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Ala
            740                 745                 750

Pro Glu Ser Val Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Asn
        755                 760                 765

Lys Gly Lys Ser Lys Ser Gln Gln Arg Leu Lys Thr Leu Ser Asp Ala
    770                 775                 780

Ile Ser Glu Leu Gly Asn Ile Leu Lys Glu His Pro Thr Asp Asn Ile
785                 790                 795                 800

Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asn Gln Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser Leu
        835                 840                 845

Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys Ser Asp
    850                 855                 860

Asn Val Pro Ser Leu Glu Ile Val Glu Lys Met Lys Gly Phe Trp Gln
865                 870                 875                 880

Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn Asn Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val Gly Phe
            900                 905                 910
```

```
Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala
        915                 920                 925


Gln Ile Leu Asp Asp Arg Phe Asn Ala Glu Val Asn Glu Lys Asn Gln
    930                 935                 940


Lys Leu Arg Ser Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser
945                 950                 955                 960


Asn Phe Arg Lys Glu Phe Gly Leu Tyr Lys Val Arg Glu Ile Asn Asp
                965                 970                 975


Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys Ala
            980                 985                 990


Ile Leu Lys Lys Tyr Pro Lys Leu  Glu Pro Glu Phe Val  Tyr Gly Asp
        995                 1000                1005


Tyr Gln  Lys Tyr Asp Leu Thr  Lys Asp Pro Lys Glu  Ile Glu Lys
    1010                1015                1020


Ala Thr  Glu Lys Tyr Phe Phe  Tyr Ser Asn Leu Leu  Asn Phe Phe
    1025                1030                1035


Lys Asp  Lys Val Tyr Tyr Ala  Asp Gly Thr Ile Ile  Gln Arg Gly
    1040                1045                1050


Asn Val  Glu Tyr Ser Lys Asp  Thr Gly Glu Ile Ala  Trp Asn Lys
    1055                1060                1065


Lys Arg  Asp Phe Ala Ile Val  Arg Lys Val Leu Ser  Tyr Pro Gln
    1070                1075                1080


Val Asn  Ile Val Lys Lys Thr  Glu Glu Gln Thr Gly  Gly Phe Ser
    1085                1090                1095


Lys Glu  Ser Ile Leu Pro Lys  Gly Asn Ser Asp Lys  Leu Ile Pro
    1100                1105                1110
```

```
Arg Lys  Thr Lys Asn Val Gln  Leu Asp Thr Thr Lys  Tyr Gly Gly
    1115                1120                1125

Phe Asp  Ser Pro Val Ile Ala  Tyr Ser Ile Leu Leu  Val Ala Asp
    1130                1135                1140

Val Glu  Lys Gly Lys Ser Lys  Lys Leu Lys Thr Val  Lys Ser Leu
    1145                1150                1155

Ile Gly  Ile Thr Ile Met Glu  Lys Val Lys Phe Glu  Ala Asn Pro
    1160                1165                1170

Val Ala  Phe Leu Glu Gly Lys  Gly Tyr Gln Asn Val  Val Glu Glu
    1175                1180                1185

Asn Ile  Ile Arg Leu Pro Lys  Tyr Ser Leu Phe Glu  Leu Glu Asn
    1190                1195                1200

Gly Arg  Arg Arg Met Leu Ala  Ser Ala Lys Glu Leu  Gln Lys Gly
    1205                1210                1215

Asn Glu  Met Val Leu Pro Ser  Tyr Leu Ile Ala Leu  Leu Tyr His
    1220                1225                1230

Ala Lys  Arg Ile Gln Lys Lys  Asp Glu Pro Glu His  Leu Glu Tyr
    1235                1240                1245

Ile Lys  Gln His His Ser Glu  Phe Asn Asp Leu Leu  Asn Phe Val
    1250                1255                1260

Ser Glu  Phe Ser Gln Lys Tyr  Val Leu Ala Glu Ser  Asn Leu Glu
    1265                1270                1275

Lys Ile  Lys Asn Leu Tyr Ile  Asp Asn Glu Gln Thr  Asn Met Glu
    1280                1285                1290

Glu Ile  Ala Asn Ser Phe Ile  Asn Leu Leu Thr Phe  Thr Ala Phe
    1295                1300                1305
```

```
Gly Ala  Pro Ala Val Phe Lys  Phe Phe Gly Lys Asp  Ile Glu Arg
    1310                1315                1320


Lys Arg  Tyr Ser Thr Val Thr  Glu Ile Leu Lys Ala  Thr Leu Ile
    1325                1330                1335


His Gln  Ser Leu Thr Gly Leu  Tyr Glu Thr Arg Ile  Asp Leu Ser
    1340                1345                1350


Lys Leu  Gly Glu Glu
    1355
```

<210> 270
<211> 1327
<212> PRT
<213> Streptococcus parauberis

<400> 270

```
Met Lys Val Leu Gly Asn Thr Asp Arg Gln Thr Val Lys Lys Asn Met
1               5                   10                  15


Ile Gly Thr Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Arg Arg
            20                  25                  30


Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Ile Asn Arg Ile
        35                  40                  45


Lys Tyr Leu Gln Ser Ile Phe Asp Asp Glu Met Ser Lys Ile Asp Ser
    50                  55                  60


Ala Phe Phe Gln Arg Ile Lys Asp Ser Phe Leu Val Pro Asp Asp Lys
65                  70                  75                  80


Asn Asp Asp Arg His Pro Ile Phe Gly Asn Ile Lys Asp Glu Val Asp
                85                  90                  95


Tyr His Lys Asn Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala
            100                 105                 110


Asp Ser Asp Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala
```

115 120 125

His Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asp
130 135 140

Ser Gln Asn Thr Asp Val Asn Ala Leu Phe Leu Lys Leu Val Asp Thr
145 150 155 160

Tyr Asn Leu Met Phe Glu Asp Asp Ile Asp Thr Gln Thr Ile Asp Ala
165 170 175

Thr Val Ile Leu Thr Glu Lys Met Ser Lys Ser Arg Arg Leu Glu Asn
180 185 190

Leu Ile Ala Lys Ile Pro Asn Gln Lys Lys Asn Thr Leu Phe Gly Asn
195 200 205

Leu Ile Ser Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ala Asn Phe
210 215 220

Glu Leu Ser Glu Asp Ala Lys Leu Gln Ile Ser Lys Glu Ser Phe Glu
225 230 235 240

Glu Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp
245 250 255

Leu Phe Ile Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp
260 265 270

Ile Leu Thr Val Lys Gly Val Asn Thr Lys Ala Pro Leu Ser Ala Ser
275 280 285

Met Val Gln Arg Phe Asn Glu His Gln Asp Asp Leu Lys Leu Leu Lys
290 295 300

Lys Leu Val Lys Val Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Asp
305 310 315 320

Ile Lys Asp Lys Asn Gly Tyr Ala Gly Tyr Ile Asn Gly Lys Thr Ser

325 330 335

Gln Glu Asp Phe Tyr Lys Tyr Ile Lys Pro Ile Leu Ser Lys Leu Lys
340 345 350

Gly Ala Glu Ser Leu Ile Ser Lys Leu Glu Arg Glu Asp Phe Leu Arg
355 360 365

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
370 375 380

Asn Glu Leu Lys Ser Ile Ile Arg Arg Gln Glu Lys Tyr Tyr Pro Phe
385 390 395 400

Leu Lys Asp Lys Gln Val Arg Ile Glu Lys Ile Phe Thr Phe Arg Ile
405 410 415

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Asn Ser Ser Phe Ala Trp
420 425 430

Val Lys Arg Arg Ser Asn Glu Ser Ile Thr Pro Trp Asn Phe Glu Glu
435 440 445

Val Val Glu Gln Glu Ala Ser Ala Lys Val Phe Ile Glu Arg Met Thr
450 455 460

Asn Phe Asp Thr Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
465 470 475 480

Leu Leu Tyr Glu Met Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
485 490 495

Tyr Gln Ala Glu Gly Met Arg Lys Pro Glu Phe Leu Ser Ser Glu Glu
500 505 510

Lys Ile Glu Ile Val Ser Asn Leu Phe Lys Thr Glu Arg Lys Val Thr
515 520 525

Val Lys Gln Leu Lys Glu Asn Tyr Phe Asn Lys Ile Arg Cys Leu Asp

530 535 540

Ser Ile Thr Ile Ser Gly Val Glu Asp Lys Phe Asn Ala Ser Leu Gly
545 550 555 560

Thr Tyr His Asp Leu Leu Asn Ile Ile Lys Asn Gln Lys Ile Leu Asp
565 570 575

Asp Glu Gln Asn Gln Asp Ser Leu Glu Asp Ile Val Leu Thr Leu Thr
580 585 590

Leu Phe Glu Asp Glu Lys Met Ile Ala Lys Arg Leu Ser Lys Tyr Glu
595 600 605

Ser Ile Phe Asp Pro Ser Ile Leu Lys Lys Leu Lys Lys Arg His Tyr
610 615 620

Thr Gly Trp Gly Arg Leu Ser Gln Lys Leu Ile Asn Gly Ile Arg Asp
625 630 635 640

Lys Gln Thr Gly Lys Thr Ile Leu Asp Phe Leu Ile Asp Gly Gln Ala
645 650 655

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Pro Ser Leu Asp Phe Ala
660 665 670

Ser Ile Ile Lys Glu Ala Gln Glu Lys Thr Ile Lys Ser Glu Lys Leu
675 680 685

Glu Glu Thr Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly
690 695 700

Ile Leu Gln Ser Val Lys Ile Val Asp Glu Val Val Lys Val Met Gly
705 710 715 720

Tyr Glu Pro Ser Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Ser
725 730 735

Thr Gln Arg Gly Ile Asn Asn Ser Arg Glu Arg Leu Arg Lys Leu Glu

740 745 750

Glu Val His Lys Asn Ile Gly Ser Lys Ile Leu Lys Glu His Glu Ile
755 760 765

Ser Asn Ala Gln Leu Gln Ser Asp Arg Val Tyr Leu Tyr Leu Leu Gln
770 775 780

Asp Gly Lys Asp Met Tyr Thr Gly Lys Asp Leu Asp Phe Asp Arg Leu
785 790 795 800

Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asp
805 810 815

Asn Ser Ile Asp Asn Ile Val Leu Thr Ser Gln Glu Ser Asn Arg Gly
820 825 830

Lys Ser Asp Asn Val Pro Tyr Ile Ala Ile Val Asn Lys Met Lys Ser
835 840 845

Tyr Trp Gln His Gln Leu Lys Ser Gly Ala Ile Ser Gln Arg Lys Phe
850 855 860

Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Tyr Asp Lys
865 870 875 880

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
885 890 895

His Val Ala Gln Ile Leu Asn Asn Arg Phe Asn Asn Asn Val Asp Asp
900 905 910

Ser Ser Lys Asn Lys Arg Pro Val Lys Ile Ile Thr Leu Lys Ser Lys
915 920 925

Met Val Ser Asp Phe Arg Lys Glu Phe Gly Phe Tyr Lys Ile Arg Glu
930 935 940

Val Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val

945 950 955 960

Gly Thr Ala Leu Leu Lys Lys Tyr Pro Lys Leu Glu Ala Glu Phe Val
965 970 975

Tyr Gly Asp Tyr Lys His Tyr Asp Leu Ser Asp Thr Ser Leu Gly Lys
980 985 990

Ala Thr Ala Lys Met Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe Lys
995 1000 1005

Lys Glu Val Arg Leu Ala Asp Gly Thr Val Ile Thr Arg Pro Gln
1010 1015 1020

Ile Glu Thr Asn Thr Glu Thr Gly Glu Ile Val Trp Asp Lys Val
1025 1030 1035

Lys Asp Ile Lys Thr Ile Arg Lys Val Leu Ser Ile Pro Gln Ile
1040 1045 1050

Asn Val Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser Lys
1055 1060 1065

Glu Ser Ile Leu Ser Lys Arg Asp Ser Asp Lys Leu Ile Pro Arg
1070 1075 1080

Lys Asn Asn Trp Asp Pro Lys Lys Tyr Gly Gly Phe Gly Ser Pro
1085 1090 1095

Ile Ile Ala Tyr Ser Val Leu Val Val Ala Lys Val Thr Lys Gly
1100 1105 1110

Lys Ser Gln Lys Thr Lys Ser Val Lys Glu Leu Val Gly Ile Thr
1115 1120 1125

Ile Met Glu Gln Asn Glu Phe Glu Lys Asp Arg Ile Thr Phe Leu
1130 1135 1140

Glu Lys Lys Gly Tyr Gln Asp Ile Gln Glu Ser Leu Ile Ile Lys

1145 1150 1155

Leu Pro Lys Phe Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys Arg
1160 1165 1170

Leu Leu Ala Ser Glu Leu Gln Lys Gly Asn Glu Leu Ser Leu Pro
1175 1180 1185

Asn Lys Tyr Ile Gln Phe Leu Tyr Leu Ala Ser Arg Tyr Thr Ser
1190 1195 1200

Phe Ser Gly Lys Glu Glu Asp Arg Glu Lys His Arg His Phe Val
1205 1210 1215

Glu Ser His Leu His Tyr Phe Asp Glu Ile Lys Asp Ile Ile Ala
1220 1225 1230

Asp Phe Ser Arg Arg Tyr Ile Leu Ala Asp Ala Asn Leu Glu Lys
1235 1240 1245

Ile Leu Thr Leu Tyr Asn Glu Lys Asn Gln Phe Ser Ile Glu Glu
1250 1255 1260

Gln Ala Thr Asn Met Leu Asn Leu Phe Thr Phe Thr Gly Leu Gly
1265 1270 1275

Ala Pro Ala Thr Leu Lys Phe Phe Asn Val Asp Ile Asp Arg Lys
1280 1285 1290

Arg Tyr Thr Ser Ser Thr Glu Ile Leu Asn Ser Thr Leu Ile Arg
1295 1300 1305

Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Lys
1310 1315 1320

Ile Gly Gly Asp
1325

<210> 271

<211> 1355
<212> PRT
<213> Streptococcus phocae

<400> 271

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Lys Lys Ser Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15

Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met Lys
            20                  25                  30

Val Leu Gly Asn Thr Ser Arg Gln Ser Ile Lys Lys Asn Met Ile Gly
        35                  40                  45

Ala Leu Leu Phe Asp Glu Gly Gly Pro Ala Ala Ser Thr Arg Val Lys
    50                  55                  60

Arg Thr Thr Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Cys Tyr
65                  70                  75                  80

Leu Arg Asp Ile Phe Glu Ser Glu Met His Thr Ile Asp Lys His Phe
                85                  90                  95

Phe Leu Arg Leu Glu Asp Ser Phe Leu His Lys Ser Asp Lys Arg Tyr
            100                 105                 110

Glu Ala His Pro Ile Phe Gly Thr Leu Gln Glu Glu Lys Ala Tyr His
        115                 120                 125

Asp Asn Tyr Pro Thr Ile Tyr His Leu Arg Lys Ala Leu Ala Asp Asn
    130                 135                 140

Thr Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Ile
145                 150                 155                 160

Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Ala Leu Ser Ala Asn
                165                 170                 175

Asn Thr Asp Val Gln Gln Leu Val His Ala Leu Val Asp Ala Tyr Asn
            180                 185                 190
```

```
Ile Met Phe Glu Glu Asp Leu Asp Ile Glu Ala Ile Asp Val Lys Ala
        195                 200                 205

Ile Leu Thr Glu Lys Ile Ser Lys Thr Arg Arg Leu Glu Asn Leu Ile
    210                 215                 220

Ser Asn Ile Pro Gly Gln Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile
225                 230                 235                 240

Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser His Phe Asn Leu
                245                 250                 255

Pro Glu Asp Ala Lys Leu Gln Leu Ala Lys Asp Thr Tyr Asp Glu Glu
            260                 265                 270

Leu Asn Asn Leu Leu Thr Gln Ile Gly Asp Glu Tyr Ala Asp Leu Phe
        275                 280                 285

Leu Ser Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu
    290                 295                 300

Thr Val Asn Gly Asp Gly Thr Gln Ala Pro Leu Ser Ala Ser Leu Ile
305                 310                 315                 320

Lys Arg Tyr Glu Glu His Arg Gln Asp Leu Ala Leu Leu Lys Gln Met
                325                 330                 335

Phe Lys Glu Gln Leu Pro Asp Leu Tyr Arg Asp Val Phe Thr Asp Glu
            340                 345                 350

Asn Lys Asp Gly Tyr Ala Gly Tyr Ile Ser Gly Lys Thr Ser Gln Glu
        355                 360                 365

Ala Phe Tyr Lys Tyr Ile Lys Pro Ile Leu Glu Thr Leu Asp Gly Ala
    370                 375                 380

Glu Asp Phe Leu Thr Lys Ile Asn Arg Glu Asp Phe Leu Arg Lys Gln
385                 390                 395                 400
```

```
Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu
                405                 410                 415

Leu Gln Ala Ile Leu Glu Arg Gln Gln Ala Tyr Tyr Pro Phe Leu Lys
            420                 425                 430

Asp Asn Gln Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr
        435                 440                 445

Tyr Ile Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Leu Thr
    450                 455                 460

Arg Thr Ser Asp Gln Lys Ile Thr Pro Trp Asn Phe Asp Glu Met Val
465                 470                 475                 480

Asp Gln Glu Ala Ser Ala Gln Ala Phe Ile Glu Arg Met Thr Asn Phe
                485                 490                 495

Asp Glu Tyr Leu Pro Gln Glu Lys Val Leu Pro Lys His Ser Leu Thr
            500                 505                 510

Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val
        515                 520                 525

Thr Glu Gly Met Thr Lys Pro Glu Phe Leu Ser Ala Gly Gln Lys Glu
    530                 535                 540

Gln Ile Val Glu Leu Leu Phe Lys Lys Tyr Arg Lys Val Thr Val Lys
545                 550                 555                 560

Gln Leu Lys Glu Asp Phe Phe Ser Lys Ile Glu Cys Phe Asp Thr Val
                565                 570                 575

Asp Ile Ser Gly Val Glu Asp Lys Phe Asn Ala Ser Leu Gly Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Ile Ile Lys Asp Lys Ala Phe Leu Asp Asn Ser
        595                 600                 605
```

```
Glu Asn Glu Asn Ile Ile Glu Asp Ile Ile Leu Thr Leu Thr Leu Phe
    610                 615                 620

Glu Asp Lys Glu Met Ile Ala Asn Arg Leu Ala Val Tyr Glu Asp Leu
625                 630                 635                 640

Phe Asp Gln Asn Val Leu Lys Gln Leu Lys Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Lys Gln Leu Ile Asn Gly Met Arg Asp Lys His
            660                 665                 670

Thr Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ile Asn Arg
        675                 680                 685

Asn Phe Met Gln Leu Ile Asn Asp Asp Asn Leu Ser Phe Lys Glu Glu
    690                 695                 700

Ile Lys Lys Ala Gln Glu Gly Gly Leu Lys Asp Ser Ile Asn Asp Gln
705                 710                 715                 720

Ile Arg Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Thr Ile Asn Ile Val Asp Glu Ile Val Lys Ile Met Gly Lys Ala Pro
            740                 745                 750

Gln His Ile Val Val Glu Met Ala Arg Asp Val Gln Lys Thr Asp Ile
        755                 760                 765

Gly Val Lys Gln Ser Arg Glu Arg Met Lys Arg Val Gln Glu Val Leu
    770                 775                 780

Lys Lys Leu Gly Ser Gln Leu Leu Lys Glu His Pro Val Glu Asn Phe
785                 790                 795                 800

Gln Leu Gln Asn Glu Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815
```

```
Asp Met Tyr Thr Gly Glu Glu Leu Ser Ile Ser Asn Leu Ser His Tyr
            820                 825                 830

Asp Ile Asp His Ile Ile Pro Arg Ser Phe Ile Lys Asp Asp Ser Ile
        835                 840                 845

Asp Asn Lys Val Leu Thr Arg Ser Glu His Asn Arg Gly Lys Thr Asp
    850                 855                 860

Asn Val Pro Ser Ile Glu Val Val Lys Arg Met Lys Pro Tyr Trp Gln
865                 870                 875                 880

Lys Leu Leu Asp Thr Lys Val Ile Ser Gln Arg Lys Phe Asp Asn Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Gln Glu Ser Asp Lys Ala Asn Phe
            900                 905                 910

Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala
        915                 920                 925

Gln Ile Leu Asp Ser Arg Phe Asn Thr Glu Arg Asp Glu Lys Asp Arg
    930                 935                 940

Pro Ile Arg Arg Val Lys Val Ile Thr Leu Lys Ser Lys Phe Val Ser
945                 950                 955                 960

Asp Phe Arg Gln Asp Phe Gly Phe Tyr Lys Leu Arg Glu Ile Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly Thr Ala
            980                 985                 990

Leu Leu Lys Met Tyr Pro Lys Leu  Ala Ser Glu Phe Val  Tyr Gly Asp
        995                 1000                1005

Tyr Gln  Lys Tyr Asp Leu Ser  Gly Lys Ala Ser Gly  His Ala Thr
    1010                1015                1020
```

```
Ala Lys  Tyr Phe Phe Tyr Ser  Asn Leu Met Asn Phe  Phe Lys Ser
    1025                1030                1035

Glu Val  Lys Leu Ala Asn Gly  Asn Ile Ile Lys Arg  Ser Pro Ile
    1040                1045                1050

Glu Val  Asn Glu Glu Thr Gly  Glu Ile Val Trp Asp  Lys Thr Lys
    1055                1060                1065

Asp Phe  Gly Thr Val Arg Lys  Val Leu Ser Ala Pro  Gln Val Asn
    1070                1075                1080

Ile Val  Lys Lys Thr Glu Ile  Gln Thr Gly Gly Phe  Ser Asn Glu
    1085                1090                1095

Thr Ile  Leu Ser Lys Gly Lys  Ser Ser Lys Leu Ile  Pro Arg Lys
    1100                1105                1110

Asn Lys  Trp Arg Asp Thr Thr  Lys Tyr Gly Gly Phe  Asn Thr Pro
    1115                1120                1125

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1130                1135                1140

Lys Ala  Lys Lys Leu Lys Pro  Val Lys Glu Leu Val  Gly Ile Thr
    1145                1150                1155

Ile Met  Glu Arg Thr Lys Phe  Glu Ala Asn Pro Ile  Ala Phe Leu
    1160                1165                1170

Glu Ser  Lys Gly Tyr His Asp  Ile Gln Glu His Leu  Met Ile Thr
    1175                1180                1185

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Arg Arg
    1190                1195                1200

Leu Leu  Ala Ser Glu Leu Gln  Lys Gly Asn Glu Met  Val Leu Pro
    1205                1210                1215
```

```
Gln His  Leu Val Thr Phe Leu  Tyr Arg Val Ser Lys  Arg Asp Lys
    1220                 1225                 1230

Gly Thr  Gln Ser Glu Asn Met  Glu Tyr Ile Ser Asn  His Lys Glu
    1235                 1240                 1245

Lys Phe  Ile Glu Ile Phe His  Tyr Ile Ile Arg Tyr  Ala Glu Lys
    1250                 1255                 1260

Asn Val  Ile Lys Pro Lys Val  Ile Glu Arg Leu Asn  Asp Thr Phe
    1265                 1270                 1275

Asn Gln  Lys Phe Asn Asp Ser  Asp Leu Thr Glu Leu  Ser Ile Ser
    1280                 1285                 1290

Phe Leu  Asn Leu Phe Lys Phe  Thr Ser Phe Gly Ala  Pro Glu Lys
    1295                 1300                 1305

Phe Thr  Phe Leu Asn Ser Glu  Ile Lys Gln Asp Asp  Val Arg Tyr
    1310                 1315                 1320

Arg Ser  Thr Lys Glu Cys Leu  Asn Ser Thr Leu Ile  His Gln Ser
    1325                 1330                 1335

Val Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Phe Gly
    1340                 1345                 1350

Gly Asp
    1355
```

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<213> Streptococcus pseudopneumoniae

<400> 272

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Ser Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys His Phe Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Ile Ser Lys Val Asp Asn Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Thr Glu Glu Lys Glu Tyr
        115                 120                 125

Tyr Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Thr Leu Ala His
145                 150                 155                 160

Met Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ser Phe Asp Ile
                165                 170                 175

Lys Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val
        195                 200                 205

Glu Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Thr Lys Arg Glu Arg
    210                 215                 220
```

```
Val Leu Lys Leu Phe Pro Asp Gln Lys Ser Thr Gly Leu Phe Ser Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Asp Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp
        275                 280                 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Glu Arg Tyr Glu Asn His Gln Lys Asp Leu Ala Ala Leu Lys
                325                 330                 335

Gln Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser
            340                 345                 350

Asp Gln Ser Lys Glu Gly Tyr Ala Gly Tyr Ile Asp Ser Lys Thr Thr
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Ile Asp
    370                 375                 380

Gly Ala Asp Tyr Leu Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430
```

```
Leu Lys Glu Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
    450                 455                 460

Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Ile Val Asp Lys Ala Ser Ser Ala Glu Ala Phe Ile Asn Lys Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540

Lys Lys Lys Ile Ile Asn Gln Leu Phe Lys Glu Lys Arg Lys Val Thr
545                 550                 555                 560

Glu Lys Asp Leu Ile His Tyr Leu His Asn Val Asp Gly Tyr Asp Gly
                565                 570                 575

Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Arg Phe Met Asp Glu
        595                 600                 605

Pro Lys Asn Gln Glu Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Ala Ser
625                 630                 635                 640
```

```
Ile Phe Asp Glu Lys Val Ile Lys Thr Leu Thr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Cys Ile Arg Asp Arg
            660                 665                 670

Lys Thr Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Tyr Asn
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys
    690                 695                 700

Glu Ile Ile Gln Glu Ser Gln Val Val Gly Lys Pro Asp Asp Val Lys
705                 710                 715                 720

Gln Ile Val Gln Glu Leu Pro Gly Ser Ser Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Ile Lys Leu Val Asp Glu Leu Val Lys Val Met Gly His
            740                 745                 750

Asp Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp
    770                 775                 780

Ser Leu Lys Ile Leu Ala Ser Asn Ile Leu Lys Glu His Pro Thr Asp
785                 790                 795                 800

Asn Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Lys Asp Met Tyr Thr Gly Asn Pro Leu Asp Ile Asn His Leu Ser
            820                 825                 830

Ser Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp
        835                 840                 845
```

```
Ser Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Leu Glu Val Val Gln Lys Arg Lys Ala Phe
865                 870                 875                 880

Trp Gln Gln Leu Leu Glu Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Asn Glu Arg Asp Lys Val
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Phe Asn Thr Lys Val Asn Glu Lys
    930                 935                 940

Asn Gln Lys Ile Arg Thr Val Lys Ile Ile Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Asn Phe Arg Lys Glu Phe Arg Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala
            980                 985                 990

Lys Ala Ile Leu Lys Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Gln Lys Tyr Asp  Leu Ser Arg Asp Pro  Lys Glu Ile
    1010                1015                1020

Glu Lys  Ala Thr Glu Lys Tyr  Phe Phe Tyr Ser Asn  Leu Leu Asn
    1025                1030                1035

Phe Phe  Lys Glu Glu Val His  Tyr Ala Asp Gly Thr  Ile Val Lys
    1040                1045                1050
```

```
Arg Glu  Asn Ile Glu Tyr Ser  Lys Asp Thr Gly Glu  Ile Ala Trp
    1055                1060                1065

Asn Lys  Glu Ile Asp Phe Ala  Thr Ile Arg Lys Ile  Leu Ser Leu
    1070                1075                1080

Ser Gln  Val Asn Ile Val Lys  Lys Thr Glu Glu Gln  Thr Gly Gly
    1085                1090                1095

Leu Phe  Asp Asn Asn Ile Val  Ser Lys Lys Lys Val  Val Asp Ala
    1100                1105                1110

Ser Lys  Leu Ile Pro Ile Lys  Ser Gly Leu Ser Pro  Glu Lys Tyr
    1115                1120                1125

Gly Gly  Tyr Ala Arg Pro Thr  Ile Ala Tyr Ser Val  Leu Val Ile
    1130                1135                1140

Ala Asp  Ile Glu Lys Gly Lys  Ala Lys Lys Leu Lys  Arg Ile Lys
    1145                1150                1155

Glu Met  Val Gly Ile Thr Ile  Gln Asp Lys Lys Lys  Phe Glu Ala
    1160                1165                1170

Asn Pro  Thr Ala Tyr Leu Glu  Glu Tyr Gly Tyr Lys  Asn Ile Asn
    1175                1180                1185

Pro Asn  Leu Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Lys Phe
    1190                1195                1200

Asn Asp  Gly Gln Arg Arg Leu  Leu Ala Ser Ser Ile  Glu Leu Gln
    1205                1210                1215

Lys Gly  Asn Glu Leu Ile Leu  Pro Tyr His Phe Thr  Thr Leu Leu
    1220                1225                1230

Tyr His  Ala Gln Arg Ile Asn  Lys Ile Ser Glu Pro  Ile His Lys
    1235                1240                1245
```

```
Gln Tyr  Val Glu Thr His Gln  Ser Glu Phe Glu Glu  Leu Leu Thr
    1250                1255                1260


Thr Ile  Ile Ser Leu Ser Lys  Lys Tyr Ile Gln Lys  Pro Ile Val
    1265                1270                1275


Glu Ser  Leu Leu Gln Gln Ala  Phe Glu Gln Ala Asp  Lys Asp Ile
    1280                1285                1290


Tyr Gln  Leu Ser Glu Ser Phe  Ile Ser Leu Leu Lys  Leu Thr Ser
    1295                1300                1305


Phe Gly  Ala Pro Gly Ala Phe  Arg Phe Leu Gly Val  Glu Ile Ser
    1310                1315                1320


Gln Ser  Asn Val Arg Tyr Gln  Ser Val Ser Ser Cys  Phe Asn Ala
    1325                1330                1335


Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile
    1340                1345                1350


Asp Leu  Ser Lys Leu Gly Glu  Asp
    1355                1360


<210>  273
<211>  1361
<212>  PRT
<213>  Streptococcus pseudopneumoniae

<400>  273

Ser Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Val Ile Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys His Phe Ile Lys Lys Asn Leu Ile
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Asn Lys Val Asp Ser Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Arg
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Ala Glu Glu Lys Glu Tyr
        115                 120                 125

His Lys Asn Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ala Phe Asp Ile
                165                 170                 175

Lys Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Asn Ile Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Glu Gln Val
        195                 200                 205

Glu Ala Ile Phe Ser Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255
```

```
Asp Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Gly Phe Ala Asp
        275                 280                 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Glu Arg Tyr Gln Asn His Gln Asn Asp Leu Ala Ser Leu Lys
                325                 330                 335

Gln Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser
            340                 345                 350

Asp Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Val Asp Gly Lys Thr Thr
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Leu Glu Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
    450                 455                 460
```

```
Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465                 470                 475                 480


Ile Val Asp Lys Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr
                485                 490                 495


Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510


Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525


Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540


Lys Lys Gln Ile Val Asn Gln Leu Phe Lys Glu Lys Arg Lys Val Thr
545                 550                 555                 560


Glu Lys Asp Ile Ile Gln Tyr Leu His Asn Val Asp Gly Tyr Asp Gly
                565                 570                 575


Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr
            580                 585                 590


Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asp
        595                 600                 605


Ser Lys Asn Glu Glu Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile
    610                 615                 620


Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Ser
625                 630                 635                 640


Ile Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr
                645                 650                 655


Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670
```

```
Gln Thr Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Tyr Ser
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys
    690                 695                 700

Glu Ile Ile Gln Lys Ala Gln Val Phe Gly Lys Thr Asn Asp Val Lys
705                 710                 715                 720

Gln Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Ile Lys Ile Val Glu Glu Leu Val Lys Val Met Gly His
            740                 745                 750

Glu Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Thr Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asn
    770                 775                 780

Ser Leu Lys Ile Leu Ala Ser Lys Ile Leu Lys Glu His Pro Thr Asp
785                 790                 795                 800

Asn Asn Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Lys Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asn Gln Leu Ser
            820                 825                 830

Ser Cys Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp
        835                 840                 845

Ser Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Glu Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Cys Leu Glu Val Val Asp Lys Met Lys Val Phe
865                 870                 875                 880
```

```
Trp Gln Gln Leu Leu Asp Phe Lys Leu Ile Ser Tyr Arg Lys Phe Asn
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val
            900                 905                 910

Gly Phe Ile Arg Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Phe Asn Thr Glu Val Thr Glu Lys
    930                 935                 940

Asp Lys Lys Asn Arg Asn Val Lys Ile Ile Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Asn Phe Arg Lys Glu Phe Gly Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala
            980                 985                 990

Lys Ala Ile Leu Lys Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Gln Lys Tyr Asp  Leu Ser Lys Asp Pro  Lys Asp Ile
    1010                1015                1020

Glu Lys  Ala Thr Glu Lys Tyr  Phe Phe Tyr Ser Asn  Leu Leu Asn
    1025                1030                1035

Phe Phe  Lys Glu Glu Val His  Tyr Ala Asp Gly Thr  Ile Val Lys
    1040                1045                1050

Arg Glu  Asn Ile Glu Tyr Ser  Lys Asp Thr Gly Glu  Ile Ala Trp
    1055                1060                1065

Asn Lys  Glu Lys Asp Phe Ala  Thr Ile Lys Lys Ile  Leu Ser Leu
    1070                1075                1080
```

```
Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu Glu Gln  Thr Gly Gly
    1085                1090                1095

Leu Phe  Asp Asn Asn Ile Val  Ser Lys Lys Lys Val  Val Asp Ala
    1100                1105                1110

Ser Lys  Leu Ile Pro Ile Lys  Ser Gly Leu Ser Pro  Glu Lys Tyr
    1115                1120                1125

Gly Gly  Tyr Ala Arg Pro Thr  Ile Ala Tyr Ser Val  Leu Val Ile
    1130                1135                1140

Ala Asp  Ile Glu Lys Gly Lys  Thr Lys Lys Leu Lys  Arg Ile Lys
    1145                1150                1155

Glu Met  Ile Gly Ile Thr Val  Gln Asp Lys Lys Ile  Phe Glu Ser
    1160                1165                1170

Asn Pro  Ile Ala Tyr Leu Glu  Glu Cys Gly Tyr Lys  Asn Ile Asn
    1175                1180                1185

Pro Asn  Leu Ile Ile Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Phe
    1190                1195                1200

Asn Gly  Gly Gln Arg Arg Leu  Leu Ala Ser Ser Ile  Glu Leu Gln
    1205                1210                1215

Lys Gly  Asn Glu Leu Ile Leu  Pro Tyr His Phe Thr  Ala Leu Leu
    1220                1225                1230

Tyr His  Thr Gln Arg Ile Asn  Lys Ile Ser Glu Pro  Ile His Lys
    1235                1240                1245

Gln Tyr  Val Glu Ala His Gln  Asn Glu Phe Lys Glu  Leu Leu Thr
    1250                1255                1260

Thr Ile  Ile Ser Leu Ser Lys  Lys Tyr Ile Gln Lys  Pro Asn Val
    1265                1270                1275
```

```
Glu Ser  Leu Leu Gln Gln Ala  Phe Glu Gln Ala Asp  Lys Asp Ile
    1280                1285                1290


Tyr Gln  Leu Ser Glu Ser Phe  Ile Ser Leu Leu Lys  Leu Thr Ser
    1295                1300                1305


Phe Gly  Ala Pro Gly Ala Phe  Lys Phe Leu Gly Val  Glu Ile Ser
    1310                1315                1320


Gln Ser  Ser Val Arg Tyr Lys  Pro Asn Ser Gln Phe  Leu Asp Ala
    1325                1330                1335


Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile
    1340                1345                1350


Asp Leu  Ser Lys Leu Gly Glu  Asp
    1355                1360
```

<210> 274
<211> 1363
<212> PRT
<213> Streptococcus pseudopneumoniae

<400> 274

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Ser Asn Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Thr Val Leu Gly Asn Thr Asp Lys His Phe Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Gly Glu Met Ser Lys Val Asp Ser Ser
```

85 90 95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Arg
100 105 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Val Glu Glu Lys Glu Tyr
115 120 125

His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
130 135 140

Ser Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Val Leu Ala His
145 150 155 160

Met Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ala Phe Asp Ile
165 170 175

Lys Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr
180 185 190

Asp Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val
195 200 205

Glu Thr Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg
210 215 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225 230 235 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
245 250 255

Asp Leu Gly Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp
260 265 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp
275 280 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly

290 295 300

Ile Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Glu Arg Tyr Glu Asn His Gln Lys Asp Leu Thr Thr Leu Lys
325 330 335

Gln Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser
340 345 350

Asp Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu
370 375 380

Gly Thr Asp Tyr Phe Leu Glu Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
420 425 430

Leu Lys Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
450 455 460

Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465 470 475 480

Ile Val Asp Lys Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser

```
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540

Lys Lys Gln Ile Val Asn Gln Leu Phe Lys Glu Lys Arg Lys Val Thr
545                 550                 555                 560

Glu Lys Asp Ile Ile His Tyr Leu His Thr Val Asp Gly Tyr Asp Gly
                565                 570                 575

Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asp
        595                 600                 605

Ser Lys Asn Glu Ala Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Ser
625                 630                 635                 640

Leu Phe Asp Lys Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Cys Asp Lys
            660                 665                 670

Gln Thr Gly Asn Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Glu Ile
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys
    690                 695                 700

Lys Ile Ile Gln Lys Ser Gln Val Val Gly Glu Thr Asp Asp Val Lys
```

705 710 715 720

Gln Val Val Arg Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile
725 730 735

Leu Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Asp His
740 745 750

Ala Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Ala Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp
770 775 780

Ser Leu Lys Ile Leu Ala Ser Asn Ile Leu Lys Glu Asn Pro Thr Asp
785 790 795 800

Asn Asn Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
805 810 815

Gly Lys Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asn Gln Leu Ser
820 825 830

Ser Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp
835 840 845

Ser Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys
850 855 860

Ser Asp Asn Val Pro Ser Leu Glu Val Val Gln Lys Arg Lys Ala Phe
865 870 875 880

Trp Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn
885 890 895

Asn Leu Thr Lys Ala Glu Arg Glu Arg Asp Gly Leu Asn Glu Leu Asp
900 905 910

Lys Val Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr

```
        915                 920                 925

Lys His Val Ala Gln Ile Leu Asp Ala Arg Phe Asn Lys Glu Val Thr
    930                 935                 940

Glu Lys Asp Lys Lys Asn Arg Asn Val Lys Ile Ile Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Arg Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Val Ala Lys Ala Ile Leu Lys Lys  Tyr Pro Lys Leu Glu  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Gln Lys  Asn Asp Leu Ser Lys  Asp Pro Lys
    1010                1015                1020

Asp Ile  Glu Lys Ala Thr Glu  Lys Tyr Phe Phe Tyr  Ser Asn Leu
    1025                1030                1035

Leu Asn  Phe Phe Lys Glu Glu  Val His Tyr Ala Asp  Gly Thr Ile
    1040                1045                1050

Val Lys  Arg Glu Asn Ile Glu  Tyr Ser Lys Asp Thr  Gly Glu Ile
    1055                1060                1065

Ala Trp  Asn Lys Glu Lys Asp  Phe Ala Thr Ile Lys  Lys Val Leu
    1070                1075                1080

Ser Tyr  Pro Gln Val Asn Ile  Val Lys Lys Thr Glu  Glu Gln Thr
    1085                1090                1095

Gly Gly  Leu Phe Asp Asn Asn  Ile Val Ser Lys Glu  Lys Val Val
    1100                1105                1110

Asp Ala  Ser Lys Leu Ile Pro  Ile Lys Ser Gly Leu  Ser Pro Glu
```

1115 1120 1125

Lys Tyr Gly Gly Tyr Ala Arg Pro Thr Ile Ala Tyr Ser Val Leu
1130 1135 1140

Val Ile Ala Asp Ile Glu Lys Gly Lys Thr Lys Lys Leu Lys Arg
1145 1150 1155

Ile Lys Glu Met Val Gly Ile Thr Ile Gln Asp Lys Lys Lys Phe
1160 1165 1170

Glu Ala Asn Pro Ile Ala Tyr Leu Glu Glu Cys Gly Tyr Lys Asn
1175 1180 1185

Ile Asn Pro Asn Leu Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe
1190 1195 1200

Glu Phe Asn Gly Gly Gln Arg Arg Leu Leu Ala Ser Ser Ile Glu
1205 1210 1215

Leu Gln Lys Gly Asn Glu Leu Ile Leu Pro Tyr His Phe Thr Ala
1220 1225 1230

Leu Leu Tyr His Ala Gln Arg Ile Asn Lys Phe Ser Glu Pro Ile
1235 1240 1245

His Lys Gln Tyr Val Glu Ala His Gln Asn Glu Phe Lys Glu Leu
1250 1255 1260

Leu Thr Ile Ile Ile Ser Leu Ser Lys Lys Tyr Ile Gln Lys Pro
1265 1270 1275

Asn Val Glu Ser Leu Leu His Gln Ala Phe Glu Gln Ala Asp Asn
1280 1285 1290

Asp Ile Tyr Gln Leu Ser Glu Ser Phe Ile Ser Leu Leu Lys Leu
1295 1300 1305

Thr Ser Phe Gly Ala Pro Gly Ala Phe Lys Phe Leu Gly Ala Glu

1310 1315 1320

Ile Ser Gln Ser Ser Val Arg Tyr Lys Pro Asn Ser Gln Phe Leu
1325 1330 1335

Asp Thr Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr
1340 1345 1350

Arg Ile Asp Leu Ser Lys Leu Gly Glu Asp
1355 1360

<210> 275
<211> 1360
<212> PRT
<213> Streptococcus pseudoporcinus

<400> 275

Tyr Ser Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly Trp
1 5 10 15

Ala Val Ile Asn Glu Asp Tyr Lys Val Pro Ala Lys Lys Met Thr Val
20 25 30

Phe Gly Asn Thr Asp Arg Lys Thr Ile Lys Lys Asn Leu Leu Gly Thr
35 40 45

Val Leu Phe Asp Ser Gly Glu Thr Ala Gln Ala Arg Arg Leu Lys Arg
50 55 60

Thr Asn Arg Arg Arg Tyr Thr Arg Arg Arg Tyr Arg Leu Cys Gln Leu
65 70 75 80

Gln Asn Ile Phe Ala Thr Glu Met Val Lys Val Asp Asp Thr Phe Phe
85 90 95

Gln Arg Leu Ser Glu Ser Phe Phe Tyr Tyr Gln Asp Lys Ala Phe Asp
100 105 110

Lys His Pro Ile Phe Gly Asn Ser Lys Glu Glu Arg Ala Tyr His Lys
115 120 125

```
Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Asp Leu Ala Asp Arg Asp
    130                 135                 140

Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ser His Ile Ile
145                 150                 155                 160

Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Leu Asn Ser Glu Asn
                165                 170                 175

Thr Asp Val Gln Lys Leu Phe Ile Ala Leu Val Thr Val Tyr Asn Leu
            180                 185                 190

Leu Phe Glu Glu Glu Ile Ala Gly Glu Thr Cys Asp Ala Lys Ala Leu
        195                 200                 205

Leu Thr Ala Lys Thr Ser Lys Ser Lys Arg Leu Glu Ser Leu Ile Ser
    210                 215                 220

Glu Phe Pro Gly Gln Lys Lys Asn Gly Leu Phe Gly Asn Leu Leu Ala
225                 230                 235                 240

Leu Ala Leu Gly Leu Arg Pro Asn Phe Lys Ser Asn Phe Gly Leu Ser
                245                 250                 255

Glu Asp Ala Lys Leu Gln Ile Thr Lys Asp Thr Tyr Glu Glu Glu Leu
            260                 265                 270

Asp Asn Leu Leu Ala Glu Ile Gly Asp His Tyr Ala Asp Leu Phe Leu
        275                 280                 285

Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Thr
    290                 295                 300

Leu Ser Asp Glu Asn Thr Arg Ala Pro Leu Ser Ala Ser Met Ile Lys
305                 310                 315                 320

Arg Tyr Glu Glu His Gln Glu Asp Leu Ala Leu Leu Lys Lys Leu Val
                325                 330                 335
```

```
Lys Glu Gln Met Pro Glu Lys Tyr Trp Glu Ile Phe Ser Asn Ala Lys
            340                 345                 350

Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Val Ser Gln Glu Asp
        355                 360                 365

Phe Tyr Arg Tyr Ile Lys Pro Ile Leu Ser Arg Leu Lys Gly Gly Asp
    370                 375                 380

Glu Phe Leu Ala Lys Ile Asp Arg Asp Asp Phe Leu Arg Lys Gln Arg
385                 390                 395                 400

Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Lys Glu Leu
                405                 410                 415

His Ala Ile Leu Arg Arg Gln Glu Lys Tyr Tyr Pro Phe Leu Ala Glu
            420                 425                 430

Gln Lys Glu Lys Ile Glu Gln Leu Leu Cys Phe Arg Ile Pro Tyr Tyr
        435                 440                 445

Val Gly Pro Leu Ala Lys Gly Gly Asn Ser Ser Phe Ala Trp Leu Lys
    450                 455                 460

Arg Arg Ser Asp Glu Pro Ile Thr Pro Trp Asn Phe Lys Asp Val Val
465                 470                 475                 480

Asp Glu Glu Ala Ser Ala Gln Ala Phe Ile Glu Gly Met Thr Asn Tyr
                485                 490                 495

Asp Thr Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Pro Leu
            500                 505                 510

Tyr Glu Met Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Ile
        515                 520                 525

Ala Glu Asn Met Thr Lys Pro Leu Tyr Leu Ser Ala Glu Gln Lys Glu
    530                 535                 540
```

```
Ala Ile Ile Asp His Leu Phe Lys Gln Thr Arg Lys Val Thr Val Lys
545                 550                 555                 560

Asp Leu Lys Glu Lys Tyr Phe Ser Gln Ile Glu Gly Leu Glu Asn Val
                565                 570                 575

Asp Val Thr Gly Val Glu Gly Ala Phe Asn Ala Ser Leu Gly Thr Tyr
            580                 585                 590

Asn Asp Leu Leu Lys Ile Ile Lys Asp Lys Ala Phe Leu Asp Asp Glu
        595                 600                 605

Ala Asn Ala Glu Ile Leu Glu Glu Ile Val Leu Ile Leu Thr Leu Phe
    610                 615                 620

Gln Asp Glu Lys Leu Ile Glu Lys Arg Leu Ala Lys Tyr Ala Asn Leu
625                 630                 635                 640

Phe Glu Lys Ser Val Leu Lys Lys Leu Arg Lys Arg His Tyr Arg Gly
                645                 650                 655

Trp Gly Arg Leu Ser Arg Gln Leu Ile Asp Gly Met Lys Asp Lys Ala
            660                 665                 670

Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Asp Phe Ala Asn Arg
        675                 680                 685

Asn Phe Ile Gln Leu Ile Asn Asp Ser Ser Leu Asp Phe Glu Lys Leu
    690                 695                 700

Ile Asp Asp Ala Gln Lys Lys Ala Ile Lys Arg Glu Ser Leu Thr Glu
705                 710                 715                 720

Ala Val Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Leu Lys Val Val Asp Glu Ile Val Lys Val Met Gly His Asn
            740                 745                 750
```

```
Pro Asp Asn Ile Val Ile Glu Met Ser Arg Glu Asn Gln Thr Thr Ala
        755                 760                 765

Gln Gly Leu Lys Asn Ala Arg Gln Arg Leu Lys Lys Ile Lys Glu Val
    770                 775                 780

His Lys Lys Thr Gly Ser Arg Ile Leu Glu Asp Asn Ser Glu Arg Ile
785                 790                 795                 800

Thr Asn Leu Thr Leu Gln Asp Asn Arg Leu Tyr Leu Tyr Leu Leu Gln
                805                 810                 815

Asp Gly Lys Asp Met Tyr Thr Gly Gln Asp Leu Asp Ile Asn Asn Leu
            820                 825                 830

Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Lys Asp
        835                 840                 845

Asn Ser Ile Asp Asn Leu Val Leu Thr Thr Gln Lys Ala Asn Arg Gly
    850                 855                 860

Lys Ser Asp Asn Val Pro Ser Ile Glu Val Val Arg Asp Met Lys Asp
865                 870                 875                 880

Arg Val Trp Arg Arg Gln Leu Ala Asn Gly Ala Ile Ser Arg Gln Lys
                885                 890                 895

Phe Asp His Leu Thr Lys Ala Glu Arg Gly Gly Leu Ala Asp Ser Asp
            900                 905                 910

Lys Ala Arg Phe Leu Arg Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Gln Leu Leu Asp Ser Arg Phe Asn Ser Lys Ser Asn
    930                 935                 940

Gln Asn Lys Lys Leu Ala Arg Asn Val Lys Ile Ile Thr Leu Lys Ser
945                 950                 955                 960
```

```
Lys Ile Val Ser Asp Phe Arg Lys Asp Phe Gly Leu Tyr Lys Leu Arg
               965                 970                 975

Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
           980                 985                 990

Val Gly Thr Ala Leu Leu Lys Lys  Tyr Pro Lys Leu Glu  Ala Glu Phe
        995                1000                1005

Val Tyr  Gly Asp Tyr Lys His  Phe Asp Leu Ser Asp  Pro Ser Leu
    1010                1015                1020

Gly Lys  Ala Thr Ala Lys Val  Phe Phe Tyr Ser Asn  Ile Met Asn
    1025                1030                1035

Phe Phe  Lys Glu Glu Leu Ser  Leu Ala Asp Gly Thr  Leu Met Lys
    1040                1045                1050

Arg Pro  Val Ile Glu Thr Asn  Thr Glu Thr Gly Glu  Val Val Trp
    1055                1060                1065

Asp Lys  Val Lys Asp Phe Lys  Thr Ile Arg Lys Val  Leu Ser Tyr
    1070                1075                1080

Pro Gln  Val Asn Ile Val Lys  Lys Thr Glu Ile Gln  Ser Gly Ala
    1085                1090                1095

Phe Ser  Lys Glu Ser Val Leu  Ser Lys Gly Asn Ser  Asp Lys Leu
    1100                1105                1110

Ile Glu  Arg Lys Lys Gly Trp  Asp Pro Lys Lys Tyr  Gly Gly Phe
    1115                1120                1125

Asp Ser  Pro Asn Thr Ala Tyr  Ser Ile Phe Val Val  Ala Lys Val
    1130                1135                1140

Ala Lys  Arg Lys Ala Gln Lys  Leu Lys Thr Val Lys  Glu Ile Val
    1145                1150                1155
```

```
Gly Ile  Thr Ile Met Glu Gln  Ala Glu Tyr Glu Lys  Asp Asn Ile
    1160                1165                1170

Ala Phe  Leu Glu Lys Lys Gly  Tyr Gln Asp Ile Gln  Glu Lys Leu
    1175                1180                1185

Leu Ile  Lys Leu Pro Lys Tyr  Ser Leu Phe Glu Leu  Glu Asn Gly
    1190                1195                1200

Arg Arg  Arg Leu Leu Ala Ser  Glu Phe Gln Lys Gly  Asn Glu Leu
    1205                1210                1215

Ala Leu  Ser Gly Lys Tyr Met  Lys Phe Leu Tyr Leu  Ala Ser Arg
    1220                1225                1230

Tyr Asp  Lys Leu Ser Ser Lys  Ile Glu Ser Glu Gln  Gln Lys Lys
    1235                1240                1245

Leu Phe  Val Glu Gln His Leu  His Tyr Phe Asp Glu  Ile Leu Asp
    1250                1255                1260

Ile Val  Val Lys His Ala Thr  Cys Tyr Ile Lys Ala  Glu Asn Asn
    1265                1270                1275

Leu Lys  Lys Ile Ile Ser Leu  Tyr Lys Lys Lys Glu  Ala Tyr Ser
    1280                1285                1290

Ile Asn  Glu Gln Ala Leu Asn  Met Leu Asn Leu Phe  Ile Phe Thr
    1295                1300                1305

Ser Leu  Gly Ala Pro Ser Thr  Phe Val Phe Phe Asp  Glu Thr Ile
    1310                1315                1320

Asp Arg  Lys Arg Tyr Thr Thr  Ser Ser Asp Val Leu  Asn Gly Ile
    1325                1330                1335

Leu Ile  Gln Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1340                1345                1350
```

Leu Ser Arg Phe Gly Gly Asp
    1355   1360

<210> 276
<211> 1316
<212> PRT
<213> Streptococcus pseudoporcinus

<400> 276

Met Leu Gly Thr Val Leu Phe Asp Ser Gly Glu Thr Ala Gln Ala Arg
1   5   10   15

Arg Leu Lys Arg Thr Asn Arg Arg Arg Tyr Thr Arg Arg Arg Tyr Arg
            20   25   30

Leu Cys Gln Leu Gln Asn Ile Phe Ala Thr Glu Met Val Lys Val Asp
        35   40   45

Asp Thr Phe Phe Gln Arg Leu Ser Glu Ser Phe Phe Tyr Tyr Gln Asp
    50   55   60

Lys Ala Phe Asp Lys His Pro Ile Phe Gly Asn Ser Lys Glu Glu Arg
65   70   75   80

Ala Tyr His Lys Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Asp Leu
                85   90   95

Ala Asp Arg Asp Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu
            100   105   110

Ser His Ile Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Lys Leu
        115   120   125

Asn Ser Glu Asn Thr Asp Val Gln Lys Leu Phe Ile Ala Leu Val Thr
    130   135   140

Val Tyr Asn Leu Leu Phe Glu Glu Glu Ile Ala Gly Glu Thr Cys Asp
145   150   155   160

```
Ala Lys Ala Leu Leu Thr Ala Lys Thr Ser Lys Ser Lys Arg Leu Glu
                165                 170                 175

Ser Leu Ile Ser Glu Phe Pro Gly Gln Lys Lys Asn Gly Leu Phe Gly
            180                 185                 190

Asn Leu Leu Ala Leu Ala Leu Gly Leu Arg Pro Asn Phe Lys Ser Asn
        195                 200                 205

Phe Gly Leu Ser Glu Asp Ala Lys Leu Gln Ile Thr Lys Asp Thr Tyr
    210                 215                 220

Glu Glu Glu Leu Asp Asn Leu Leu Ala Glu Ile Gly Asp His Tyr Ala
225                 230                 235                 240

Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser
                245                 250                 255

Asp Ile Leu Thr Leu Ser Asp Glu Asn Thr Arg Ala Pro Leu Ser Ala
            260                 265                 270

Ser Met Ile Lys Arg Tyr Glu Glu His Gln Glu Asp Leu Ala Leu Leu
        275                 280                 285

Lys Lys Leu Val Lys Glu Gln Met Pro Glu Lys Tyr Trp Glu Ile Phe
    290                 295                 300

Ser Asn Ala Lys Lys Asn Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Val
305                 310                 315                 320

Ser Gln Glu Asp Phe Tyr Arg Tyr Ile Lys Pro Ile Leu Ser Arg Leu
                325                 330                 335

Lys Gly Gly Asp Glu Phe Leu Ala Lys Ile Asp Arg Asp Asp Phe Leu
            340                 345                 350

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His
        355                 360                 365
```

```
Leu Lys Glu Leu His Ala Ile Leu Arg Arg Gln Glu Lys Tyr Tyr Pro
    370                 375                 380

Phe Leu Ala Glu Gln Lys Glu Lys Ile Glu Gln Leu Leu Cys Phe Arg
385                 390                 395                 400

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Lys Gly Gly Asn Ser Ser Phe
                405                 410                 415

Ala Trp Leu Lys Arg Arg Ser Asp Glu Pro Ile Thr Pro Trp Asn Phe
            420                 425                 430

Lys Asp Val Val Asp Glu Glu Ala Ser Ala Gln Ala Phe Ile Glu Gly
        435                 440                 445

Met Thr Asn Tyr Asp Thr Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys
    450                 455                 460

His Ser Pro Leu Tyr Glu Met Phe Thr Val Tyr Asn Glu Leu Thr Lys
465                 470                 475                 480

Val Lys Tyr Ile Ala Glu Asn Met Thr Lys Pro Leu Tyr Leu Ser Ala
                485                 490                 495

Glu Gln Lys Glu Ala Ile Ile Asp His Leu Phe Lys Gln Thr Arg Lys
            500                 505                 510

Val Thr Val Lys Asp Leu Lys Glu Lys Tyr Phe Ser Gln Ile Glu Gly
        515                 520                 525

Leu Glu Asn Val Asp Val Thr Gly Val Glu Gly Ala Phe Asn Ala Ser
    530                 535                 540

Leu Gly Thr Tyr Asn Asp Leu Leu Lys Ile Ile Lys Asp Lys Ala Phe
545                 550                 555                 560

Leu Asp Asp Glu Ala Asn Ala Glu Ile Leu Glu Glu Ile Val Leu Ile
                565                 570                 575
```

```
Leu Thr Leu Phe Gln Asp Glu Lys Leu Ile Glu Lys Arg Leu Ala Lys
            580                 585                 590

Tyr Ala Asn Leu Phe Glu Lys Ser Val Leu Lys Lys Leu Arg Lys Arg
        595                 600                 605

His Tyr Arg Gly Trp Gly Arg Leu Ser Arg Gln Leu Ile Asp Gly Met
    610                 615                 620

Lys Asp Lys Ala Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Asp
625                 630                 635                 640

Phe Ala Asn Arg Asn Phe Ile Gln Leu Ile Asn Asp Ser Ser Leu Asp
                645                 650                 655

Phe Glu Lys Leu Ile Asp Asp Ala Gln Lys Lys Ala Ile Lys Arg Glu
            660                 665                 670

Ser Leu Thr Glu Ala Val Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys
        675                 680                 685

Lys Gly Ile Leu Gln Ser Leu Lys Val Val Asp Glu Ile Val Lys Val
    690                 695                 700

Met Gly His Asn Pro Asp Asn Ile Val Ile Glu Met Ser Arg Glu Asn
705                 710                 715                 720

Gln Thr Thr Ala Gln Gly Leu Lys Asn Ala Arg Gln Arg Leu Lys Lys
                725                 730                 735

Ile Lys Glu Val His Lys Lys Thr Gly Ser Arg Ile Leu Glu Asp Asn
            740                 745                 750

Ser Glu Arg Ile Thr Asn Leu Thr Leu Gln Asp Asn Arg Leu Tyr Leu
        755                 760                 765

Tyr Leu Leu Gln Asp Gly Lys Asp Met Tyr Thr Gly Gln Asp Leu Asp
    770                 775                 780
```

```
Ile Asn Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
785                 790                 795                 800

Phe Ile Lys Asp Asn Ser Ile Asp Asn Leu Val Leu Thr Thr Gln Lys
                805                 810                 815

Ala Asn Arg Gly Lys Ser Asp Asn Val Pro Ser Ile Glu Val Val Arg
            820                 825                 830

Asp Met Lys Asp Arg Val Trp Arg Arg Gln Leu Ala Asn Gly Ala Ile
        835                 840                 845

Ser Arg Gln Lys Phe Asp His Leu Thr Lys Ala Glu Arg Gly Gly Leu
    850                 855                 860

Ala Asp Ser Asp Lys Ala Arg Phe Leu Arg Arg Gln Leu Val Glu Thr
865                 870                 875                 880

Arg Gln Ile Thr Lys His Val Ala Gln Leu Leu Asp Ser Arg Phe Asn
                885                 890                 895

Ser Lys Ser Asn Gln Asn Lys Lys Leu Ala Arg Asn Val Lys Ile Ile
            900                 905                 910

Thr Leu Lys Ser Lys Ile Val Ser Asp Phe Arg Lys Asp Phe Gly Leu
        915                 920                 925

Tyr Lys Leu Arg Glu Val Asn Asn Tyr His His Ala His Asp Ala Tyr
    930                 935                 940

Leu Asn Ala Val Val Gly Thr Ala Leu Leu Lys Lys Tyr Pro Lys Leu
945                 950                 955                 960

Glu Ala Glu Phe Val Tyr Gly Asp Tyr Lys His Phe Asp Leu Ser Asp
                965                 970                 975

Pro Ser Leu Gly Lys Ala Thr Ala Lys Val Phe Phe Tyr Ser Asn Ile
            980                 985                 990
```

```
Met Asn Phe Phe Lys Glu Glu Leu  Ser Leu Ala Asp Gly  Thr Leu Met
        995                 1000                1005


Lys Arg  Pro Val Ile Glu Thr  Asn Thr Glu Thr Gly  Glu Val Val
    1010                1015                1020


Trp Asp  Lys Val Lys Asp Phe  Lys Thr Ile Arg Lys  Val Leu Ser
    1025                1030                1035


Tyr Pro  Gln Val Asn Ile Val  Lys Lys Thr Glu Ile  Gln Ser Gly
    1040                1045                1050


Ala Phe  Ser Lys Glu Ser Val  Leu Ser Lys Gly Asn  Ser Asp Lys
    1055                1060                1065


Leu Ile  Glu Arg Lys Lys Gly  Trp Asp Pro Lys Lys  Tyr Gly Gly
    1070                1075                1080


Phe Asp  Ser Pro Asn Thr Ala  Tyr Ser Ile Phe Val  Val Ala Lys
    1085                1090                1095


Val Ala  Lys Arg Lys Ala Gln  Lys Leu Lys Thr Val  Lys Glu Ile
    1100                1105                1110


Val Gly  Ile Thr Ile Met Glu  Gln Ala Glu Tyr Glu  Lys Asp Asn
    1115                1120                1125


Ile Ala  Phe Leu Glu Lys Lys  Gly Tyr Gln Asp Ile  Gln Glu Lys
    1130                1135                1140


Leu Leu  Ile Lys Leu Pro Lys  Tyr Ser Leu Phe Glu  Leu Glu Asn
    1145                1150                1155


Gly Arg  Arg Arg Leu Leu Ala  Ser Glu Phe Gln Lys  Gly Asn Glu
    1160                1165                1170


Leu Ala  Leu Ser Gly Lys Tyr  Met Lys Phe Leu Tyr  Leu Ala Ser
    1175                1180                1185
```

```
Arg Tyr  Asp Lys Leu Ser Ser  Lys Ile Glu Ser Glu  Gln Gln Lys
    1190                 1195                 1200


Lys Leu  Phe Val Glu Gln His  Leu His Tyr Phe Asp  Glu Ile Leu
    1205                 1210                 1215


Asp Ile  Val Val Lys His Ala  Thr Cys Tyr Ile Lys  Ala Glu Asn
    1220                 1225                 1230


Asn Leu  Lys Lys Ile Ile Ser  Leu Tyr Lys Lys Lys  Glu Ala Tyr
    1235                 1240                 1245


Ser Ile  Asn Glu Gln Ala Leu  Asn Met Leu Asn Leu  Phe Ile Phe
    1250                 1255                 1260


Thr Ser  Leu Gly Ala Pro Ser  Thr Phe Val Phe Phe  Asp Glu Thr
    1265                 1270                 1275


Ile Asp  Arg Lys Arg Tyr Thr  Thr Ser Ser Asp Val  Leu Asn Gly
    1280                 1285                 1290


Ile Leu  Ile Gln Gln Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Ile
    1295                 1300                 1305


Asp Leu  Ser Arg Phe Gly Gly  Asp
    1310                 1315


<210>  277
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<212>  PRT
<213>  Streptococcus sanguinis

<400>  277

Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15


Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met Arg
            20                  25                  30
```

```
Val Phe Gly Asp Thr Asp Arg Ser His Ile Lys Lys Asn Leu Leu Gly
        35                  40                  45

Thr Leu Leu Phe Asp Asp Gly Asn Thr Ala Glu Ser Arg Arg Leu Lys
    50                  55                  60

Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu Tyr
65                  70                  75                  80

Leu Gln Glu Ile Phe Thr Glu Ser Met Asn Glu Ile Asp Glu Ser Phe
                85                  90                  95

Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Arg Gly
            100                 105                 110

Ser Lys Tyr Pro Ile Phe Ala Thr Leu Gln Glu Glu Lys Glu Tyr His
        115                 120                 125

Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp Ser
    130                 135                 140

Lys Glu Lys Ser Asp Val Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Thr Phe Asp Ile Lys
                165                 170                 175

Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Asn Ile Tyr Asp
            180                 185                 190

Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val Glu
        195                 200                 205

Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg Val
    210                 215                 220

Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu Phe
225                 230                 235                 240
```

```
Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe Asp
               245                 250                 255

Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp Glu
            260                 265                 270

Glu Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp Leu
        275                 280                 285

Phe Leu Ile Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly Ile
    290                 295                 300

Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Glu Arg Tyr Glu Asn His Gln Lys Asp Leu Ala Ala Leu Lys Gln
               325                 330                 335

Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Val Glu Val Phe Ser Asp
            340                 345                 350

Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr Gln
        355                 360                 365

Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu Gly
    370                 375                 380

Ala Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gln
               405                 410                 415

Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445
```

```
Tyr Tyr Val Gly Pro Leu Ala Arg Asp Asn Arg Asp Phe Ser Trp Leu
    450                 455                 460

Thr Arg Asn Ser Asp Glu Pro Ile Arg Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Ala Arg Ser Ala Glu Asp Phe Ile His Arg Met Thr Asn
                485                 490                 495

Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys Phe
        515                 520                 525

Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln Lys
    530                 535                 540

Lys Gln Ile Val Asn Gln Leu Phe Lys Glu Lys Arg Lys Val Thr Glu
545                 550                 555                 560

Lys Asp Ile Ile His Tyr Leu His Asn Val Asp Gly Tyr Asp Gly Ile
                565                 570                 575

Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Asn Leu Ser Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Ile Thr Lys Asp Lys Glu Phe Met Asp Asp Pro
        595                 600                 605

Lys Asn Glu Glu Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile Phe
    610                 615                 620

Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Thr Leu
625                 630                 635                 640

Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr Gly
                645                 650                 655
```

```
Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Lys Ile Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys Glu
    690                 695                 700

Ile Ile Gln Lys Ala Gln Val Val Gly Lys Thr Asp Asp Val Lys Gln
705                 710                 715                 720

Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Gly Tyr Ala
            740                 745                 750

Leu Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Ala
        755                 760                 765

Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp Ala
    770                 775                 780

Leu Lys Asn Leu Ala Pro Asn Ile Leu Lys Glu Asn Pro Thr Asp Asn
785                 790                 795                 800

Ile Gln Leu Lys Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Lys Asp Met Tyr Thr Gly Lys Pro Leu Asp Ile Asn Gln Leu Ser Ser
            820                 825                 830

Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser
        835                 840                 845

Ile Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys Ser
    850                 855                 860
```

```
Asp Asn Val Pro Ser Leu Glu Val Val Gln Lys Arg Lys Ala Phe Trp
865                 870                 875                 880


Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn Asn
                885                 890                 895


Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val Gly
            900                 905                 910


Phe Ile Arg Arg Gln Leu Val Glu Thr Gln Gln Ile Thr Lys Asn Val
        915                 920                 925


Ala Gln Ile Leu Asp Ala Arg Phe Asn Thr Glu Val Lys Glu Lys Asn
    930                 935                 940


Gln Lys Ile Arg Thr Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val
945                 950                 955                 960


Ser Asn Phe Arg Lys Glu Phe Gly Leu Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975


Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys
            980                 985                 990


Ala Ile Leu Lys Lys Tyr Pro Lys  Leu Glu Pro Glu Phe  Val Tyr Gly
        995                 1000                1005


Asp Tyr  Gln Lys Tyr Asp Leu  Phe Lys Pro Ser Lys  Glu Ile Glu
    1010                1015                1020


Lys Ala  Thr Glu Lys Tyr Phe  Phe Tyr Ser Asn Leu  Leu Asn Phe
    1025                1030                1035


Phe Lys  Glu Glu Val Leu Tyr  Ala Asp Gly Thr Ile  Arg Lys Arg
    1040                1045                1050


Glu Asn  Ile Glu Tyr Ser Lys  Asp Thr Gly Glu Ile  Ala Trp Asp
    1055                1060                1065
```

```
Lys Glu  Lys Asp Phe Ala Thr  Ile Lys Lys Val Leu  Ser Tyr Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Arg Glu Val Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Pro  Lys Gly Asn Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Lys Asp Ile  Leu Trp Asp Thr Thr  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Val Ile  Ala Tyr Ser Ile Leu  Leu Ile Ala
    1130                1135                1140

Asp Ile  Glu Lys Gly Lys Ala  Lys Lys Leu Lys Thr  Val Lys Thr
    1145                1150                1155

Leu Val  Gly Ile Thr Ile Met  Glu Lys Ala Ala Phe  Glu Glu Asn
    1160                1165                1170

Pro Ile  Thr Phe Leu Glu Asn  Lys Gly Tyr His Asn  Val Arg Lys
    1175                1180                1185

Glu Asn  Ile Leu Cys Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Lys Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Ile Val Leu Pro  Val Cys Leu Thr Thr  Leu Leu Tyr
    1220                1225                1230

His Ser  Lys Asn Leu His Lys  Leu Asp Glu Pro Glu  His Leu Glu
    1235                1240                1245

Tyr Ile  Gln Lys His Arg Asn  Glu Phe Lys Asp Leu  Leu Asn Leu
    1250                1255                1260
```

```
Val Ser  Glu Phe Ser Gln Lys  Tyr Ile Leu Ala Glu  Ala Asn Leu
    1265                1270                1275


Glu Lys  Ile Lys Asp Leu Tyr  Ala Asp Asn Glu Gln  Ala Asp Ile
    1280                1285                1290


Glu Ile  Leu Ala Asn Ser Phe  Ile Asn Leu Leu Thr  Phe Thr Ala
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Phe Phe Gly Lys  Asp Val Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Thr Val  Ser Glu Ile Leu Asn  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Lys  Leu Gly Glu Glu
    1355
```

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<212> PRT
<213> Streptococcus sanguinis

<400> 278

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Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15


Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met Lys
            20                  25                  30


Val Leu Gly Asn Thr Asp Lys His Phe Ile Lys Lys Asn Leu Ile Gly
        35                  40                  45


Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Asp Arg Arg Leu Lys
    50                  55                  60


Arg Thr Ser Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg Tyr
```

65 70 75 80

Leu Gln Glu Ile Phe Ser Glu Glu Ile Ser Lys Leu Asp Ser Ser Phe
85 90 95

Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Arg Gly
100 105 110

Ser Lys Tyr Pro Ile Phe Ala Thr Leu Glu Glu Glu Lys Glu Tyr His
115 120 125

Lys Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp Ser
130 135 140

Lys Glu Lys Thr Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145 150 155 160

Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ser Phe Asp Ile Lys
165 170 175

Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr Asp
180 185 190

Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val Glu
195 200 205

Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Thr Lys Arg Glu Arg Val
210 215 220

Leu Lys Leu Phe Ser Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu Phe
225 230 235 240

Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe Asp
245 250 255

Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp Glu
260 265 270

Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Gly Phe Ala Asp Leu

```
        275                 280                 285

Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly Ile
    290                 295                 300

Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Glu Arg Tyr Glu Asn His Gln Glu Asp Leu Ala Ala Leu Lys Gln
                325                 330                 335

Phe Ile Lys Asn Asn Leu Ser Glu Lys Tyr Ala Glu Val Phe Ser Asp
            340                 345                 350

Gln Ser Lys Asp Gly Tyr Ala Gly Phe Ile Asp Gly Lys Thr Thr Gln
        355                 360                 365

Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Leu Glu Gly
    370                 375                 380

Ala Asp Tyr Phe Leu Asn Lys Ile Glu Arg Glu Asp Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gln
                405                 410                 415

Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Leu Phe Leu
            420                 425                 430

Lys Glu Asn Arg Glu Lys Ile Glu Lys Ile Leu Ala Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp Leu
    450                 455                 460

Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr Asn
```

485 490 495

Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys Phe
515 520 525

Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln Lys
530 535 540

Lys Gln Ile Val Asn Gln Leu Phe Lys Asp Lys Arg Lys Val Thr Glu
545 550 555 560

Lys Asp Ile Ile His Tyr Leu His Asn Val Asp Gly Tyr Asp Gly Ile
565 570 575

Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr Tyr
580 585 590

His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asn Pro
595 600 605

Lys Asn Gly Glu Ile Leu Glu Asn Ile Ile His Thr Leu Thr Ile Phe
610 615 620

Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Thr Leu
625 630 635 640

Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr Gly
645 650 655

Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg Asp Lys Gln
660 665 670

Thr Gly Lys Thr Ile Leu Glu Tyr Leu Ile Asp Asp Gly Asp Cys Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys Glu

690 695 700

Ile Ile Gln Lys Ala Gln Val Val Gly Lys Thr Asp Asp Val Lys Gln
705 710 715 720

Val Val Gln Glu Ile Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His Asn
740 745 750

Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr Ala
755 760 765

Lys Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp Ala
770 775 780

Leu Lys Asn Leu Ala Pro Asn Ile Leu Lys Glu Asn Pro Thr Asp Asn
785 790 795 800

Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn Gly
805 810 815

Lys Asp Met Tyr Thr Gly Lys Ala Ile Asp Ile Asn Gln Leu Ser Asn
820 825 830

Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser
835 840 845

Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys Ser
850 855 860

Asp Asn Val Pro Ser Ile Glu Val Val Gln Lys Arg Lys Ala Phe Trp
865 870 875 880

Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn Asn
885 890 895

Leu Thr Lys Ala Lys Arg Gly Gly Leu Asp Glu Arg Asp Lys Val Gly

```
            900                 905                 910

Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Gln Leu Leu Asp Thr Arg Phe Asn Thr Glu Val Asn Glu Glu Asn
    930                 935                 940

Gln Lys Ile Arg Thr Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val
945                 950                 955                 960

Ser Asn Phe Arg Lys Glu Phe Gly Leu Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Lys
            980                 985                 990

Ala Ile Leu Lys Lys Tyr Pro Lys  Leu Glu Pro Glu Phe  Val Tyr Gly
        995                 1000                1005

Asp Tyr  Gln Lys Tyr Asp Leu  Ser Lys Ala Ser Asn  Thr Ile Asp
    1010                1015                1020

Lys Ala  Thr Glu Lys Tyr Phe  Phe Tyr Ser Asn Leu  Leu Asn Phe
    1025                1030                1035

Phe Lys  Glu Lys Val Arg Tyr  Ala Asp Gly Thr Ile  Lys Lys Arg
    1040                1045                1050

Glu Asn  Ile Glu Tyr Ser Asn  Asp Thr Gly Glu Ile  Ala Trp Asn
    1055                1060                1065

Lys Glu  Lys Asp Phe Ala Thr  Ile Lys Lys Val Leu  Ser Leu Pro
    1070                1075                1080

Gln Val  Asn Ile Val Lys Lys  Thr Glu Glu Gln Thr  Gly Gly Leu
    1085                1090                1095

Phe Asp  Asn Asn Ile Val Ser  Lys Lys Lys Val Val  Asp Ala Ser
```

1100 1105 1110

Lys Leu Ile Pro Ile Lys Ser Ser Leu Ser Pro Glu Lys Tyr Gly
1115 1120 1125

Gly Tyr Ala Arg Pro Thr Ile Ala Tyr Ser Val Leu Val Ile Ala
1130 1135 1140

Asp Ile Glu Lys Gly Lys Gly Lys Ala Lys Lys Leu Lys Arg Ile
1145 1150 1155

Lys Glu Ile Val Gly Ile Thr Ile Gln Asp Lys Lys Lys Phe Glu
1160 1165 1170

Ser Asn Pro Val Thr Tyr Leu Glu Glu Cys Gly Tyr Lys Asn Ile
1175 1180 1185

Asn Ser Asn Leu Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Glu
1190 1195 1200

Phe Asn Asp Gly Gln Arg Arg Leu Leu Ala Ser Ser Ile Glu Leu
1205 1210 1215

Gln Lys Gly Asn Glu Leu Ile Leu Pro Tyr His Leu Thr Ala Leu
1220 1225 1230

Leu Tyr His Ala Gln Arg Ile Asn Lys Ile Ser Glu Pro Ile His
1235 1240 1245

Lys Gln Tyr Val Glu Ala His Gln Asn Glu Phe Lys Glu Leu Leu
1250 1255 1260

Thr Thr Ile Ile Ser Leu Ser Lys Lys Tyr Ile Gln Lys Pro Asn
1265 1270 1275

Val Glu Leu Leu Leu Gln Gln Ala Phe Asp Gln Ala Asp Lys Asp
1280 1285 1290

Ile Tyr Gln Leu Ser Glu Ser Phe Ile Ser Leu Leu Lys Leu Thr

1295 1300 1305

Ser Phe Gly Ala Pro Gly Ala Phe Lys Phe Leu Gly Val Glu Ile
1310 1315 1320

Ser Gln Ser Ser Val Arg Tyr Lys Pro Asn Ser Gln Phe Leu Asp
1325 1330 1335

Thr Thr Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg
1340 1345 1350

Ile Asp Leu Ser Lys Leu Gly Glu Asp
1355 1360

<210> 279
<211> 1360
<212> PRT
<213> Streptococcus sp. F0441

<400> 279

Glu Asn Lys Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
20 25 30

Lys Val Leu Gly Asn Thr Asp Lys His Phe Ile Lys Lys Asn Leu Ile
35 40 45

Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Ala Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ser Glu Glu Ile Gly Lys Val Asp Ser Ser
85 90 95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Ile Pro Glu Asp Lys Arg
100 105 110

```
Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Ala Glu Glu Lys Lys Tyr
        115                 120                 125

His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Lys Glu Lys Thr Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ala Phe Asp Ile
                165                 170                 175

Lys Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Ser Ile Tyr
            180                 185                 190

Asn Asn Thr Phe Glu Gly Asn Ser Leu Ser Gly Gln Asn Val Gln Val
        195                 200                 205

Glu Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Ala Lys Arg Glu Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Asp Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Arg Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp
        275                 280                 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Thr Asn Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320
```

```
Met Ile Glu Arg Tyr Glu Asn His Gln Lys Asp Leu Ala Ser Leu Lys
                325                 330                 335

Gln Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Asp Glu Val Phe Ser
            340                 345                 350

Asp Gln Ser Glu Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr
        355                 360                 365

Gln Glu Thr Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
    450                 455                 460

Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Ile Val Asp Lys Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525
```

```
Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540

Lys Lys Gln Ile Val Thr Gln Leu Phe Lys Glu Lys Arg Lys Val Thr
545                 550                 555                 560

Glu Lys Asp Ile Ile Gln Phe Leu His Asn Val Asp Gly Tyr Asp Gly
                565                 570                 575

Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Ala Phe Met Asp Asp
        595                 600                 605

Ala Lys Asn Glu Ala Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Ser
625                 630                 635                 640

Leu Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Ser Asp Lys
            660                 665                 670

Gln Thr Gly Asn Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Glu Ile
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys
    690                 695                 700

Glu Ile Ile Gln Lys Ala Gln Val Val Gly Lys Thr Asn Asp Val Lys
705                 710                 715                 720

Gln Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735
```

```
Leu Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met Gly His
            740                 745                 750

Ala Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp
    770                 775                 780

Ser Leu Lys Ile Leu Ala Ser Lys Ile Leu Lys Glu His Pro Thr Asp
785                 790                 795                 800

Asn Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Lys Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asn Gln Leu Ser
            820                 825                 830

Ser Cys Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp
        835                 840                 845

Ser Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Leu Glu Val Val Asp Lys Met Lys Val Phe
865                 870                 875                 880

Trp Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Tyr Arg Lys Phe Asn
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Asn Glu Leu Asp Lys Val
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ala Arg Phe Asn Lys Glu Val Thr Glu Lys
    930                 935                 940
```

```
Asp Lys Lys Asn Arg Thr Val Lys Ile Ile Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Asn Phe Arg Lys Glu Phe Glu Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala
            980                 985                 990

Lys Ala Ile Leu Lys Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Gln Lys Tyr Asp  Leu Ser Lys Asp Pro  Lys Glu Ile
    1010                1015                1020

Glu Lys  Ala Thr Glu Lys Tyr  Phe Phe Tyr Ser Asn  Leu Leu Asn
    1025                1030                1035

Phe Phe  Lys Glu Glu Val His  Tyr Ala Asp Gly Thr  Ile Val Lys
    1040                1045                1050

Arg Glu  Asn Ile Glu Tyr Ser  Lys Asp Thr Gly Glu  Ile Ala Trp
    1055                1060                1065

Asn Lys  Glu Lys Asp Phe Ala  Thr Ile Lys Lys Val  Leu Ser Leu
    1070                1075                1080

Pro Gln  Val Asn Ile Val Lys  Lys Arg Glu Val Gln  Thr Gly Gly
    1085                1090                1095

Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Asn Ser  Asp Lys Leu
    1100                1105                1110

Ile Pro  Arg Lys Thr Lys Asp  Ile Leu Trp Asp Thr  Thr Lys Tyr
    1115                1120                1125

Gly Gly  Phe Asp Ser Pro Val  Ile Ala Tyr Ser Ile  Leu Leu Ile
    1130                1135                1140
```

```
Ala Asp  Ile Glu Lys Gly Lys  Ala Lys Lys Leu Lys  Thr Val Lys
    1145                1150                1155

Thr Leu  Val Gly Ile Thr Ile  Met Glu Lys Asp Ala  Phe Glu Lys
    1160                1165                1170

Asn Pro  Ile Ala Phe Leu Glu  Asn Lys Gly Tyr His  Asn Val Cys
    1175                1180                1185

Lys Glu  Asn Ile Leu Cys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu
    1190                1195                1200

Glu Asn  Gly Arg Arg Arg Leu  Leu Ala Ser Ala Lys  Glu Leu Gln
    1205                1210                1215

Lys Cys  Asn Glu Ile Val Leu  Pro Val Tyr Leu Thr  Thr Leu Leu
    1220                1225                1230

Tyr His  Ser Lys Asn Val His  Lys Leu Asp Glu Pro  Gly His Leu
    1235                1240                1245

Glu Tyr  Ile Gln Lys His Arg  Asn Glu Phe Lys Asp  Leu Leu Asn
    1250                1255                1260

Leu Val  Ser Glu Phe Ser Gln  Lys Tyr Val Leu Ala  Asp Ala Asn
    1265                1270                1275

Leu Glu  Lys Ile Lys Asn Leu  Tyr Ala Asp Asn Glu  Gln Ala Asp
    1280                1285                1290

Ile Glu  Ile Leu Ala Asn Ser  Phe Ile Asn Leu Leu  Thr Phe Thr
    1295                1300                1305

Ala Leu  Gly Ala Pro Ala Ala  Phe Lys Phe Phe Gly  Lys Asp Val
    1310                1315                1320

Asp Arg  Lys Arg Tyr Thr Thr  Val Ser Glu Ile Leu  Asn Ala Thr
    1325                1330                1335
```

```
Leu Ile  His Gln Ser Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1340                1345                1350


Leu Ser  Lys Leu Gly Glu Asp
    1355                1360


<210>  280
<211>  1360
<212>  PRT
<213>  Streptococcus sp. FF10

<400>  280

Met Lys Lys Pro Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys Glu Tyr Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Met
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Asp Ile Phe Ser Pro Glu Leu Asn Gln Val Asp Glu Ser
                85                  90                  95


Phe Leu His Arg Leu Asp Asp Ser Phe Leu Val Ala Glu Asp Lys Arg
            100                 105                 110


Gly Glu Arg His Val Ile Phe Gly Asn Ile Ala Asp Glu Val Lys Tyr
        115                 120                 125


His Lys Glu Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140
```

```
Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Ile Asp Glu Pro Ile Asp Ile
                165                 170                 175

Arg Asn Met Asn Ser Gln Asn Leu Phe Lys Glu Phe Leu Leu Ala Phe
            180                 185                 190

Asp Gly Ile Gln Val Asp Cys Tyr Leu Ala Ser Lys His Thr Asp Ile
        195                 200                 205

Ser Gly Ile Ile Thr Ala Lys Ile Ser Lys Ser Arg Lys Val Glu Ala
    210                 215                 220

Val Leu Glu Gln Phe Pro Asp Gln Lys Lys Asn Ser Phe Phe Gly Asn
225                 230                 235                 240

Met Val Ser Leu Val Phe Gly Leu Met Pro Asn Phe Lys Ser Asn Phe
                245                 250                 255

Glu Leu Asp Glu Asp Ala Lys Leu Gln Phe Ser Arg Asp Ser Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Gly Ile Ile Gly Asp Glu Tyr Ala Asp
        275                 280                 285

Val Phe Val Ala Ala Lys Lys Val Tyr Asp Ser Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Thr Asn Asn His Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Asp Arg Tyr Asp Glu His Asn Ser Asp Lys Lys Leu Leu Arg
                325                 330                 335

Asp Phe Ile Arg Thr Asn Ile Gly Lys Glu Val Phe Lys Glu Val Phe
            340                 345                 350
```

```
Tyr Asp Thr Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr
        355                 360                 365

Asn Gln Glu Asp Phe Tyr Lys Tyr Leu Lys Asn Leu Leu Gln Lys Val
    370                 375                 380

Asp Gly Gly Asp Tyr Phe Ile Glu Lys Ile Glu Arg Glu Asp Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Val His
                405                 410                 415

Leu Asp Glu Met Lys Ala Ile Leu Arg Arg Gln Gly Glu Phe Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Ala Glu Lys Ile Gln Gln Ile Leu Thr Phe Lys
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala
    450                 455                 460

Trp Ala Ser Tyr Asn Ser Asn Glu Lys Met Thr Pro Trp Asn Phe Asp
465                 470                 475                 480

Asn Val Ile Asp Lys Thr Ser Ser Ala Gln Ala Phe Ile Glu Arg Met
                485                 490                 495

Thr Asn Asn Asp Leu Tyr Leu Pro Asp Gln Lys Val Leu Pro Lys His
            500                 505                 510

Ser Leu Leu Tyr Gln Lys Phe Ala Val Tyr Asn Glu Leu Thr Lys Ile
        515                 520                 525

Lys Tyr Val Thr Glu Thr Gly Glu Ala Arg Leu Phe Asp Val Phe Leu
    530                 535                 540

Lys Lys Glu Ile Phe Asp Gly Leu Phe Lys Lys Glu Arg Lys Val Thr
545                 550                 555                 560
```

```
Lys Lys Lys Ile Leu Asn Phe Leu Asp Lys Asn Phe Asp Glu Phe Arg
                565                 570                 575

Ile Thr Asp Ile Gln Gly Leu Asp Asn Glu Thr Gly Asn Phe Asn Ala
            580                 585                 590

Ser Tyr Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Gly Asp Lys Glu
        595                 600                 605

Phe Met Asp Ser Ser Asp Asn Val Asp Val Leu Glu Asp Ile Val Leu
    610                 615                 620

Ser Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Leu
625                 630                 635                 640

Lys Tyr Glu Asp Ile Phe Ser Lys Lys Val Ile Ala Asn Leu Thr Arg
                645                 650                 655

Arg His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly
            660                 665                 670

Ile Lys Asp Lys His Ser Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp
        675                 680                 685

Asp Gly His Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Asn
    690                 695                 700

Leu Ser Phe Lys Asp Glu Ile Ala Asn Ser Gln Val Ile Gly Asp Gly
705                 710                 715                 720

Asp Asp Leu His Gln Val Val Gln Glu Leu Ala Gly Ser Pro Ala Ile
                725                 730                 735

Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys
            740                 745                 750

Val Met Gly Tyr Asn Pro Glu Gln Ile Val Val Glu Met Ala Arg Glu
        755                 760                 765
```

```
Asn Gln Thr Thr Ala Arg Gly Arg Asn Asn Ser Gln Gln Arg Leu Gly
    770                 775                 780

Ser Leu Thr Lys Ala Ile Gln Asp Phe Gly Ser Asp Ile Leu Lys Arg
785                 790                 795                 800

Tyr Pro Val Glu Asn Asn Gln Leu Gln Asn Asp Gln Leu Tyr Leu Tyr
                805                 810                 815

Tyr Leu Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Thr Leu Asp Ile
            820                 825                 830

His Asn Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe
        835                 840                 845

Ile Lys Asp Asn Ser Leu Asp Asn Arg Val Leu Thr Asn Ser Lys Ser
    850                 855                 860

Asn Arg Gly Lys Ser Asp Asn Val Pro Ser Asn Glu Val Val Lys Arg
865                 870                 875                 880

Met Lys Gly Phe Trp Leu Lys Gln Leu Asp Ala Lys Leu Ile Ser Gln
                885                 890                 895

Arg Lys Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Ala
            900                 905                 910

Glu Asp Lys Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln
        915                 920                 925

Ile Thr Lys His Val Ala Arg Ile Leu Asp Glu Arg Phe Asn Arg Asp
    930                 935                 940

Phe Asp Lys Asn Asp Lys Arg Ile Arg Asn Val Lys Ile Val Thr Leu
945                 950                 955                 960

Lys Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Phe Tyr Lys
                965                 970                 975
```

```
Val Arg Glu Ile Asn Asn Phe His His Ala His Asp Ala Tyr Leu Asn
            980                 985                 990


Ala Val Val Ala Lys Ala Leu Leu  Ile Arg Tyr Pro Lys  Leu Glu Pro
        995                1000                1005


Glu Phe  Val Tyr Gly Glu Tyr  Pro Lys Tyr Asn Ser  Tyr Arg Glu
    1010                1015                1020


Arg Lys  Ala Thr Glu Lys Met  Phe Phe Tyr Ser Asn  Ile Met Asn
    1025                1030                1035


Met Phe  Lys Thr Thr Ile Lys  Leu Ala Asp Gly Arg  Val Val Glu
    1040                1045                1050


Lys Pro  Val Ile Glu Ala Asn  Glu Glu Thr Gly Glu  Ile Ala Trp
    1055                1060                1065


Asp Lys  Thr Lys His Phe Ala  Asn Val Lys Lys Val  Leu Ser Tyr
    1070                1075                1080


Pro Gln  Val Ser Ile Val Lys  Lys Val Glu Glu Gln  Thr Gly Gly
    1085                1090                1095


Phe Ser  Lys Glu Ser Ile Leu  Pro Lys Gly Gly Ser  Asp Lys Leu
    1100                1105                1110


Ile Ala  Arg Lys Thr Lys Asn  Asn Tyr Leu Ser Thr  Gln Lys Tyr
    1115                1120                1125


Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr Ser Ile  Met Phe Val
    1130                1135                1140


Ala Asp  Ile Glu Lys Gly Lys  Ser Lys Arg Leu Lys  Thr Val Lys
    1145                1150                1155


Glu Met  Ile Gly Ile Thr Ile  Met Glu Arg Ser Arg  Phe Glu Ser
    1160                1165                1170
```

```
Asn Ser  Val Thr Phe Leu Glu  Glu Lys Gly Tyr Arg  Asn Ile Arg
    1175                1180                1185

Glu Asn  Thr Ile Ile Lys Phe  Pro Lys Tyr Ser Leu  Phe Glu Leu
    1190                1195                1200

Glu Asn  Gly Arg Arg Arg Leu  Leu Ala Ser Ala Ile  Glu Leu Gln
    1205                1210                1215

Lys Gly  Asn Glu Met Phe Leu  Pro Gln Gln Phe Val  Asn Leu Leu
    1220                1225                1230

Tyr His  Ala Gln His Ala Asn  Lys Glu Asp Ser Val  Ile Tyr Leu
    1235                1240                1245

Glu Lys  His Arg His Glu Leu  Ser Glu Leu Phe His  His Ile Ile
    1250                1255                1260

Gly Val  Ser Glu Lys Thr Ile  Leu Lys Pro Lys Val  Glu Met Thr
    1265                1270                1275

Leu Asn  Glu Ala Phe Glu Lys  His Phe Glu Phe Asp  Glu Val Ser
    1280                1285                1290

Glu Leu  Ala Gln Ser Phe Ile  Ser Leu Leu Lys Phe  Thr Ala Phe
    1295                1300                1305

Gly Ala  Pro Gly Gly Phe Lys  Phe Leu Asp Ala Asp  Ile Lys Gln
    1310                1315                1320

Ser Asn  Leu Arg Tyr Gln Thr  Val Thr Glu Val Leu  Ser Ser Thr
    1325                1330                1335

Leu Ile  His Gln Ser Val Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp
    1340                1345                1350

Leu Ser  Lys Leu Gly Gly Glu
    1355                1360
```

<210> 281
<211> 1364
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<213> Streptococcus sp. M334

<400> 281

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Ser Asn Lys Ser Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Lys His Phe Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Gln Glu Ile Ser Lys Val Asp Ser Ser
                85                  90                  95


Phe Phe His Arg Leu Asp Asp Phe Phe Leu Val Pro Glu Asp Lys Arg
            100                 105                 110


Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Val Glu Glu Lys Glu Tyr
        115                 120                 125


His Lys Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140


Ser Lys Glu Lys Thr Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160


Met Ile Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ser Phe Asp Ile
                165                 170                 175
```

```
Lys Asn Asn Asp Ile Gln Lys Ile Phe Ser Glu Phe Ile Ser Ile Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Gly Lys Ser Leu Ser Gly Gln Asn Ala Gln Val
        195                 200                 205

Glu Ala Ile Phe Thr Asp Lys Ile Ser Lys Ser Thr Lys Arg Glu Arg
    210                 215                 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225                 230                 235                 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
                245                 250                 255

Asp Leu Glu Glu Lys Ala Pro Leu Gln Phe Ser Lys Asp Thr Tyr Asp
            260                 265                 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp
        275                 280                 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Lys Asp Leu Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Ile Glu Arg Tyr Glu Asn His Gln Lys Asp Leu Ala Ala Leu Lys
                325                 330                 335

Gln Phe Ile Gln Asn Asn Leu Gln Glu Lys Tyr Asp Glu Val Phe Ser
            340                 345                 350

Asp Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu
    370                 375                 380
```

```
Gly Ala Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Lys
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met Asn Ala Ile Ile Arg Arg Gln Gly Glu His Tyr Pro Phe
            420                 425                 430

Leu Gln Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Gly Asp Phe Ala Trp
    450                 455                 460

Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465                 470                 475                 480

Ile Val Asp Gln Ala Ser Ser Ala Glu Asp Phe Ile Asn Lys Met Thr
                485                 490                 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Leu Thr Arg Tyr Gln Phe Leu Asp Lys Lys Gln
    530                 535                 540

Lys Lys Asp Ile Phe Asp Thr Phe Phe Lys Ala Glu Asn Lys Arg Lys
545                 550                 555                 560

Val Thr Glu Lys Asp Ile Ile His Tyr Leu His Asn Val Asp Gly Tyr
                565                 570                 575

Asp Gly Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu
            580                 585                 590
```

```
Ser Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Ala Phe Met
        595                 600                 605

Asp Asp Ser Lys Asn Glu Glu Ile Leu Glu Asn Ile Ile His Thr Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr
625                 630                 635                 640

Asp Ser Leu Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asp Lys Lys Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Glu Ile Asn Arg Asn Phe Met Gln Leu Ile His Asp Asp Gly Leu Ser
    690                 695                 700

Phe Lys Glu Ile Ile Gln Lys Ala Gln Val Phe Gly Lys Thr Asn Asp
705                 710                 715                 720

Val Lys Gln Val Val Gln Glu Leu Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly His Ala Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Ala Arg Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile
    770                 775                 780

Glu Asp Ser Leu Lys Asn Leu Ala Ser Asn Ile Leu Lys Glu Asn Pro
785                 790                 795                 800
```

```
Thr Asp Asn Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Gly Lys Pro Leu Glu Ile Asn Gln
            820                 825                 830

Leu Ser Asn Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asp Ser Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asn Val Pro Ser Leu Glu Val Val Glu Lys Met Lys
865                 870                 875                 880

Ala Phe Trp Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys
                885                 890                 895

Phe Asn Asn Leu Thr Lys Ala Glu Arg Glu Arg Gly Gly Leu Asn Glu
            900                 905                 910

Leu Asp Lys Val Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln
        915                 920                 925

Ile Thr Lys His Val Ala Gln Phe Leu Asp Ala Arg Phe Asn Lys Glu
    930                 935                 940

Val Thr Glu Lys Asp Lys Lys Asn Arg Asn Val Lys Ile Ile Thr Leu
945                 950                 955                 960

Lys Ser Asn Leu Val Ser Asn Phe Arg Lys Glu Phe Gly Leu Tyr Lys
                965                 970                 975

Val Arg Glu Ile Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn
            980                 985                 990

Ala Val Leu Ala Lys Ala Ile Leu  Lys Lys Tyr Pro Lys  Leu Glu Pro
        995                 1000                1005
```

```
Glu Phe  Val Tyr Gly Asp Tyr  Gln Lys Tyr Asp Leu  Ser Arg Glu
    1010                1015                1020

Pro Lys  Glu Val Glu Lys Ala  Thr Gln Lys Tyr Phe  Phe Tyr Ser
    1025                1030                1035

Asn Leu  Leu Asn Phe Phe Lys  Glu Glu Val His Tyr  Ala Asp Gly
    1040                1045                1050

Thr Ile  Val Lys Arg Glu Asn  Ile Glu Tyr Ser Lys  Asp Thr Gly
    1055                1060                1065

Glu Ile  Ala Trp Asn Lys Glu  Lys Asp Phe Ala Thr  Val Lys Lys
    1070                1075                1080

Val Leu  Ser Leu Pro Gln Val  Asn Ile Val Lys Lys  Thr Glu Val
    1085                1090                1095

Gln Thr  Gly Gly Phe Ser Lys  Glu Ser Ile Leu Pro  Lys Gly Asn
    1100                1105                1110

Ser Asp  Lys Leu Ile Pro Arg  Lys Thr Lys Glu Ile  Leu Trp Asp
    1115                1120                1125

Thr Thr  Lys Tyr Gly Gly Phe  Asp Ser Pro Val Ile  Ala Tyr Ser
    1130                1135                1140

Ile Leu  Leu Ile Ala Asp Ile  Glu Lys Gly Lys Ala  Lys Lys Leu
    1145                1150                1155

Lys Thr  Val Lys Thr Leu Val  Gly Ile Thr Ile Met  Glu Lys Ala
    1160                1165                1170

Thr Phe  Glu Lys Asn Pro Ile  Thr Phe Leu Glu Asn  Lys Gly Tyr
    1175                1180                1185

His Asn  Val Arg Lys Glu Asn  Ile Leu Cys Leu Pro  Lys Tyr Ser
    1190                1195                1200
```

```
Leu Phe  Glu Leu Glu Ser Gly  Arg Arg Arg Met Leu  Ala Ser Ala
    1205                 1210                 1215


Lys Glu  Leu Gln Lys Gly Asn  Glu Ile Val Leu Pro  Val Tyr Leu
    1220                 1225                 1230


Thr Thr  Leu Leu Tyr His Ser  Lys Asn Val His Lys  Leu Asp Glu
    1235                 1240                 1245


Pro Glu  His Leu Glu Tyr Ile  Gln Lys His Arg Tyr  Glu Phe Lys
    1250                 1255                 1260


Asp Leu  Leu Asn Leu Val Ser  Glu Phe Ser Gln Lys  Tyr Val Leu
    1265                 1270                 1275


Ala Asp  Ala Asn Leu Glu Lys  Ile Lys Asn Leu Tyr  Ala Asp Asn
    1280                 1285                 1290


Glu Gln  Ala Asp Ile Glu Ile  Leu Ala Asn Ser Phe  Ile Asn Leu
    1295                 1300                 1305


Leu Thr  Phe Thr Ala Leu Gly  Ala Pro Ala Ala Phe  Lys Phe Leu
    1310                 1315                 1320


Gly Lys  Asp Val Asp Arg Lys  Arg Tyr Thr Thr Val  Ser Glu Ile
    1325                 1330                 1335


Leu Asn  Ala Thr Leu Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu
    1340                 1345                 1350


Thr Arg  Ile Asp Leu Ser Lys  Leu Gly Glu Asp
    1355                 1360
```

<210> 282
<211> 1360
<212> PRT
<213> Streptococcus sp. taxon 056

<400> 282

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Asn Asn Asn Asn Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
```

```
1               5                   10                  15

Gly Trp Ala Val Ile Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30

Arg Val Leu Gly Asn Thr Asp Lys Arg Phe Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Glu Gly Thr Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Ser Lys Val Asp Ser Ser
                85                  90                  95

Phe Phe His Arg Leu Asp Asp Ser Phe Leu Val Pro Glu Asp Lys Ser
            100                 105                 110

Gly Ser Lys Tyr Pro Ile Phe Ala Thr Leu Ala Glu Glu Lys Glu Tyr
        115                 120                 125

His Lys Lys Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ser Lys Glu Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Thr Lys Tyr Arg Gly His Phe Leu Tyr Glu Glu Ala Phe Asp Ile
                165                 170                 175

Lys Asn Asn Asp Ile Gln Lys Ile Phe Asn Glu Phe Ile Asn Ile Tyr
            180                 185                 190

Asp Asn Thr Phe Glu Gly Ser Ser Leu Ser Gly Gln Asn Ala Gln Val
        195                 200                 205

Glu Ala Ile Phe Thr Gly Lys Ile Ser Lys Ser Val Lys Arg Glu His
```

210 215 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Ser Thr Gly Leu Phe Ser Glu
225 230 235 240

Phe Leu Lys Leu Ile Val Gly Asn Gln Ala Asp Phe Lys Lys His Phe
245 250 255

Asp Leu Glu Glu Lys Ala Ser Leu Gln Phe Ser Lys Asp Thr Tyr Asp
260 265 270

Glu Asp Leu Glu Asn Leu Leu Gly Gln Ile Gly Asp Asp Phe Ala Asp
275 280 285

Leu Phe Leu Val Ala Lys Lys Leu Tyr Asp Ala Ile Leu Leu Ser Gly
290 295 300

Ile Leu Thr Val Thr Asp Pro Ser Thr Lys Ala Pro Leu Ser Ala Ser
305 310 315 320

Met Ile Glu Arg Tyr Glu Asn His Gln Glu Asp Leu Ala Ala Leu Lys
325 330 335

Gln Phe Ile Lys Asn Asn Leu Pro Glu Lys Tyr Ala Glu Val Phe Ser
340 345 350

Asp Gln Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr
355 360 365

Gln Glu Ala Phe Tyr Lys Tyr Ile Lys Asn Leu Leu Ser Lys Phe Glu
370 375 380

Gly Ala Asp Tyr Phe Leu Asp Lys Ile Glu Arg Glu Asp Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
405 410 415

Gln Glu Met Asn Ala Ile Leu Arg Arg Gln Gly Glu His Tyr Pro Leu

420 425 430

Leu Lys Glu Asn Lys Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Arg Asp Phe Ala Trp
450 455 460

Leu Thr Arg Asn Ser Asp Gln Ala Ile Arg Pro Trp Asn Phe Glu Glu
465 470 475 480

Ile Val Asp Lys Ala Ser Ser Ala Glu Ser Phe Ile Asn Lys Met Thr
485 490 495

Asn Tyr Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
500 505 510

Leu Leu Tyr Glu Thr Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
515 520 525

Phe Ile Ala Glu Gly Leu Arg Asp Tyr Gln Phe Phe Asp Ser Gly Gln
530 535 540

Lys Lys Gln Ile Val Asn Gln Leu Phe Lys Glu Lys Arg Lys Val Thr
545 550 555 560

Glu Lys Asp Ile Ile His Tyr Leu His Asn Val Asp Gly Tyr Asp Gly
565 570 575

Ile Glu Leu Lys Gly Ile Glu Lys Gln Phe Asn Ala Ser Leu Ser Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Glu Phe Met Asp Asn
595 600 605

His Lys Asn Gln Glu Ile Leu Glu Asn Ile Val His Thr Leu Thr Ile
610 615 620

Phe Glu Asp Arg Glu Met Ile Lys Gln Arg Leu Ala Gln Tyr Asp Ser

625 630 635 640

Ile Phe Asp Glu Lys Val Ile Lys Ala Leu Thr Arg Arg His Tyr Thr
645 650 655

Gly Trp Gly Lys Leu Ser Ala Lys Leu Ile Asn Gly Ile Cys Asp Lys
660 665 670

Lys Thr Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Tyr Asn
675 680 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Gly Leu Ser Phe Lys
690 695 700

Glu Ile Ile Gln Lys Ala Gln Val Val Gly Lys Thr Asp Asp Leu Thr
705 710 715 720

Gln Val Val Arg Glu Leu Ser Gly Ser Pro Ala Ile Lys Lys Gly Ile
725 730 735

Leu Gln Ser Ile Lys Ile Val Asp Glu Leu Val Lys Ile Met Gly Tyr
740 745 750

Ala Pro Glu Ser Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Ala Lys Gly Lys Lys Asn Ser Gln Gln Arg Tyr Lys Arg Ile Glu Asp
770 775 780

Ala Leu Lys Asn Leu Ala Pro Thr Ile Ser Lys Glu Asn Pro Thr Asp
785 790 795 800

Asn Ile Gln Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
805 810 815

Gly Lys Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asn Gln Leu Ser
820 825 830

Ser Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp

```
        835                 840                 845

Ser Leu Asp Asn Arg Val Leu Thr Ser Ser Lys Asp Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Leu Glu Val Val Lys Lys Arg Lys Ala Phe
865                 870                 875                 880

Trp Gln Gln Leu Leu Asp Ser Lys Leu Ile Ser Glu Arg Lys Phe Asn
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Asp Glu Arg Asp Lys Val
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Arg Ile Leu Asp Ala Arg Phe Asn Thr Glu Val Ser Glu Lys
    930                 935                 940

Asn Gln Lys Ile Arg Ser Val Lys Ile Ile Thr Leu Lys Ser Asn Leu
945                 950                 955                 960

Val Ser Asn Phe Arg Lys Glu Phe Lys Leu Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala
            980                 985                 990

Lys Ala Ile Leu Lys Lys Tyr Pro  Lys Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Gln Lys Tyr Asp  Leu Ser Lys Asp Pro  Lys Glu Val
    1010                1015                1020

Glu Lys  Ala Thr Glu Lys Tyr  Phe Phe Tyr Ser Asn  Leu Leu Asn
    1025                1030                1035

Phe Phe  Lys Glu Glu Val His  Tyr Ala Asp Gly Thr  Ile Val Lys
```

1040 1045 1050

Arg Glu Asn Ile Glu Tyr Ser Lys Asp Thr Gly Glu Ile Ala Trp
1055 1060 1065

Asn Lys Glu Lys Asp Phe Val Thr Ile Lys Lys Val Leu Ser Tyr
1070 1075 1080

Pro Gln Val Asn Ile Val Lys Lys Arg Glu Val Gln Thr Gly Gly
1085 1090 1095

Phe Ser Lys Glu Ser Ile Leu Pro Lys Gly Asn Ser Asp Lys Leu
1100 1105 1110

Ile Pro Arg Lys Thr Lys Asp Ile Leu Trp Asp Thr Thr Lys Tyr
1115 1120 1125

Gly Gly Phe Asp Ser Pro Val Ile Ala Tyr Ser Ile Leu Leu Ile
1130 1135 1140

Ala Asp Ile Glu Lys Gly Lys Ala Lys Lys Leu Lys Thr Val Lys
1145 1150 1155

Thr Leu Val Gly Ile Thr Ile Met Glu Lys Ala Ala Phe Glu Lys
1160 1165 1170

Asn Pro Ile Thr Phe Leu Glu Asn Lys Gly Tyr His Asn Val Arg
1175 1180 1185

Lys Glu Asn Ile Leu Cys Leu Pro Lys Tyr Ser Leu Phe Glu Leu
1190 1195 1200

Glu Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Lys Glu Leu Gln
1205 1210 1215

Lys Gly Asn Glu Ile Val Leu Pro Val Tyr Leu Thr Thr Leu Leu
1220 1225 1230

Tyr His Ser Lys Asn Val His Lys Leu Asp Glu Pro Glu His Leu

1235 1240 1245

Glu Tyr Ile Gln Lys His Arg Tyr Glu Phe Lys Asp Leu Leu Asn
1250 1255 1260

Leu Val Ser Glu Phe Ser Gln Lys Tyr Val Leu Ala Glu Ala Asn
1265 1270 1275

Leu Glu Lys Ile Lys Ser Leu Tyr Val Asp Asn Glu Gln Ala Asp
1280 1285 1290

Ile Glu Ile Leu Ala Asn Ser Phe Ile Asn Leu Leu Thr Phe Thr
1295 1300 1305

Ala Leu Gly Ala Pro Ala Ala Phe Lys Phe Phe Gly Lys Asp Val
1310 1315 1320

Asp Arg Lys Arg Tyr Thr Thr Val Ser Glu Ile Leu Asn Ala Thr
1325 1330 1335

Leu Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp
1340 1345 1350

Leu Ser Lys Leu Gly Glu Asp
1355 1360

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<400> 283

Met Lys Lys Lys Tyr Ala Ile Gly Ile Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
20 25 30

Lys Val Phe Gly Asn Thr Glu Lys Arg Tyr Ile Lys Lys Asn Leu Leu
35 40 45

```
Gly Thr Leu Leu Phe Asp Glu Gly Asn Thr Ala Glu Asn Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Ile Asn Lys Ile Asp Asp Ser
                85                  90                  95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Ile Val Glu Asp Lys Gln
            100                 105                 110

Gly Ser Lys His Pro Ile Phe Gly Thr Leu Gln Glu Glu Lys Lys Tyr
        115                 120                 125

His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Ser Gln Lys Ala Asp Ile Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Lys Ser
                165                 170                 175

Glu Asn Lys Asp Val Gln His Leu Phe Asn Asp Phe Val Glu Met Phe
            180                 185                 190

Asp Lys Thr Val Glu Gly Ser Tyr Leu Ser Glu Asn Leu Pro Asn Val
        195                 200                 205

Ala Asp Val Leu Val Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Ile Leu His Tyr Phe Pro Asn Glu Lys Lys Asn Gly Leu Phe Gly Asn
225                 230                 235                 240

Phe Leu Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255
```

```
Glu Leu Ala Glu Asp Ala Lys Ile Gln Phe Ser Lys Glu Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Ile Ala Thr Lys Ser Leu Tyr Asp Gly Ile Leu Leu Ala Gly
    290                 295                 300

Ile Leu Ser Thr Thr Asp Ser Thr Thr Lys Ala Pro Leu Ser Ser Ser
305                 310                 315                 320

Met Val Asn Arg Tyr Glu Glu His Lys Lys Asp Leu Ala Leu Leu Lys
                325                 330                 335

Asn Phe Ile His Gln Asn Leu Ser Asp Ser Tyr Lys Glu Val Phe Asn
            340                 345                 350

Asp Lys Leu Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr Thr
        355                 360                 365

Gln Glu Asn Phe Tyr Arg Phe Ile Lys Lys Ala Ile Glu Lys Ile Glu
    370                 375                 380

Gly Ser Asp Tyr Phe Ile Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Val Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Glu Phe Ala Trp
    450                 455                 460
```

```
Leu Asn Arg Lys Ser Asp Glu Lys Ile Arg Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Met Val Asp Lys Glu Thr Ser Ala Glu Asn Phe Ile Thr Arg Met Thr
                485                 490                 495

Asn Tyr Asp Gln Tyr Leu Pro Asp Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Met Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540

Lys Lys Asp Ile Val Lys Thr Leu Phe Lys Thr Lys Arg Lys Val Thr
545                 550                 555                 560

Ala Lys Asp Ile Lys Ala Tyr Leu Glu Asn Ser Asn Gly Tyr Ala Gly
                565                 570                 575

Val Glu Leu Lys Gly Leu Glu Glu Gln Phe Asn Ala Ser Leu Pro Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Leu Arg Asp Lys Ala Phe Ile Asp Ala
        595                 600                 605

Glu Glu Asn Gln Glu Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Lys Tyr Lys Asp
625                 630                 635                 640

Ile Leu Thr Glu Glu Gln Arg Lys Lys Leu Glu Arg Arg His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Leu Asp Lys
            660                 665                 670
```

```
Val Thr Arg Lys Thr Ile Leu Gly Tyr Leu Ile Asp Asp Gly Thr Ser
        675                 680                 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Thr Leu Ser Phe Val
    690                 695                 700

Asp Glu Ile Arg Leu Ala Gln Gly Ser Gly Glu Ala Glu Asp Tyr Arg
705                 710                 715                 720

Ala Glu Val Gln Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Ile Glu Val Met Gly Tyr
            740                 745                 750

Asp Pro Glu His Ile Val Val Glu Met Ala Arg Glu Asn Gln Phe Thr
        755                 760                 765

Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Lys Ile Glu Asn
    770                 775                 780

Ala Ile Lys Asn Leu Asn Ser Lys Ile Leu Lys Glu Tyr Pro Thr Asn
785                 790                 795                 800

Asn Gln Ala Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Lys Asp Met Tyr Thr Asp Glu Glu Leu Asp Ile Asp Gln Leu Ser
            820                 825                 830

Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp
        835                 840                 845

Ser Leu Asp Asn Lys Val Leu Thr Lys Ser Ala Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asp Val Pro Ser Leu Glu Ile Val His Lys Lys Lys Asn Phe
865                 870                 875                 880
```

```
Trp Lys Gln Leu Leu Asp Ser Gln Leu Ile Ser Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asn Glu Asp Lys Ala
            900                 905                 910

Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Arg Ile Leu Asp Thr Arg Phe Asn Thr Lys Leu Asp Glu Ala
    930                 935                 940

Gly Asn Arg Ile Arg Asp Pro Lys Val Asn Ile Ile Thr Leu Lys Ser
945                 950                 955                 960

Asn Leu Val Ser Gln Phe Arg Lys Asp Tyr Gln Leu Tyr Lys Val Arg
                965                 970                 975

Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val
            980                 985                 990

Val Ala Thr Ala Leu Leu Lys Lys  Tyr Pro Gln Leu Ala  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Asp Tyr Pro Lys  Tyr Asn Ser Tyr Lys  Ser Arg Lys
    1010                1015                1020

Ala Thr  Glu Lys Val Leu Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Arg Arg  Val Leu Val Tyr Ser  Lys Thr Gly Glu Val  Arg Ile Arg
    1040                1045                1050

Pro Val  Ile Glu Val Asn Lys  Glu Thr Gly Glu Ile  Val Trp Asp
    1055                1060                1065

Lys Lys  Ser Asp Phe Arg Thr  Val Arg Lys Val Leu  Ser Tyr Pro
    1070                1075                1080
```

```
Gln Val  Asn Val Val Lys Lys  Val Glu Met Gln Thr  Gly Gly Phe
    1085                1090                1095

Ser Lys  Glu Ser Ile Leu Gln  His Gly Asp Ser Asp  Lys Leu Ile
    1100                1105                1110

Pro Arg  Lys Thr Glu Lys Phe  Tyr Leu Asp Thr Lys  Lys Tyr Gly
    1115                1120                1125

Gly Phe  Asp Ser Pro Thr Ile  Ala Tyr Ser Val Leu  Leu Ile Ala
    1130                1135                1140

Asp Ile  Glu Lys Gly Lys Ala  Lys Lys Leu Lys Arg  Val Lys Glu
    1145                1150                1155

Leu Ile  Gly Ile Thr Ile Met  Glu Arg Met Ala Phe  Glu Lys Asn
    1160                1165                1170

Pro Ile  Glu Phe Leu Glu His  Lys Gly Tyr Lys Asn  Ile Leu Glu
    1175                1180                1185

Lys Asn  Ile Ile Lys Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu
    1190                1195                1200

Asn Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Lys Glu  Leu Gln Lys
    1205                1210                1215

Gly Asn  Glu Met Ile Leu Pro  Pro His Leu Val Thr  Leu Leu Tyr
    1220                1225                1230

His Ser  Ser Asn Ile His Lys  Ile Thr Glu Pro Ile  His Leu Asn
    1235                1240                1245

Tyr Val  Asn Lys Asn Lys His  Glu Phe Lys Glu Leu  Leu Arg His
    1250                1255                1260

Ile Ser  Asp Phe Ser Thr Arg  Tyr Ile Leu Ala Gln  Asp Arg Leu
    1265                1270                1275
```

```
Ser Lys  Ile Glu Glu Leu Tyr  Asp Lys Asn Asp Gly  Asp Asp Ile
    1280                1285                1290


Ser Asp  Leu Thr Ser Ser Phe  Val Asn Leu Leu Thr  Phe Thr Ala
    1295                1300                1305


Ile Gly  Ala Pro Ala Ala Phe  Lys Phe Leu Gly Ser  Val Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Ile  Ala Glu Ile Leu Glu  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Val Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Lys  Leu Gly Gly Asp
    1355


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<213>  Streptococcus suis

<400>  284

Met Lys Lys Lys Tyr Ala Ile Gly Ile Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Lys Val Phe Gly Asn Thr Glu Lys Arg Tyr Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Thr Leu Leu Phe Asp Glu Gly Asn Thr Ala Glu Asn Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80
```

```
Tyr Leu Gln Glu Ile Phe Ala Glu Glu Ile Asn Lys Ile Asp Asp Ser
                85                  90                  95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Ile Val Glu Asp Lys Gln
            100                 105                 110

Gly Ser Lys His Pro Ile Phe Gly Thr Leu Gln Glu Glu Lys Glu Tyr
        115                 120                 125

His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Ser Gln Lys Ala Asp Ile Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Lys Ser
                165                 170                 175

Glu Asn Lys Asp Val Gln His Leu Phe Asn Asp Phe Val Glu Met Phe
            180                 185                 190

Asp Lys Thr Val Glu Gly Ser Tyr Leu Ser Glu Asn Leu Pro Asn Val
        195                 200                 205

Ala Asp Val Leu Val Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Ile Leu His Tyr Phe Pro Asn Glu Lys Lys Asn Gly Leu Phe Gly Asn
225                 230                 235                 240

Phe Leu Thr Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Glu Leu Ala Glu Asp Ala Lys Ile Gln Phe Ser Lys Glu Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285
```

```
Leu Phe Ile Ala Thr Lys Ser Leu Tyr Asp Gly Ile Leu Leu Ala Gly
    290                 295                 300

Ile Leu Ser Thr Thr Asp Ser Thr Thr Lys Ala Pro Leu Ser Ser Ser
305                 310                 315                 320

Met Val Asn Arg Tyr Glu Glu His Gln Lys Asp Leu Ala Leu Leu Lys
                325                 330                 335

Asn Phe Ile His Gln Asn Leu Ser Asp Ser Tyr Lys Glu Val Phe Asn
            340                 345                 350

Asp Lys Leu Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr Thr
        355                 360                 365

Gln Glu Asn Phe Tyr Arg Phe Ile Lys Lys Ala Ile Glu Lys Ile Glu
    370                 375                 380

Gly Ser Asn Tyr Phe Ile Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Val Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Glu Phe Ala Trp
    450                 455                 460

Leu Asn Arg Lys Ser Asp Glu Lys Ile Arg Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Met Val Asp Lys Glu Thr Ser Ala Glu Asn Phe Ile Thr Arg Met Thr
                485                 490                 495
```

```
Asn Tyr Asp Gln Tyr Leu Pro Asp Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525

Tyr Val Thr Glu Gln Gly Lys Ser Phe Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Glu Lys Leu Met Asp Phe Leu Gly Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Leu Gly Leu Asp Lys Asp Asn Lys Ser Phe Asn Ala Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Val Ser Lys Asp Leu Leu
        595                 600                 605

Asp Asn Pro Glu Asn Glu Asp Ile Leu Glu Asn Val Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Lys Tyr
625                 630                 635                 640

Lys Asp Val Leu Thr Glu Glu Gln Arg Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asp Lys Val Thr Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Thr Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Thr Leu Ser
    690                 695                 700
```

```
Phe Val Asp Glu Ile Arg Leu Ala Gln Gly Ser Gly Glu Ala Glu Asp
705                 710                 715                 720

Tyr Arg Ala Glu Val Gln Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Ile Glu Val Met
            740                 745                 750

Gly Tyr Asp Pro Glu His Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Lys Ile
    770                 775                 780

Glu Asn Ala Ile Lys Asn Leu Asn Ser Lys Ile Leu Lys Glu Tyr Pro
785                 790                 795                 800

Thr Asn Asn Gln Ala Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Lys Asp Met Tyr Thr Asp Glu Glu Leu Asp Ile Asp Gln
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asp Ser Leu Asp Asn Lys Val Leu Thr Lys Ser Ala Lys Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val His Lys Lys Lys
865                 870                 875                 880

Asn Phe Trp Lys Gln Leu Leu Asp Ser Gln Leu Ile Ser Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asn Glu Asp
            900                 905                 910
```

```
Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Thr Arg Phe Asn Thr Lys Leu Asp
    930                 935                 940

Glu Ala Gly Asn Arg Ile Arg Asp Pro Lys Val Asn Ile Ile Thr Leu
945                 950                 955                 960

Lys Ser Asn Leu Val Ser Gln Phe Arg Lys Asp Tyr Gln Leu Tyr Lys
                965                 970                 975

Val Arg Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn
            980                 985                 990

Ala Val Val Ala Thr Ala Leu Leu  Lys Lys Tyr Pro Gln  Leu Ala Pro
        995                 1000                1005

Glu Phe  Val Tyr Gly Asp Tyr  Pro Lys Tyr Asn Ser  Tyr Lys Ser
    1010                1015                1020

Arg Lys  Ala Thr Glu Lys Val  Leu Phe Tyr Ser Asn  Ile Met Asn
    1025                1030                1035

Phe Phe  Arg Arg Val Leu Val  Tyr Ser Lys Thr Gly  Glu Val Arg
    1040                1045                1050

Ile Arg  Pro Val Ile Glu Val  Asn Lys Glu Thr Gly  Glu Ile Val
    1055                1060                1065

Trp Asp  Lys Lys Ser Asp Phe  Arg Thr Val Arg Lys  Val Leu Ser
    1070                1075                1080

Tyr Pro  Gln Val Asn Val Val  Lys Lys Val Glu Met  Gln Thr Gly
    1085                1090                1095

Gly Phe  Ser Lys Glu Ser Ile  Leu Gln His Gly Asp  Ser Asp Lys
    1100                1105                1110
```

```
Leu Ile  Pro Arg Lys Thr Glu  Lys Phe Tyr Leu Asp  Thr Lys Lys
    1115                1120                1125

Tyr Gly  Gly Phe Asp Ser Pro  Thr Ile Ala Tyr Ser  Val Leu Leu
    1130                1135                1140

Ile Ala  Asp Ile Glu Lys Gly  Lys Ala Lys Lys Leu  Lys Arg Val
    1145                1150                1155

Lys Glu  Leu Ile Gly Ile Thr  Ile Met Glu Arg Met  Ala Phe Glu
    1160                1165                1170

Lys Asn  Pro Ile Glu Phe Leu  Glu His Lys Gly Tyr  Lys Asn Ile
    1175                1180                1185

Leu Glu  Lys Asn Ile Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu
    1190                1195                1200

Leu Glu  Asn Gly Arg Arg Arg  Leu Leu Ala Ser Ala  Lys Glu Leu
    1205                1210                1215

Gln Lys  Gly Asn Glu Met Ile  Leu Pro Pro His Leu  Val Thr Leu
    1220                1225                1230

Leu Tyr  His Ser Ser Asn Ile  His Lys Ile Thr Glu  Pro Ile His
    1235                1240                1245

Leu Asn  Tyr Val Asn Lys Asn  Lys His Glu Phe Lys  Glu Leu Leu
    1250                1255                1260

Arg His  Ile Ser Asp Phe Ser  Thr Arg Tyr Ile Leu  Ala Gln Asp
    1265                1270                1275

Arg Leu  Ser Lys Ile Glu Glu  Leu Tyr Asp Lys Asn  Asp Gly Asp
    1280                1285                1290

Asp Ile  Ser Asp Leu Thr Ser  Ser Phe Val Asn Leu  Leu Thr Phe
    1295                1300                1305
```

```
Thr Ala  Ile Gly Ala Pro Ala  Ala Phe Lys Phe Leu  Gly Ser Val
    1310                1315                1320


Ile Asp  Arg Lys Arg Tyr Thr  Ser Ile Ala Glu Ile  Leu Glu Ala
    1325                1330                1335


Thr Leu  Ile His Gln Ser Val  Thr Gly Leu Tyr Glu  Thr Arg Ile
    1340                1345                1350


Asp Leu  Ser Lys Leu Gly Gly  Asp
    1355                1360


<210>  285
<211>  1361
<212>  PRT
<213>  Streptococcus suis

<400>  285

Met Lys Lys Lys Tyr Ala Ile Gly Ile Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Lys Val Phe Gly Asn Thr Glu Lys Arg Tyr Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Thr Leu Leu Phe Asp Glu Gly Asn Thr Ala Glu Asn Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Ile Asn Lys Ile Asp Asp Ser
                85                  90                  95


Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Ile Val Glu Asp Lys Gln
            100                 105                 110
```

```
Gly Ser Lys His Pro Ile Phe Gly Thr Leu Gln Glu Glu Lys Glu Tyr
        115                 120                 125

His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140

Ser Ser Gln Lys Ala Asp Ile Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Lys Ser
                165                 170                 175

Glu Asn Lys Asp Val Gln His Leu Phe Asn Asp Phe Val Glu Met Phe
            180                 185                 190

Asp Lys Thr Val Glu Gly Ser Tyr Leu Ser Glu Asn Leu Pro Asn Val
        195                 200                 205

Ala Asp Val Leu Val Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Ile Leu His Tyr Phe Pro Asn Glu Lys Lys Asn Gly Leu Phe Gly Asn
225                 230                 235                 240

Phe Leu Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Glu Leu Ala Glu Asp Ala Lys Ile Gln Phe Ser Lys Glu Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
        275                 280                 285

Leu Phe Ile Ala Thr Lys Ser Leu Tyr Asp Gly Ile Leu Leu Ala Gly
    290                 295                 300

Ile Leu Ser Thr Thr Asp Ser Thr Thr Lys Ala Pro Leu Ser Ser Ser
305                 310                 315                 320
```

```
Met Val Asn Arg Tyr Glu Glu His Gln Lys Asp Leu Ala Leu Leu Lys
                325                 330                 335

Asn Phe Ile His Gln Asn Leu Ser Asp Ser Tyr Lys Glu Val Phe Asn
            340                 345                 350

Asp Lys Leu Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr Thr
        355                 360                 365

Gln Glu Asn Phe Tyr Arg Phe Ile Lys Lys Ala Ile Glu Lys Ile Glu
    370                 375                 380

Gly Ser Asn Tyr Phe Ile Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Val Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Glu Phe Ala Trp
    450                 455                 460

Leu Asn Arg Lys Ser Asp Glu Lys Ile Arg Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Met Val Asp Lys Glu Thr Ser Ala Glu Asn Phe Ile Thr Arg Met Thr
                485                 490                 495

Asn Tyr Asp Gln Tyr Leu Pro Asp Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525
```

```
Tyr Val Thr Glu Gln Gly Lys Ser Phe Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp Gly Val Phe Lys Val Tyr Arg Lys Val Thr Lys
545                 550                 555                 560

Glu Lys Leu Met Asp Phe Leu Gly Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Leu Gly Leu Asp Lys Asp Asn Lys Ser Phe Asn Ala Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Lys Lys Ile Val Ser Lys Asp Leu Leu
        595                 600                 605

Asp Asn Pro Glu Asn Glu Asp Ile Leu Glu Asn Val Val Leu Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Lys Tyr
625                 630                 635                 640

Lys Asp Val Leu Thr Glu Glu Gln Arg Lys Lys Leu Glu Arg Arg His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asp Lys Val Thr Arg Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Thr Ser Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Thr Leu Ser
    690                 695                 700

Phe Val Asp Glu Ile Arg Leu Ala Gln Gly Ser Gly Glu Ala Glu Asp
705                 710                 715                 720

Tyr Arg Ala Glu Val Gln Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735
```

```
Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Ile Glu Val Met
            740                 745                 750

Gly Tyr Asp Pro Glu His Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Phe Thr Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Lys Ile
    770                 775                 780

Glu Asn Ala Ile Lys Asn Leu Asn Ser Lys Ile Leu Lys Glu Tyr Pro
785                 790                 795                 800

Thr Asn Asn Gln Ala Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Lys Asp Met Tyr Thr Asp Glu Glu Leu Asp Ile Asp Gln
            820                 825                 830

Leu Ser Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys
        835                 840                 845

Asp Asp Ser Leu Asp Asn Lys Val Leu Thr Lys Ser Ala Lys Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asp Val Pro Ser Leu Glu Ile Val His Lys Lys Lys
865                 870                 875                 880

Asn Phe Trp Lys Gln Leu Leu Asp Ser Gln Leu Ile Ser Gln Arg Lys
                885                 890                 895

Phe Asp Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asn Glu Asp
            900                 905                 910

Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
        915                 920                 925

Lys His Val Ala Arg Ile Leu Asp Thr Arg Phe Asn Thr Lys Leu Asp
    930                 935                 940
```

```
Glu Ala Gly Asn Arg Ile Arg Asp Pro Lys Val Asn Ile Ile Thr Leu
945                 950                 955                 960


Lys Ser Asn Leu Val Ser Gln Phe Arg Lys Asp Tyr Gln Leu Tyr Lys
                965                 970                 975


Val Arg Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn
            980                 985                 990


Ala Val Val Ala Thr Ala Leu Leu  Lys Lys Tyr Pro Gln  Leu Ala Pro
        995                 1000                1005


Glu Phe  Val Tyr Gly Asp Tyr  Pro Lys Tyr Asn Ser  Tyr Lys Ser
    1010                1015                1020


Arg Lys  Ala Thr Glu Lys Val  Leu Phe Tyr Ser Asn  Ile Met Asn
    1025                1030                1035


Phe Phe  Arg Arg Val Leu Val  Tyr Ser Lys Thr Gly  Glu Val Arg
    1040                1045                1050


Ile Arg  Pro Val Ile Glu Val  Asn Lys Glu Thr Gly  Glu Ile Val
    1055                1060                1065


Trp Asp  Lys Lys Ser Asp Phe  Arg Thr Val Arg Lys  Val Leu Ser
    1070                1075                1080


Tyr Pro  Gln Val Asn Val Val  Lys Lys Val Glu Met  Gln Thr Gly
    1085                1090                1095


Gly Phe  Ser Lys Glu Ser Ile  Leu Gln His Gly Asp  Ser Asp Lys
    1100                1105                1110


Leu Ile  Pro Arg Lys Thr Glu  Lys Phe Tyr Leu Asp  Thr Lys Lys
    1115                1120                1125


Tyr Gly  Gly Phe Asp Ser Pro  Thr Ile Ala Tyr Ser  Val Leu Leu
    1130                1135                1140
```

```
Ile Ala  Asp Ile Glu Lys Gly  Lys Ala Lys Lys Leu  Lys Arg Val
    1145                1150                1155

Lys Glu  Leu Ile Gly Ile Thr  Ile Met Glu Arg Met  Ala Phe Glu
    1160                1165                1170

Lys Asn  Pro Ile Glu Phe Leu  Glu His Lys Gly Tyr  Lys Asn Ile
    1175                1180                1185

Leu Glu  Lys Asn Ile Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu
    1190                1195                1200

Leu Glu  Asn Gly Arg Arg Arg  Leu Leu Ala Ser Ala  Lys Glu Leu
    1205                1210                1215

Gln Lys  Gly Asn Glu Met Ile  Leu Pro Pro His Leu  Val Thr Leu
    1220                1225                1230

Leu Tyr  His Ser Ser Asn Ile  His Lys Ile Thr Glu  Pro Ile His
    1235                1240                1245

Leu Asn  Tyr Val Asn Lys Asn  Lys His Glu Phe Lys  Glu Leu Leu
    1250                1255                1260

Arg His  Ile Ser Asp Phe Ser  Thr Arg Tyr Ile Leu  Ala Gln Asp
    1265                1270                1275

Arg Leu  Ser Lys Ile Glu Glu  Leu Tyr Asp Lys Asn  Asp Gly Asp
    1280                1285                1290

Asp Ile  Ser Asp Leu Thr Ser  Ser Phe Val Asn Leu  Leu Thr Phe
    1295                1300                1305

Thr Ala  Ile Gly Ala Pro Ala  Ala Phe Lys Phe Leu  Gly Ser Val
    1310                1315                1320

Ile Asp  Arg Lys Arg Tyr Thr  Ser Ile Ala Glu Ile  Leu Glu Ala
    1325                1330                1335
```

```
Thr Leu  Ile His Gln Ser Val  Thr Gly Leu Tyr Glu  Thr Arg Ile
    1340                1345                1350


Asp Leu  Ser Lys Leu Gly Gly  Asp
    1355                1360
```

<210> 286
<211> 1359
<212> PRT
<213> Streptococcus suis

<400> 286

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Met Lys Lys Lys Tyr Ala Ile Gly Ile Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Val Val Thr Asp Asp Tyr Lys Val Pro Ser Lys Lys Met
            20                  25                  30


Lys Val Phe Gly Asn Thr Glu Lys Arg Tyr Ile Lys Lys Asn Leu Leu
        35                  40                  45


Gly Thr Leu Leu Phe Asp Glu Gly Asn Thr Ala Glu Asn Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Ile Leu
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ala Glu Glu Ile Asn Lys Ile Asp Asp Ser
                85                  90                  95


Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Ile Val Glu Asp Lys Gln
            100                 105                 110


Gly Ser Lys His Pro Ile Phe Gly Thr Leu Gln Glu Glu Lys Lys Tyr
        115                 120                 125


His Lys Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Gln Leu Ala Asp
    130                 135                 140


Ser Ser Gln Lys Ala Asp Ile Arg Leu Ile Tyr Leu Ala Leu Ala His
```

145 150 155 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Lys Ser
165 170 175

Glu Asn Lys Asp Val Gln His Leu Phe Asn Asp Phe Val Glu Met Phe
180 185 190

Asp Lys Thr Val Glu Gly Ser Tyr Leu Ser Glu Asn Leu Pro Asn Val
195 200 205

Ala Asp Val Leu Val Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
210 215 220

Ile Leu His Tyr Phe Pro Asn Glu Lys Lys Asn Gly Leu Phe Gly Asn
225 230 235 240

Phe Leu Ala Leu Ala Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
245 250 255

Glu Leu Ala Glu Asp Ala Lys Ile Gln Phe Ser Lys Glu Thr Tyr Glu
260 265 270

Glu Asp Leu Glu Glu Leu Leu Gly Lys Ile Gly Asp Asp Tyr Ala Asp
275 280 285

Leu Phe Ile Ala Thr Lys Ser Leu Tyr Asp Gly Ile Leu Leu Ala Gly
290 295 300

Ile Leu Ser Thr Thr Asp Ser Thr Thr Lys Ala Pro Leu Ser Ser Ser
305 310 315 320

Met Val Asn Arg Tyr Glu Glu His Lys Lys Asp Leu Ala Leu Leu Lys
325 330 335

Asn Phe Ile His Gln Asn Leu Ser Asp Ser Tyr Lys Glu Val Phe Asn
340 345 350

Asp Lys Leu Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Lys Thr Thr

```
        355                 360                 365

Gln Glu Asn Phe Tyr Arg Phe Ile Lys Lys Ala Ile Glu Lys Ile Glu
    370                 375                 380

Gly Ser Asp Tyr Phe Ile Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Ile Arg Arg Gln Ala Glu Phe Tyr Pro Phe
            420                 425                 430

Leu Val Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Lys Ser Glu Phe Ala Trp
    450                 455                 460

Leu Asn Arg Lys Ser Asp Glu Lys Ile Arg Pro Trp Asn Phe Asp Glu
465                 470                 475                 480

Met Val Asp Lys Glu Thr Ser Ala Glu Asn Phe Ile Thr Arg Met Thr
                485                 490                 495

Asn Tyr Asp Gln Tyr Leu Pro Asp Gln Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Lys Phe Ala Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Phe Ile Ala Glu Gly Met Arg Asp Tyr Gln Phe Leu Asp Ser Gly Gln
    530                 535                 540

Lys Lys Asp Ile Val Lys Thr Leu Phe Lys Thr Lys Arg Lys Val Thr
545                 550                 555                 560

Ala Lys Asp Ile Lys Ala Tyr Leu Glu Asn Ser Asn Gly Tyr Ala Gly
```

565 570 575

Val Glu Leu Lys Gly Leu Glu Glu Gln Phe Asn Ala Ser Leu Pro Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Leu Arg Asp Lys Ala Phe Ile Asp Ala
595 600 605

Glu Glu Asn Gln Glu Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Arg Lys Arg Leu Glu Lys Tyr Lys Asp
625 630 635 640

Ile Leu Thr Glu Glu Gln Arg Lys Lys Leu Glu Arg Arg His Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Ala Lys Leu Ile Asn Gly Ile Leu Asp Lys
660 665 670

Val Thr Arg Lys Thr Ile Leu Gly Tyr Leu Ile Asp Asp Gly Thr Ser
675 680 685

Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Thr Leu Ser Phe Val
690 695 700

Asp Glu Ile Arg Leu Ala Gln Gly Ser Gly Glu Ala Glu Asp Tyr Arg
705 710 715 720

Ala Glu Val Gln Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
725 730 735

Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Ile Glu Val Met Gly Tyr
740 745 750

Asp Pro Glu His Ile Val Val Glu Met Ala Arg Glu Asn Gln Phe Thr
755 760 765

Asn Gln Gly Arg Arg Asn Ser Gln Gln Arg Tyr Lys Lys Ile Glu Asn

770 775 780

Ala Ile Lys Asn Leu Asn Ser Lys Ile Leu Lys Glu Tyr Pro Thr Asn
785 790 795 800

Asn Gln Ala Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Leu Gln Asn
805 810 815

Gly Lys Asp Met Tyr Thr Asp Glu Glu Leu Asp Ile Asp Gln Leu Ser
820 825 830

Gln Tyr Asp Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp
835 840 845

Ser Leu Asp Asn Lys Val Leu Thr Lys Ser Ala Lys Asn Arg Gly Lys
850 855 860

Ser Asp Asp Val Pro Ser Leu Glu Ile Val His Lys Lys Lys Asn Phe
865 870 875 880

Trp Lys Gln Leu Leu Asp Ser Gln Leu Ile Ser Gln Arg Lys Phe Asp
885 890 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Thr Asn Glu Asp Lys Ala
900 905 910

Arg Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
915 920 925

Val Ala Arg Ile Leu Asp Thr Arg Phe Asn Thr Lys Leu Asp Glu Ala
930 935 940

Gly Asn Arg Ile Arg Asp Pro Lys Val Asn Ile Ile Thr Leu Lys Ser
945 950 955 960

Asn Leu Val Ser Gln Phe Arg Lys Asp Tyr Gln Leu Tyr Lys Val Arg
965 970 975

Glu Ile Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val

980 985 990

Val Ala Thr Ala Leu Leu Lys Lys Tyr Pro Gln Leu Ala Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro Lys Tyr Asn Ser Tyr Lys Ser Arg Lys
1010 1015 1020

Ala Thr Glu Lys Val Leu Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Arg Arg Val Leu Val Tyr Ser Lys Thr Gly Glu Val Arg Ile Arg
1040 1045 1050

Pro Val Ile Glu Val Asn Lys Glu Thr Gly Glu Ile Val Trp Asp
1055 1060 1065

Lys Lys Ser Asp Phe Lys Thr Val Arg Lys Val Leu Ser Tyr Pro
1070 1075 1080

Gln Val Asn Val Val Lys Lys Val Glu Met Gln Thr Gly Gly Phe
1085 1090 1095

Ser Lys Glu Ser Ile Leu Gln His Gly Asp Ser Asp Lys Leu Ile
1100 1105 1110

Pro Arg Lys Thr Glu Lys Phe Tyr Leu Asp Thr Lys Lys Tyr Gly
1115 1120 1125

Gly Phe Asp Ser Pro Thr Ile Ala Tyr Ser Val Leu Leu Ile Ala
1130 1135 1140

Asp Ile Glu Lys Gly Lys Ala Lys Lys Leu Lys Arg Val Lys Glu
1145 1150 1155

Leu Ile Gly Ile Thr Ile Met Glu Arg Met Ala Phe Glu Lys Asn
1160 1165 1170

Pro Ile Glu Phe Leu Glu His Lys Gly Tyr Lys Asn Ile Leu Glu

1175 1180 1185

Lys Asn Ile Ile Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu
1190 1195 1200

Asn Gly Arg Arg Arg Leu Leu Ala Ser Ala Lys Glu Leu Gln Lys
1205 1210 1215

Gly Asn Glu Met Ile Leu Pro Pro His Leu Val Thr Leu Leu Tyr
1220 1225 1230

His Ser Ser Asn Ile His Lys Ile Thr Glu Pro Ile His Leu Asn
1235 1240 1245

Tyr Val Asn Lys Asn Lys His Glu Phe Lys Glu Leu Leu Arg His
1250 1255 1260

Ile Ser Asp Phe Ser Thr Arg Tyr Ile Leu Ala Gln Asp Arg Leu
1265 1270 1275

Ser Lys Ile Glu Glu Leu Tyr Asp Lys Asn Asp Gly Asp Asp Ile
1280 1285 1290

Ser Asp Leu Thr Ser Ser Phe Val Asn Leu Leu Thr Phe Thr Ala
1295 1300 1305

Ile Gly Ala Pro Ala Ala Phe Lys Phe Leu Gly Ser Val Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Ile Ala Glu Ile Leu Glu Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Val Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Lys Leu Gly Gly Asp
1355

<210> 287

<211> 1351
<212> PRT
<213> Streptococcus suis

<400> 287

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Met Asp Gln Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Val Thr Asp Asp Tyr Lys Val Pro Ala Lys Lys Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Lys Gln Ser Ile Lys Lys Asn Leu Leu
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Glu Glu Met Asn Lys Val Asp Glu Asn
                85                  90                  95

Phe Phe Gln Arg Leu Asp Asp Ser Phe Leu Val Asp Glu Asp Lys Arg
            100                 105                 110

Gly Glu Arg His Pro Ile Phe Gly Asn Ile Ala Ala Glu Val Lys Tyr
        115                 120                 125

His Asp Asp Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Ile Ser Gln Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Gln Leu Lys Ala
                165                 170                 175

Glu Asn Thr Asn Val Gln Ala Leu Phe Lys Asp Phe Val Glu Val Tyr
            180                 185                 190
```

```
Asp Lys Thr Val Glu Glu Ser His Leu Ser Glu Met Thr Val Asp Ala
        195                 200                 205

Leu Ser Ile Leu Thr Glu Lys Val Ser Lys Ser Arg Arg Leu Glu Asn
    210                 215                 220

Leu Ile Ala His Tyr Pro Ala Glu Lys Lys Asn Thr Leu Phe Gly Asn
225                 230                 235                 240

Leu Ile Ala Leu Ser Leu Gly Leu Gln Pro Asn Phe Lys Thr Asn Phe
                245                 250                 255

Gln Leu Ser Glu Asp Ala Lys Leu Gln Phe Ser Lys Asp Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Gly Leu Leu Gly Glu Ile Gly Asp Glu Tyr Ala Asp
        275                 280                 285

Leu Phe Ala Ser Ala Lys Asn Leu Tyr Asp Ala Ile Leu Leu Ser Gly
    290                 295                 300

Ile Leu Thr Val Asp Asp Asn Ser Thr Lys Ala Pro Leu Ser Ala Ser
305                 310                 315                 320

Met Val Lys Arg Tyr Glu Glu His Gln Lys Asp Leu Lys Lys Leu Lys
                325                 330                 335

Asp Phe Ile Lys Val Asn Ala Pro Asp Gln Tyr Asn Ala Ile Phe Lys
            340                 345                 350

Asp Lys Asn Lys Lys Gly Tyr Ala Gly Tyr Ile Glu Asn Gly Val Lys
        355                 360                 365

Gln Asp Glu Phe Tyr Lys Tyr Leu Lys Gly Ile Leu Leu Gln Ile Asn
    370                 375                 380

Gly Ser Gly Asp Phe Leu Asp Lys Ile Asp Arg Glu Asp Phe Leu Arg
385                 390                 395                 400
```

```
Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu
                405                 410                 415

Gln Glu Met His Ala Ile Leu Arg Arg Gln Glu Glu His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Gln Asp Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Arg Lys Gly Ser Arg Phe Ala Trp
    450                 455                 460

Ala Glu Tyr Lys Ala Asp Glu Lys Ile Thr Pro Trp Asn Phe Asp Asp
465                 470                 475                 480

Ile Leu Asp Lys Glu Lys Ser Ala Glu Lys Phe Ile Thr Arg Met Thr
                485                 490                 495

Leu Asn Asp Leu Tyr Leu Pro Glu Glu Lys Val Leu Pro Lys His Ser
            500                 505                 510

Leu Leu Tyr Glu Thr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys
        515                 520                 525

Tyr Val Asn Glu Gln Gly Glu Ala Lys Phe Phe Asp Ala Asn Met Lys
    530                 535                 540

Gln Glu Ile Phe Asp His Val Phe Lys Glu Asn Arg Lys Val Thr Lys
545                 550                 555                 560

Asp Lys Leu Leu Asn Tyr Leu Gly Lys Glu Phe Asp Glu Phe Arg Ile
                565                 570                 575

Val Asp Leu Thr Gly Leu Asp Lys Glu Asn Lys Val Phe Asn Ser Ser
            580                 585                 590

Leu Gly Thr Tyr His Asp Leu Arg Lys Ile Leu Asp Lys Ser Phe Leu
        595                 600                 605
```

```
Asp Asn Lys Glu Asn Glu Gln Ile Ile Glu Asp Ile Ile Gln Thr Leu
    610                 615                 620

Thr Leu Phe Glu Asp Arg Glu Met Ile Arg Gln Arg Leu Gln Lys Tyr
625                 630                 635                 640

Ser Asp Ile Phe Thr Lys Ala Gln Leu Lys Lys Leu Glu Arg Cys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Tyr Lys Leu Ile Asn Gly Ile Arg
            660                 665                 670

Asn Lys Glu Asn Lys Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Tyr Ala Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ala Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Ala Gln Val Ile Gly Glu Thr Asp Asp
705                 710                 715                 720

Leu Asn Gln Val Val Ser Asp Ile Ala Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Lys Val Met
            740                 745                 750

Gly Tyr Asn Pro Ala Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Asp Lys Gly Arg Arg Asn Ser Gln Gln Arg Leu Lys Leu Leu
    770                 775                 780

Gln Asp Ser Leu Lys Pro Val Asn Ile Lys Asn Val Glu Asn Gln Gln
785                 790                 795                 800

Leu Gln Asn Asp Arg Leu Phe Leu Tyr Tyr Ile Gln Asn Gly Lys Asp
                805                 810                 815
```

```
Met Tyr Thr Gly Glu Thr Leu Asp Ile Asn Asn Leu Ser Gln Tyr Asp
            820                 825                 830

Ile Asp His Ile Ile Pro Gln Ala Phe Ile Lys Asp Asp Ser Phe Asp
        835                 840                 845

Asn Arg Val Leu Thr Ser Ser Ser Glu Asn Arg Gly Lys Ser Asp Asn
    850                 855                 860

Val Pro Ser Ile Glu Val Val Arg Ala Arg Lys Ala Asp Trp Met Arg
865                 870                 875                 880

Leu Arg Lys Ala Gly Leu Ile Ser Gln Arg Lys Phe Asp Asn Leu Thr
                885                 890                 895

Lys Ala Glu Arg Gly Gly Leu Thr Glu Asn Asp Lys Ala Gly Phe Ile
            900                 905                 910

Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln
        915                 920                 925

Val Leu Asp Ala Arg Phe Asn Ala Lys His Asp Glu Asn Lys Lys Val
    930                 935                 940

Ile Arg Asp Val Lys Ile Ile Thr Leu Lys Ser Asn Leu Val Ser Gln
945                 950                 955                 960

Phe Arg Lys Asp Phe Lys Phe Tyr Lys Val Arg Glu Ile Asn Asp Tyr
                965                 970                 975

His His Ala His Asp Ala Tyr Leu Asn Ala Val Ile Gly Thr Ala Leu
            980                 985                 990

Leu Lys Lys Tyr Pro Lys Leu Ala  Ser Glu Phe Val Tyr  Gly Glu Phe
        995                 1000                1005

Lys Lys  Tyr Asp Val Ser Asp  Lys Glu Ile Gly Lys  Ala Thr Ala
    1010                1015                1020
```

```
Lys Tyr  Phe Phe Tyr Ser Asn  Leu Met Asn Phe Phe  Lys Lys Glu
    1025                1030                1035

Val Lys  Phe Ala Asp Gly Thr  Val Val Glu Arg Pro  Asp Ile Glu
    1040                1045                1050

Thr Ser  Glu Asp Gly Glu Ile  Ala Trp Asn Lys Gln  Thr Asp Phe
    1055                1060                1065

Lys Ile  Val Arg Lys Val Leu  Ser Tyr Pro Gln Val  Asn Ile Val
    1070                1075                1080

Lys Lys  Thr Glu Val Gln Thr  His Gly Leu Asp Arg  Pro Ser Pro
    1085                1090                1095

Lys Pro  Lys Pro Asp Ser Ser  Glu Asn Leu Val Gly  Val Lys Arg
    1100                1105                1110

Asn Leu  Asp Pro Lys Lys Tyr  Gly Gly Tyr Ala Gly  Ile Ser Asn
    1115                1120                1125

Ser Tyr  Ala Val Leu Val Lys  Ala Ile Ile Glu Lys  Gly Val Lys
    1130                1135                1140

Lys Lys  Glu Thr Met Val Leu  Glu Phe Gln Gly Ile  Ser Ile Leu
    1145                1150                1155

Asp Arg  Ile Thr Phe Glu Lys  Asp Lys Arg Ala Phe  Leu Leu Gly
    1160                1165                1170

Lys Gly  Tyr Lys Asp Ile Lys  Lys Ile Ile Glu Leu  Pro Lys Tyr
    1175                1180                1185

Ser Leu  Phe Glu Leu Lys Asp  Gly Ser Arg Arg Met  Leu Ala Ser
    1190                1195                1200

Arg Gly  Glu Ile His Lys Gly  Asn Glu Leu Phe Val  Pro Gln Lys
    1205                1210                1215
```

```
Phe Thr  Thr Leu Leu Tyr His  Ala Lys Arg Ile Asn  Asn Pro Ile
    1220                 1225                 1230


Asn Lys  Asp His Ile Glu Tyr  Val Lys Lys His Arg  Asp Asp Phe
    1235                 1240                 1245


Lys Glu  Leu Leu Asn Tyr Val  Leu Glu Phe Asn Glu  Lys Tyr Val
    1250                 1255                 1260


Gly Ala  Thr Lys Asn Gly Glu  Arg Leu Lys Glu Ala  Val Ala Asp
    1265                 1270                 1275


Phe Asp  Ser Lys Ser Asn Glu  Glu Ile Cys Thr Ser  Phe Leu Gly
    1280                 1285                 1290


Leu Phe  Glu Leu Thr Ser Leu  Gly Ser Ala Ser Asp  Phe Glu Phe
    1295                 1300                 1305


Leu Gly  Val Lys Ile Pro Arg  Tyr Arg Asp Tyr Thr  Pro Ser Ser
    1310                 1315                 1320


Leu Leu  Lys Asp Ser Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1325                 1330                 1335


Tyr Glu  Thr Arg Ile Asp Leu  Ser Lys Leu Gly Glu  Asp
    1340                 1345                 1350


<210>  288
<211>  1256
<212>  PRT
<213>  Brochothrix thermosphacta

<400>  288

Met Trp Gly Val Ser Leu Phe Glu Ala Gly Lys Thr Ala Ala Glu Arg
1               5                  10                  15


Arg Gly Tyr Arg Ser Thr Arg Arg Arg Leu Asn His Arg Lys Phe Arg
            20                  25                  30
```

```
Leu Arg Leu Leu Glu Asp Met Phe Glu Lys Glu Ile Leu Ser Lys Asp
        35                  40                  45

Pro Ser Phe Phe Ile Arg Leu Lys Glu Ala Phe Leu Ser Pro Lys Asp
    50                  55                  60

Glu Gln Lys Gln Phe Leu Phe Asn Asp Lys Asp Tyr Thr Asp Ala Asp
65                  70                  75                  80

Tyr Tyr Glu Gln Tyr Lys Thr Ile Tyr His Leu Arg Tyr Asp Leu Ile
                85                  90                  95

Ser Gln His Arg Gln Phe Asp Ile Arg Glu Val Tyr Leu Ala Ile His
            100                 105                 110

His Leu Ile Lys Tyr Arg Gly His Phe Ile Tyr Glu Asp Gln Thr Phe
        115                 120                 125

Thr Thr Asp Gly Asn Gln Leu Gln His His Ile Lys Ala Ile Ile Thr
    130                 135                 140

Met Ile Asn Ser Thr Leu Asn Arg Ile Ile Pro Glu Thr Ile Asp Ile
145                 150                 155                 160

Asn Val Phe Glu Lys Ile Leu Leu Asp Arg Met Met Asn Arg Ser Ser
                165                 170                 175

Lys Val Lys Phe Leu Ile Glu Leu Thr Gly Lys Gln Asp Lys Pro Leu
            180                 185                 190

Leu Lys Glu Leu Phe Asn Leu Ile Val Gly Leu Lys Ala Lys Pro Ala
        195                 200                 205

Ser Ile Phe Glu Gln Glu Asn Leu Ala Thr Ile Val Glu Thr Met Asn
    210                 215                 220

Met Ser Thr Glu Gln Val Gln Leu Asp Leu Leu Thr Leu Ala Asp Val
225                 230                 235                 240
```

```
Leu Ala Asp Glu Glu Tyr Asp Leu Leu Leu Thr Ala Gln Lys Ile Tyr
                245                 250                 255

Ser Ala Ile Ile Leu Asp Glu Ser Met Asp Gly Tyr Glu Tyr Phe Ala
            260                 265                 270

Glu Ala Lys Lys Glu Ser Tyr Arg Lys His Gln Glu Glu Leu Val Leu
        275                 280                 285

Val Lys Lys Met Leu Lys Ser Asn Ala Ile Thr Asn Asp Glu Arg Ala
    290                 295                 300

Lys Phe Glu Tyr Phe Tyr Thr Asp Tyr Ile Gly Tyr Glu Glu Ser Lys
305                 310                 315                 320

Ser Lys Glu Glu Arg Leu Phe Lys His Ile Glu Leu Leu Leu Ala Lys
                325                 330                 335

Glu Asn Val Leu Thr Thr Val Glu His Ala Leu Leu Glu Lys Asn Ile
            340                 345                 350

Thr Phe Ala Ser Leu Leu Pro Leu Gln Arg Ser Ser Arg Asn Ala Val
        355                 360                 365

Ile Pro Tyr Gln Val His Glu Lys Glu Leu Val Ala Ile Leu Glu Asn
    370                 375                 380

Gln Ala Thr Tyr Tyr Pro Phe Leu Leu Glu Gln Lys Asp Asn Ile His
385                 390                 395                 400

Lys Leu Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Asp
                405                 410                 415

Gln Lys Asp Ser Glu Phe Ala Trp Met Val Arg Lys Gln Ala Gly Lys
            420                 425                 430

Ile Thr Pro Phe Asn Phe Glu Glu Met Val Asp Ile Asp Ala Ser Ser
        435                 440                 445
```

```
Glu Ala Phe Ile Lys Arg Met Thr Asn Lys Cys Thr Tyr Leu Ile His
    450                 455                 460

Glu Asp Val Ile Pro Lys His Ser Phe Ser Tyr Ala Lys Phe Glu Val
465                 470                 475                 480

Leu Asn Glu Leu Asn Lys Ile Arg Leu Asp Gly Lys Pro Ile Asp Ile
                485                 490                 495

Pro Leu Lys Lys Arg Ile Phe Glu Gly Leu Phe Leu Glu Lys Thr Lys
            500                 505                 510

Val Thr Gln Thr Ser Leu Lys Lys Trp Leu Ala Glu His Glu His Met
        515                 520                 525

Thr Val Ser Val Val Gln Gly Thr Gln Lys Glu Thr Glu Phe Ala Thr
    530                 535                 540

Ser Leu Gln Ala Phe His Arg Phe Val Lys Ile Phe Asp Arg Glu Thr
545                 550                 555                 560

Val Ser Asn Pro Ala Asn Glu Glu Met Phe Glu Lys Ile Ile Tyr Trp
                565                 570                 575

Ser Thr Val Phe Glu Asp Lys Lys Ile Met Arg Arg Lys Leu Ser Glu
            580                 585                 590

Tyr Pro Gln Leu Thr Glu Gln Gln Gln Val Gln Leu Ala Gln Val Arg
        595                 600                 605

Phe Arg Gly Trp Gly Arg Leu Ser Gln Arg Leu Ile Asn Arg Ile Lys
    610                 615                 620

Thr Pro Glu Asp His Lys Leu Ser Ile Asn Glu Ile Leu Gln Thr Asn
625                 630                 635                 640

Glu Asn Phe Met Gln Ile Ile Arg Asn Lys Asp Tyr Leu Phe Lys Lys
                645                 650                 655
```

```
Ile Ile Glu Glu Gln Phe Glu Asn Glu Thr Ala Leu Leu Asn Lys Gln
            660                 665                 670

Arg Ile Asp Glu Leu Ala Ala Ser Pro Ala Asn Lys Lys Gly Ile Trp
        675                 680                 685

Gln Ala Ile Lys Ile Val Lys Glu Leu Glu Lys Val Leu Gln Gln Pro
    690                 695                 700

Ala Glu Asn Ile Phe Ile Glu Phe Ala Arg Ser Asp Glu Glu Ser Lys
705                 710                 715                 720

Arg Ser Thr Pro Arg Asp Lys Phe Ile Glu Lys Ala Tyr Ala Glu Thr
                725                 730                 735

Asp Thr Glu His Leu Lys Glu Leu Lys Gln Arg Ser Lys Gln Leu Ser
            740                 745                 750

Ser Gln Arg Leu Phe Leu Tyr Phe Ile Gln Asn Gly Lys Cys Met Tyr
        755                 760                 765

Ser Gly Glu His Leu Asp Ile Glu Arg Leu Asp Ser Tyr Glu Val Asp
    770                 775                 780

His Ile Leu Pro Gln Ser Tyr Ile Lys Asp Asn Ser Ile Glu Asn Leu
785                 790                 795                 800

Ala Leu Val Lys Lys Val Glu Asn Gln Arg Lys Lys Asp Ser Leu Leu
                805                 810                 815

Leu Asn Ser Ser Ile Ile Asn Gln Asn Tyr Ser Arg Trp Glu Gln Leu
            820                 825                 830

Lys Asn Ala Gly Leu Ile Gly Glu Lys Lys Phe Arg Asn Leu Thr Arg
        835                 840                 845

Thr Lys Ile Thr Asp Arg Asp Lys Glu Gly Phe Ile Ala Arg Gln Leu
    850                 855                 860
```

```
Val Glu Thr Arg Gln Ile Thr Lys His Val Thr Gln Leu Leu Gln Gln
865                 870                 875                 880


Glu Tyr Lys Asp Thr Thr Lys Val Phe Ala Ile Lys Ala Thr Leu Val
                885                 890                 895


Ser Gly Leu Arg Arg Lys Phe Glu Phe Ile Lys Asn Arg Asn Val Asn
            900                 905                 910


Asp Tyr His His Ala Gln Asp Ala Phe Leu Val Ala Phe Leu Gly Thr
        915                 920                 925


Asn Ile Thr Ser Asn Tyr Pro Lys Ile Glu Met Glu Tyr Leu Phe Lys
    930                 935                 940


Gly Tyr Gln His Tyr Leu Asn Glu Val Gly Lys Ala Ala Lys Pro Lys
945                 950                 955                 960


Phe Thr Phe Ile Val Glu Asn Leu Ser Lys Gln Gln Asn Ser Thr Thr
                965                 970                 975


Gly Glu Val Lys Trp Asn Pro Glu Val Asp Ile Ala Lys Leu Lys Arg
            980                 985                 990


Ile Leu Asn Phe Lys Gln Cys Asn  Ile Val Arg Lys Val  Glu Glu Gln
        995                 1000                1005


Ser Gly  Ala Leu Phe Lys Glu  Thr Ile Tyr Pro Val  Glu Glu Ser
    1010                1015                1020


Ser Ser  Lys Thr Ile Pro Leu  Lys Lys His Leu Asp  Thr Ala Ile
    1025                1030                1035


Tyr Gly  Gly Tyr Thr Ala Val  Asn Tyr Ala Ser Tyr  Ala Leu Ile
    1040                1045                1050


Gln Phe  Lys Lys Gly Arg Lys  Leu Lys Arg Glu Ile  Ile Gly Ile
    1055                1060                1065
```

```
Pro Leu  Ala Val Gln Thr Arg  Ile Asp Asn Ser Glu  Thr Ser Leu
    1070                1075                1080

Gln Ala  Tyr Ile Ala Glu Gln  Ile Lys Ser Glu Val  Glu Ile Leu
    1085                1090                1095

Asn Gly  Arg Ile Leu Lys Tyr  Gln Leu Ile Ser Asn  Asn Gly Asn
    1100                1105                1110

Arg Leu  Tyr Ile Ala Gly Ser  Glu Arg His Asn Ala  Arg Gln Leu
    1115                1120                1125

Ile Val  Ser Asp Glu Ala Ala  Lys Val Ile Trp Leu  Ile Ser Thr
    1130                1135                1140

Lys Gln  Ala Asp Glu Ala Met  Phe Leu Lys Tyr Tyr  Arg Leu Glu
    1145                1150                1155

His Leu  Glu Ala Val Phe Glu  Glu Leu Ile Arg Lys  Gln Ala Ala
    1160                1165                1170

Asp Tyr  Gln Ile Phe Glu Lys  Leu Ile Lys Lys Ile  Glu Val Asn
    1175                1180                1185

Phe Tyr  Ser Cys Thr Tyr Asn  Glu Lys Val Lys Val  Ile Glu Leu
    1190                1195                1200

Leu Lys  Ile Thr Gln Ala Asn  Ala Thr Asn Gly Asp  Leu Lys Leu
    1205                1210                1215

Leu Lys  Met Ser Asn Arg Glu  Gly Arg Leu Gly Ser  Val Ser Val
    1220                1225                1230

Ala Leu  Asp Phe Lys Ile Ile  Asn Gln Ser Val Thr  Gly Leu Tyr
    1235                1240                1245

Gln Ser  Ile Glu Asp Tyr Asn  Asn
    1250                1255
```

<210> 289
<211> 1290
<212> PRT
<213> Catenibacterium mitsuokai

<400> 289

```
Ile Val Asp Tyr Cys Ile Gly Leu Asp Leu Gly Thr Gly Ser Val Gly
1               5                  10                  15


Trp Ala Val Val Asp Met Asn His Arg Leu Met Lys Arg Asn Gly Lys
            20                  25                  30


His Leu Trp Gly Ser Arg Leu Phe Ser Asn Ala Glu Thr Ala Ala Asn
        35                  40                  45


Arg Arg Ala Ser Arg Ser Ile Arg Arg Arg Tyr Asn Lys Arg Arg Glu
    50                  55                  60


Arg Ile Arg Leu Leu Arg Ala Ile Leu Gln Asp Met Val Leu Glu Lys
65                  70                  75                  80


Asp Pro Thr Phe Phe Ile Arg Leu Glu His Thr Ser Phe Leu Asp Glu
                85                  90                  95


Glu Asp Lys Ala Lys Tyr Leu Gly Asp Asn Tyr Asn Leu Phe Ile Asp
            100                 105                 110


Glu Asp Phe Asn Asp Tyr Thr Tyr Tyr His Lys Tyr Pro Thr Ile Tyr
        115                 120                 125


His Leu Arg Lys Ala Leu Cys Glu Ser Thr Glu Lys Ala Asp Pro Arg
    130                 135                 140


Leu Ile Tyr Leu Ala Leu His His Ile Val Lys Tyr Arg Gly Asn Phe
145                 150                 155                 160


Leu Tyr Glu Gly Gln Lys Phe Asn Met Asp Ala Ser Asn Ile Glu Asp
                165                 170                 175
```

```
Lys Leu Ser Asp Ile Phe Thr Gln Phe Thr Ser Phe Asn Asn Ile Pro
            180                 185                 190

Tyr Glu Asp Asp Lys Lys Asn Leu Glu Ile Leu Glu Ile Leu Lys Lys
        195                 200                 205

Pro Leu Ser Lys Lys Ala Lys Val Asp Glu Val Met Thr Leu Ile Ala
    210                 215                 220

Pro Glu Lys Asp Tyr Lys Ser Ala Phe Lys Glu Leu Val Thr Gly Ile
225                 230                 235                 240

Ala Gly Asn Lys Met Asn Val Thr Lys Met Ile Leu Cys Glu Pro Ile
                245                 250                 255

Lys Gln Gly Asp Ser Glu Ile Lys Leu Lys Phe Ser Asp Ser Asn Tyr
            260                 265                 270

Asp Asp Gln Phe Ser Glu Val Glu Lys Asp Leu Gly Glu Tyr Val Glu
        275                 280                 285

Phe Val Asp Ala Leu His Asn Val Tyr Ser Trp Val Glu Leu Gln Thr
    290                 295                 300

Ile Met Gly Ala Thr His Thr Asp Asn Ala Ser Ile Ser Glu Ala Met
305                 310                 315                 320

Val Ser Arg Tyr Asn Lys His His Asp Asp Leu Lys Leu Leu Lys Asp
                325                 330                 335

Cys Ile Lys Asn Asn Val Pro Asn Lys Tyr Phe Asp Met Phe Arg Asn
            340                 345                 350

Asp Ser Glu Lys Ser Lys Gly Tyr Tyr Asn Tyr Ile Asn Arg Lys Ala
        355                 360                 365

Pro Val Asp Glu Phe Tyr Lys Tyr Val Lys Lys Cys Ile Glu Lys Val
    370                 375                 380
```

```
Asp Thr Pro Glu Ala Lys Gln Ile Leu Asn Asp Ile Glu Leu Glu Asn
385                 390                 395                 400


Phe Leu Leu Lys Gln Asn Ser Arg Thr Asn Gly Ser Val Pro Tyr Gln
                405                 410                 415


Met Gln Leu Asp Glu Met Ile Lys Ile Ile Asp Asn Gln Ala Glu Tyr
            420                 425                 430


Tyr Pro Ile Leu Lys Glu Lys Arg Glu Gln Leu Leu Ser Ile Leu Thr
        435                 440                 445


Phe Arg Ile Pro Tyr Tyr Phe Gly Pro Leu Glu Thr Ser Glu His Ala
    450                 455                 460


Trp Ile Lys Arg Leu Glu Gly Lys Glu Asn Gln Arg Ile Leu Pro Trp
465                 470                 475                 480


Asn Tyr Gln Asp Ile Val Asp Val Asp Ala Thr Ala Glu Gly Phe Ile
                485                 490                 495


Lys Arg Met Arg Ser Tyr Cys Thr Tyr Phe Pro Asp Glu Glu Val Leu
            500                 505                 510


Pro Lys Asn Ser Leu Ile Val Ser Lys Tyr Glu Val Tyr Asn Glu Leu
        515                 520                 525


Asn Lys Ile Arg Val Asp Asp Lys Leu Leu Glu Val Asp Val Lys Asn
    530                 535                 540


Asp Ile Tyr Asn Glu Leu Phe Met Lys Asn Lys Thr Val Thr Glu Lys
545                 550                 555                 560


Lys Leu Lys Asn Trp Leu Val Asn Asn Gln Cys Cys Ser Lys Asp Ala
                565                 570                 575


Glu Ile Lys Gly Phe Gln Lys Glu Asn Gln Phe Ser Thr Ser Leu Thr
            580                 585                 590
```

```
Pro Trp Ile Asp Phe Thr Asn Ile Phe Gly Lys Ile Asp Gln Ser Asn
        595                 600                 605

Phe Asp Leu Ile Glu Asn Ile Ile Tyr Asp Leu Thr Val Phe Glu Asp
    610                 615                 620

Lys Lys Ile Met Lys Arg Arg Leu Lys Lys Lys Tyr Ala Leu Pro Asp
625                 630                 635                 640

Asp Lys Val Lys Gln Ile Leu Lys Leu Lys Tyr Lys Asp Trp Ser Arg
                645                 650                 655

Leu Ser Lys Lys Leu Leu Asp Gly Ile Val Ala Asp Ser Val Thr Val
            660                 665                 670

Leu Asp Val Leu Glu Ser Arg Leu Asn Leu Met Glu Ile Ile Asn Asp
        675                 680                 685

Lys Asp Leu Gly Tyr Ala Gln Met Ile Glu Glu Ala Thr Ser Cys Pro
    690                 695                 700

Glu Asp Gly Lys Phe Thr Tyr Glu Glu Val Glu Arg Leu Ala Gly Ser
705                 710                 715                 720

Pro Ala Leu Lys Arg Gly Ile Trp Gln Ser Leu Gln Ile Val Glu Glu
                725                 730                 735

Ile Thr Lys Val Met Lys Cys Arg Pro Lys Tyr Ile Tyr Ile Glu Phe
            740                 745                 750

Glu Arg Ser Glu Glu Lys Glu Arg Thr Glu Ser Lys Ile Lys Lys Leu
        755                 760                 765

Glu Asn Val Tyr Lys Asp Glu Gln Thr Ser Val Leu Glu Glu Leu Lys
    770                 775                 780

Gly Phe Asp Asn Thr Lys Lys Ile Ser Ser Asp Ser Leu Phe Leu Tyr
785                 790                 795                 800
```

```
Phe Thr Gln Leu Gly Lys Cys Met Tyr Ser Gly Lys Lys Leu Asp Ile
                805                 810                 815

Asp Ser Leu Asp Lys Tyr Gln Ile Asp His Ile Val Pro Gln Ser Leu
            820                 825                 830

Val Lys Asp Asp Ser Phe Asp Asn Arg Val Leu Val Val Pro Ser Glu
        835                 840                 845

Asn Gln Arg Lys Leu Asp Asp Leu Val Val Pro Phe Asp Ile Arg Asp
    850                 855                 860

Lys Met Tyr Arg Phe Trp Lys Leu Leu Phe Asp His Glu Leu Ile Ser
865                 870                 875                 880

Pro Lys Lys Phe Tyr Ser Leu Ile Lys Thr Glu Tyr Thr Glu Arg Asp
                885                 890                 895

Glu Glu Arg Phe Ile Asn Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
            900                 905                 910

Lys Asn Val Thr Gln Ile Ile Glu Asp His Tyr Ser Thr Thr Lys Val
        915                 920                 925

Ala Ala Ile Arg Ala Asn Leu Ser His Glu Phe Arg Val Lys Asn His
    930                 935                 940

Ile Tyr Lys Asn Arg Asp Ile Asn Asp Tyr His His Ala His Asp Ala
945                 950                 955                 960

Tyr Ile Val Ala Leu Ile Gly Gly Phe Met Arg Asp Arg Tyr Pro Asn
                965                 970                 975

Met His Asp Ser Lys Ala Val Tyr Ser Glu Tyr Met Lys Met Phe Arg
            980                 985                 990

Asn Lys Asn Asp Gln Lys Gly Phe  Val Ile Asn Ser Met  Asn Tyr Pro
        995                 1000                1005
```

```
Tyr Glu  Val Asp Gly Lys Leu  Ile Trp Asn Pro Asp  Leu Ile Asn
    1010                1015                1020

Glu Ile  Lys Lys Cys Phe Tyr  Tyr Lys Asp Cys Tyr  Cys Thr Thr
    1025                1030                1035

Lys Leu  Asp Gln Lys Ser Gly  Gln Leu Phe Asn Thr  Val Leu Ser
    1040                1045                1050

Asn Asp  Ala His Ala Asp Lys  Gly Ala Val Val Pro  Val Asn Lys
    1055                1060                1065

Asn Arg  Ser Asp Val His Lys  Tyr Gly Gly Phe Ser  Gly Leu Gln
    1070                1075                1080

Tyr Thr  Ile Val Ala Ile Glu  Gly Gln Lys Lys Lys  Gly Lys Lys
    1085                1090                1095

Thr Glu  Leu Val Lys Lys Ile  Ser Gly Val Pro Leu  His Leu Lys
    1100                1105                1110

Ala Ala  Ser Ile Asn Glu Lys  Ile Asn Tyr Ile Glu  Glu Lys Glu
    1115                1120                1125

Gly Leu  Ser Asp Val Arg Ile  Ile Lys Asp Asn Ile  Pro Val Asn
    1130                1135                1140

Gln Met  Ile Glu Met Asp Gly  Gly Glu Tyr Leu Leu  Thr Ser Glu
    1145                1150                1155

Tyr Val  Asn Ala Arg Gln Leu  Val Leu Asn Glu Lys  Gln Cys Ala
    1160                1165                1170

Leu Ile  Ala Asp Ile Tyr Asn  Ala Ile Tyr Lys Gln  Asp Tyr Asp
    1175                1180                1185

Asn Leu  Asp Asp Ile Leu Met  Ile Gln Leu Tyr Ile  Glu Leu Thr
    1190                1195                1200
```

```
Asn Lys  Met Lys Val Leu Tyr  Pro Ala Tyr Arg Gly  Ile Ala Glu
    1205                 1210                 1215


Lys Phe  Glu Ser Tyr Val Val  Ile Ser Lys Glu Glu  Lys Ala Asn
    1220                 1225                 1230


Ile Ile  Gln Met Leu Ile Val  Met His Arg Gly Pro  Gln Asn Gly
    1235                 1240                 1245


Asn Ile  Val Tyr Asp Asp Phe  Lys Ile Ser Asp Arg  Ile Gly Arg
    1250                 1255                 1260


Leu Lys  Thr Lys Asn His Asn  Leu Asn Ile Val Phe  Ile Ser Gln
    1265                 1270                 1275


Ser Pro  Thr Gly Ile Tyr Thr  Lys Lys Tyr Lys Leu
    1280                 1285                 1290
```

<210> 290
<211> 1359
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 290

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80
```

```
Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285
```

```
Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495
```

```
Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700
```

```
Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910
```

```
Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110
```

```
Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                 1120                 1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                 1135                 1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                 1150                 1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                 1165                 1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                 1180                 1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                 1195                 1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                 1210                 1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                 1225                 1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                 1240                 1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                 1255                 1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                 1270                 1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                 1285                 1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                 1300                 1305
```

```
Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355
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<210> 291
<211> 1317
<212> PRT
<213> Clostridiales bacterium S5-A11

<400> 291

```
Met Lys Asn Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val Gly
1               5                  10                  15


Trp Ala Val Ile Lys Asp Asp Leu Thr Leu Val Arg Lys Lys Ile Lys
            20                  25                  30


Ile Ser Gly Asn Thr Asp Lys Lys Glu Val Lys Lys Asn Leu Trp Gly
        35                  40                  45


Ser Phe Leu Phe Glu Gln Gly Asp Thr Ala Gln Asp Thr Arg Val Lys
    50                  55                  60


Arg Ile Ala Arg Arg Arg Tyr Glu Arg Arg Arg Phe Arg Ile Arg Glu
65                  70                  75                  80


Leu Gln Lys Ile Phe Asp Lys Ser Met Gly Glu Val Asp Ser Asn Phe
                85                  90                  95


Phe His Arg Leu Asp Glu Ser Phe Leu Val Glu Glu Asp Lys Glu Tyr
            100                 105                 110
```

```
Ser Lys Tyr Pro Ile Phe Ser Asn Glu Lys Glu Asp Lys Asn Tyr Tyr
        115                 120                 125

Asp Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Asp Leu Ala Asp Ser
    130                 135                 140

Asn Gln Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met
145                 150                 155                 160

Ile Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Asp Leu Lys Met Asp
                165                 170                 175

Gly Ile Ser Ile Ser Glu Ser Phe Gln Glu Phe Ile Asp Ser Tyr Asn
            180                 185                 190

Glu Val Cys Ala Leu Glu Asp Glu Asn Asn Asp Glu Leu Leu Thr Gln
        195                 200                 205

Ile Glu Asn Ile Phe Lys Gln Asp Ile Ser Arg Ser Lys Lys Leu Asp
    210                 215                 220

Gln Ala Ile Ala Leu Phe Gln Gly Lys Arg Gln Ser Leu Phe Gly Ile
225                 230                 235                 240

Phe Leu Thr Leu Ile Val Gly Asn Lys Ala Asn Phe Gln Lys Ile Phe
                245                 250                 255

Asn Leu Glu Asp Asp Ile Lys Leu Asp Leu Lys Glu Glu Asp Tyr Asp
            260                 265                 270

Glu Asn Leu Glu Glu Leu Leu Ser Asn Ile Asp Glu Gly Tyr Arg Asp
        275                 280                 285

Val Phe Leu Gln Ala Lys Asn Val Tyr Asn Ala Ile Glu Leu Ser Lys
    290                 295                 300

Ile Leu Lys Thr Asp Gly Lys Glu Thr Lys Ala Pro Leu Ser Ala Gln
305                 310                 315                 320
```

```
Met Val Glu Leu Tyr Asn Gln His Arg Glu Asp Leu Lys Lys Tyr Lys
                325                 330                 335

Asp Tyr Ile Lys Ala Tyr Leu Pro Glu Lys Tyr Gly Glu Thr Phe Lys
            340                 345                 350

Asp Ala Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Ser
        355                 360                 365

Gln Glu Asp Phe Tyr Lys Phe Val Lys Ala Gln Leu Lys Gly Glu Glu
    370                 375                 380

Asn Gly Glu Tyr Phe Leu Glu Ala Ile Glu Asn Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Ser Phe Tyr Asn Gly Val Ile Pro Tyr Gln Ile His Leu
                405                 410                 415

Gln Glu Leu Thr Ala Val Leu Asp Gln Gln Glu Lys His Tyr Ser Phe
            420                 425                 430

Leu Lys Glu Asn Arg Asp Lys Ile Ile Ser Leu Leu Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Lys Gly Glu Ser Arg Phe Ala Trp
    450                 455                 460

Leu Glu Arg Ser Asn Ser Glu Glu Lys Ile Lys Pro Trp Asn Phe Asp
465                 470                 475                 480

Lys Ile Val Asp Ile Asp Lys Ser Ala Glu Leu Phe Ile Glu Asn Leu
                485                 490                 495

Thr Ser Arg Asp Thr Tyr Leu Pro Asp Glu Pro Val Leu Pro Lys Arg
            500                 505                 510

Ser Leu Ile Tyr Gln Lys Phe Thr Ile Phe Asn Glu Leu Thr Lys Ile
        515                 520                 525
```

```
Ser Tyr Ile Asp Glu Arg Gly Ile Leu Gln Asn Phe Ser Ser Arg Glu
    530                 535                 540

Lys Ile Ala Ile Phe Asn Asp Leu Phe Lys Asn Lys Ser Lys Val Thr
545                 550                 555                 560

Lys Asn Gln Leu Val Lys Tyr Ile Glu Asn Lys Glu Gln Ile Ile Ala
                565                 570                 575

Pro Glu Ile Lys Gly Ile Glu Asp Ser Phe Asn Ser Asn Tyr Ser Thr
            580                 585                 590

Tyr Ile Asp Leu Ser Lys Ile Pro Asp Met Lys Leu Leu Glu Lys Asp
        595                 600                 605

Glu Asp Glu Ile Leu Glu Glu Ile Ile Lys Ile Leu Thr Ile Phe Glu
    610                 615                 620

Asp Arg Lys Met Arg Lys Arg Gln Leu Met Lys Phe Lys Asp Lys Leu
625                 630                 635                 640

Ser Glu Lys Ala Ile Asn Gln Leu Ser Lys Lys His Tyr Thr Gly Trp
                645                 650                 655

Gly Gln Leu Ser Glu Lys Leu Ile Asn Gly Ile Arg Asp Glu Gln Ser
            660                 665                 670

Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asn Gly Cys Pro Lys Asn
        675                 680                 685

Met Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Thr Leu Ser Phe
    690                 695                 700

Lys Glu Lys Ile Arg Lys Ala Gln Asp Ile Asn Gln Val Asn Asp Ile
705                 710                 715                 720

Lys Glu Ile Val Lys Asp Leu Pro Gly Ser Pro Ala Ile Lys Lys Gly
                725                 730                 735
```

```
Ile Tyr Gln Ser Ile Arg Ile Val Asp Glu Ile Ile Arg Lys Met Lys
            740                 745                 750

Asp Arg Pro Lys Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr
        755                 760                 765

Thr Gln Glu Gly Lys Asn Lys Ser Lys Ala Arg Leu Lys Lys Ile Gln
    770                 775                 780

Glu Gly Leu Glu Asn Leu Asp Ser His Val Glu Lys Gln Ala Leu Asp
785                 790                 795                 800

Glu Glu Met Leu Lys Ser Pro Lys Tyr Tyr Leu Tyr Cys Leu Gln Asn
                805                 810                 815

Gly Lys Asp Ile Tyr Thr Gly Lys Asp Leu Asp Ile Gly Gln Leu Gln
            820                 825                 830

Thr Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe Ile Thr Asp Asn
        835                 840                 845

Ser Phe Asp Asn Leu Val Leu Thr Ser Ser Thr Val Asn Arg Gly Lys
    850                 855                 860

Leu Asp Asn Val Pro Ser Pro Asp Ile Val Arg Gln Gln Lys Gly Phe
865                 870                 875                 880

Trp Lys Gln Leu Leu Arg Ala Gly Leu Met Ser Gln Arg Lys Phe Asn
                885                 890                 895

Asn Leu Thr Lys Gly Lys Leu Thr Asp Arg Asp Arg Gln Gln Phe Ile
            900                 905                 910

Asn Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Asn
        915                 920                 925

Leu Leu Ser His His Leu Asn Glu Lys Lys Glu Val Gly Glu Ile Asn
    930                 935                 940
```

```
Ile Val Leu Leu Lys Ser Ala Leu Thr Ser Gln Phe Arg Lys Lys Phe
945                 950                 955                 960

Asp Phe Tyr Lys Val Arg Glu Val Asn Asp Tyr His His Ala His Asp
                965                 970                 975

Ala Tyr Leu Asn Gly Val Ile Ala Leu Lys Leu Leu Glu Leu Tyr Pro
            980                 985                 990

Tyr Met Ala Lys Asp Leu Ile Tyr  Gly Lys Tyr Ser Tyr  His Arg Lys
        995                 1000                1005

Gly Asp  Lys Ala Thr Gln Ala  Lys Tyr Lys Met Ser  Asn Ile Ile
    1010                1015                1020

Glu Arg  Phe Ser Gln Asp Leu  Leu Ala Asn Pro Asp  Gly Glu Ile
    1025                1030                1035

Ala Trp  Glu Lys Asp Lys Asp  Leu Asn Thr Ile Arg  Lys Val Leu
    1040                1045                1050

Ser Ser  Lys Gln Ile Asn Ile  Ile Lys Lys Ala Glu  Glu Gly Lys
    1055                1060                1065

Gly Arg  Leu Phe Lys Glu Thr  Ile Asn Ser Arg Pro  Ser Lys Lys
    1070                1075                1080

Thr Glu  Lys Arg Ile Pro Ile  Lys Asn Asn Leu Asp  Pro Asn Ile
    1085                1090                1095

Tyr Gly  Gly Tyr Ile Glu Glu  Lys Met Ala Tyr Tyr  Ile Ala Ile
    1100                1105                1110

Asn Tyr  Leu Glu Asn Gly Lys  Thr Lys Lys Ala Ile  Val Gly Ile
    1115                1120                1125

Ser Ile  Lys Asp Lys Lys Asp  Phe Glu Gly Gln Thr  Thr Glu Tyr
    1130                1135                1140
```

```
Leu Gly  Lys Ile Gly Phe Asn  Lys Ala Ser Ile Ile  Asn Ser Phe
    1145                1150                1155


Lys Asn  Tyr Thr Leu Phe Glu  Leu Glu Asn Gly Ser  Arg Arg Met
    1160                1165                1170


Ile Val  Gly Lys Gly Glu Leu  Gln Lys Gly Asn Gln  Met Tyr Leu
    1175                1180                1185


Pro Gln  Asn Leu Leu Glu Phe  Val Tyr His Leu Lys  His Tyr Asn
    1190                1195                1200


Glu Asp  Glu Thr Ser His Lys  Phe Ile Val Glu His  Lys Ala Tyr
    1205                1210                1215


Phe Asp  Glu Leu Leu Asn Tyr  Ile Val Glu Phe Ala  Asn Lys Tyr
    1220                1225                1230


Leu Glu  Leu Glu Asn Ser Ile  Glu Lys Ile Lys Asp  Leu Tyr His
    1235                1240                1245


Gly Lys  Gly Pro Asp Val Glu  Glu Lys Glu Leu Val  Glu Ser Phe
    1250                1255                1260


Ile Asn  Leu Leu Ala Ile Thr  Lys Cys Gly Pro Ala  Ala Asp Ile
    1265                1270                1275


Thr Phe  Leu Gly Glu Lys Ile  Ser Arg Lys Arg Tyr  Arg Ser Thr
    1280                1285                1290


Asn Cys  Leu Trp Gly Ser Glu  Val Ile Phe Gln Ser  Pro Thr Gly
    1295                1300                1305


Leu Tyr  Glu Thr Arg Leu Arg  Leu Glu
    1310                1315


<210>  292
<211>  1359
<212>  PRT
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<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 292

```
Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125


His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140


Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160


Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175


Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
```

```
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
```

385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn

595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
690 695 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705 710 715 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
740 745 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
770 775 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785 790 795 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn

805 810 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
820 825 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
835 840 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
850 855 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865 870 875 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
885 890 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
900 905 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
915 920 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
930 935 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945 950 955 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
965 970 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
980 985 990

Thr Ala Leu Ile Lys Lys Tyr Pro Lys Leu Glu Ser Glu Phe Val Tyr
995 1000 1005

Gly Asp Tyr Lys Val Tyr Asp Val Ser Glu Gln Glu Ile Gly Lys

1010 1015 1020

Ala Thr Ala Lys Tyr Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe
1025 1030 1035

Lys Thr Glu Ile Thr Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro
1040 1045 1050

Leu Ile Glu Thr Asn Gly Glu Thr Gly Glu Ile Val Trp Asp Lys
1055 1060 1065

Gly Arg Asp Phe Ala Thr Val Arg Lys Val Leu Ser Met Pro Gln
1070 1075 1080

Val Asn Ile Val Lys Lys Thr Glu Val Gln Thr Gly Gly Phe Ser
1085 1090 1095

Lys Glu Ser Ile Leu Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala
1100 1105 1110

Arg Lys Lys Asp Trp Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser
1115 1120 1125

Pro Thr Val Ala Tyr Ser Val Leu Val Val Ala Lys Val Glu Lys
1130 1135 1140

Gly Lys Ser Lys Lys Leu Lys Ser Val Lys Glu Leu Leu Gly Ile
1145 1150 1155

Thr Ile Met Glu Arg Ser Ser Phe Glu Lys Asn Pro Ile Asp Phe
1160 1165 1170

Leu Glu Ala Lys Gly Tyr Lys Glu Val Lys Lys Asp Leu Ile Ile
1175 1180 1185

Lys Leu Pro Lys Tyr Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys
1190 1195 1200

Arg Met Leu Ala Ser Gly Glu Leu Gln Lys Gly Asn Glu Leu Ala

1205 1210 1215

Leu Pro Ser Lys Tyr Val Asn Phe Leu Tyr Leu Ala Ser His Tyr
1220 1225 1230

Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu
1235 1240 1245

Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln
1250 1255 1260

Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
1265 1270 1275

Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile
1280 1285 1290

Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn
1295 1300 1305

Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp
1355

<210> 293
<211> 1327
<212> PRT
<213> Dolosigranulum pigrum

<400> 293

Met Gln Lys Asn Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

```
Gly Trp Ala Val Met Lys Asp Asp Tyr Thr Leu Ile Arg Lys Arg Met
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Ile Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Glu Gly Glu Thr Ala Lys Glu Thr Arg Leu
    50                  55                  60

Lys Arg Gly Thr Arg Arg Arg Tyr Gln Arg Arg Arg Asn Arg Leu Ile
65                  70                  75                  80

Tyr Leu Gln Asp Ile Phe Gln Gln Pro Met Leu Ala Ile Asp Glu Asn
                85                  90                  95

Phe Phe His Arg Leu Asp Asp Ser Phe Phe Val Pro Asp Asp Lys Ser
            100                 105                 110

Tyr Asp Arg His Pro Ile Phe Gly Ser Leu Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Asn Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Asn Pro Glu Lys Ala Asp Leu Arg Leu Val Tyr Thr Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Thr Ser Ile Ser Glu Thr Phe Glu Gln Phe Leu Asp Thr Tyr
            180                 185                 190

Ser Asp Ile Phe Lys Glu Gln Leu Val Gly Asp Ile Ser Lys Val Glu
        195                 200                 205

Glu Ile Leu Ser Ser Lys Gln Ser Arg Ser Arg Lys His Glu Gln Ile
    210                 215                 220
```

```
Met Ala Leu Phe Pro Asn Glu Asn Lys Leu Gly Asn Phe Gly Arg Phe
225                 230                 235                 240

Met Met Leu Ile Val Gly Asn Thr Ser Asn Phe Lys Pro Val Phe Asp
                245                 250                 255

Leu Asp Asp Glu Tyr Lys Leu Lys Leu Ser Asp Glu Thr Tyr Glu Glu
            260                 265                 270

Asp Leu Asp Thr Leu Leu Gly Met Thr Asp Asp Val Phe Leu Asp Val
        275                 280                 285

Phe Met Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Met Ser Ala Ile
    290                 295                 300

Ile Ser Thr Asp Thr Gly Asn Ser Lys Ala Val Leu Ser Asn Gln Met
305                 310                 315                 320

Ile Asn Phe Tyr Asp Glu His Lys Val Asp Leu Ala Gln Leu Lys Gln
                325                 330                 335

Phe Phe Lys Thr His Leu Pro Asp Lys Tyr Tyr Glu Cys Phe Ser Asp
            340                 345                 350

Pro Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Asn Gln
        355                 360                 365

Glu Asp Phe Tyr Lys Tyr Ile Glu Lys Val Met Lys Thr Ile Lys Ser
    370                 375                 380

Asp Lys Lys Asp Tyr Phe Leu Asp Lys Ile Asp Arg Glu Val Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Ser Phe Tyr Asn Ser Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Gln Glu Met Gln Ala Ile Leu Asp Arg Gln Ser Gln Tyr Tyr Pro
            420                 425                 430
```

```
Phe Leu Ala Glu Asn Arg Asp Lys Ile Glu Ser Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Thr Val Ser Asp Gln Ser Glu Phe
    450                 455                 460

Ala Trp Met Glu Arg Gln Ser Asp Glu Pro Ile Arg Pro Trp Asn Phe
465                 470                 475                 480

Asp Glu Ile Val Asn Lys Glu Arg Ser Ala Glu Lys Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Met Asp Thr Tyr Leu Leu Glu Glu Lys Val Leu Pro Lys
            500                 505                 510

Arg Ser Leu Leu Tyr Gln Thr Phe Glu Val Tyr Asn Glu Leu Thr Lys
        515                 520                 525

Val Arg Tyr Thr Asn Glu Gln Gly Lys Thr Glu Lys Leu Asn Arg Gln
    530                 535                 540

Gln Lys Ala Glu Ile Ile Glu Thr Leu Phe Lys Gln Lys Asn Arg Val
545                 550                 555                 560

Arg Glu Lys Asp Ile Ala Asn Tyr Leu Glu Gln Tyr Gly Tyr Val Asp
                565                 570                 575

Gly Thr Asp Ile Lys Gly Val Glu Asp Lys Phe Asn Ala Ser Leu Ser
            580                 585                 590

Thr Tyr Asn Asp Leu Ala Lys Ile Asp Gly Ala Lys Ala Tyr Leu Asp
        595                 600                 605

Asp Pro Glu Tyr Ala Asp Val Trp Glu Asp Ile Ile Lys Ile Leu Thr
    610                 615                 620

Ile Phe Glu Asp Lys Ala Met Arg Lys Lys Gln Leu Gln Thr Tyr Ser
625                 630                 635                 640
```

```
Asp Thr Leu Ser Pro Glu Ile Leu Lys Lys Leu Glu Arg Lys His Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Phe Ser Lys Lys Leu Ile Asn Gly Leu Arg Asp
            660                 665                 670

Glu Gly Ser Asn Lys Thr Ile Leu Asp Tyr Leu Lys Asp Glu Gly Ser
        675                 680                 685

Ser Gly Pro Thr Asn Arg Asn Phe Met Gln Leu Ile Arg Asp Asn Thr
    690                 695                 700

Leu Ser Phe Lys Lys Lys Ile Glu Asp Ala Gln Thr Ile Glu Asp Thr
705                 710                 715                 720

Thr His Ile Tyr Asp Thr Val Ala Glu Leu Pro Gly Ser Pro Ala Ile
                725                 730                 735

Lys Lys Gly Ile Arg Gln Ala Leu Lys Ile Val Glu Glu Ile Ile Asp
            740                 745                 750

Ile Ile Gly Tyr Glu Pro Glu Asn Ile Val Val Glu Met Ala Arg Glu
        755                 760                 765

Ser Gln Thr Thr Lys Lys Gly Lys Asp Leu Ser Lys Glu Arg Leu Glu
    770                 775                 780

Lys Leu Thr Glu Ala Ile Lys Glu Phe Asp Gly Val Lys Val Lys Asp
785                 790                 795                 800

Leu Lys Asn Glu Asn Leu Arg Asn Asp Arg Leu Tyr Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Arg Asp Met Tyr Thr Asn Glu Pro Leu Asp Ile Asn Asn
            820                 825                 830

Leu Ser Lys Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Thr Thr
        835                 840                 845
```

```
Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Arg Thr Lys Asn Gln
    850                 855                 860

Gly Asn Lys Ser Asp Asp Val Pro Ser Ile Asn Ile Val His Lys Met
865                 870                 875                 880

Lys Pro Phe Trp Arg Gln Leu His Lys Ala Gly Leu Ile Ser Asp Arg
                885                 890                 895

Lys Phe Lys Asn Leu Thr Lys Ala Glu His Gly Gly Leu Thr Glu Ala
            900                 905                 910

Asp Arg Ala His Phe Leu Asn Arg Gln Leu Val Glu Thr Arg Gln Ile
        915                 920                 925

Thr Lys His Val Ala Asn Leu Leu Asp Ser Gln Tyr Asn Thr Ala Glu
    930                 935                 940

Glu Gln Arg Ile Asn Ile Val Leu Leu Lys Ser Ser Met Thr Ser Arg
945                 950                 955                 960

Phe Arg Lys Glu Phe Lys Leu Tyr Lys Val Arg Glu Ile Asn Asp Tyr
                965                 970                 975

His His Gly His Asp Ala Tyr Leu Asn Ala Val Val Ala Thr Thr Ile
            980                 985                 990

Met Lys Val Tyr Pro Asn Leu Lys  Pro Gln Phe Val Tyr  Gly Gln Tyr
        995                 1000                1005

Lys Lys  Thr Ser Met Phe Lys  Glu Glu Lys Ala Thr  Ala Arg Lys
    1010                1015                1020

His Phe  Tyr Ser Asn Ile Thr  Lys Phe Phe Lys Lys  Glu Lys Val
    1025                1030                1035

Val Asn  Glu Glu Thr Gly Glu  Ile Leu Trp Asp Thr  Glu Arg His
    1040                1045                1050
```

```
Leu Ser  Thr Ile Lys Arg Val  Leu Ser Trp Lys Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Val Glu Lys Gln  Lys Gly Gln Leu Trp  Lys Glu Thr
    1070                1075                1080

Ile Tyr  Pro Lys Gly Asp Ser  Ser Lys Leu Ile Pro  Val Lys Glu
    1085                1090                1095

Gly Met  Asp Pro Gln Lys Tyr  Gly Gly Leu Ser Gln  Val Ser Glu
    1100                1105                1110

Ala Phe  Ala Val Val Ile Thr  His Glu Lys Gly Lys  Lys Lys Gln
    1115                1120                1125

Leu Lys  Ser Asp Leu Ile Ser  Ile Pro Ile Val Asp  Gln Lys Ala
    1130                1135                1140

Tyr Glu  Gln His Pro Thr Ala  Tyr Leu Glu Glu Ala  Gly Tyr Asn
    1145                1150                1155

Asn Pro  Thr Val Leu His Glu  Leu Phe Lys Tyr Gln  Leu Phe Glu
    1160                1165                1170

Leu Glu  Asp Gly Ser Arg Arg  Met Ile Ala Ser Ala  Lys Glu Phe
    1175                1180                1185

Gln Lys  Gly Asn Gln Met Val  Leu Pro Leu Glu Leu  Val Glu Leu
    1190                1195                1200

Leu Tyr  His Ala Asn Arg Tyr  Asp Lys Val Lys Phe  Pro Asp Ser
    1205                1210                1215

Ile Glu  Tyr Val His Asp Asn  Leu Ala Lys Phe Asp  Asp Leu Leu
    1220                1225                1230

Glu Tyr  Val Ile Asp Phe Ser  Asn Lys Tyr Ile Asn  Ala Asp Lys
    1235                1240                1245
```

```
Asn Val  Gln Lys Ile Gln Lys  Ile Tyr Lys Glu His  Gly Thr Glu
    1250                 1255                 1260


Asp Val  Glu Leu Thr Val Glu  Ser Phe Val Asn Leu  Met Thr Phe
    1265                 1270                 1275


Thr Ala  Met Gly Ala Pro Ala  Thr Phe Lys Phe Tyr  Gly Glu Ser
    1280                 1285                 1290


Ile Thr  Arg Ser Arg Tyr Thr  Ser Ile Thr Glu Phe  Arg Gly Ser
    1295                 1300                 1305


Thr Leu  Ile Phe Gln Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Tyr
    1310                 1315                 1320


Lys Leu  Glu Asp
    1325
```

<210> 294
<211> 1329
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 294

```
Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20                  25                  30


Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60
```

```
Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Asp Leu Asp Glu Asn
                85                  90                  95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270
```

```
Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Lys Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
        355                 360                 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480
```

```
Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Gly Tyr Leu Ile Asp Asp Gly
        675                 680                 685
```

```
Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780

Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845

Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Asp Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895
```

```
Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940

Asn Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990

Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Phe Gln  Thr Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020

Ala Lys  Ala Ile Ile Tyr Thr  Asn Leu Leu Arg Phe  Phe Thr Glu
    1025                1030                1035

Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050

Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065

Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080

Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095
```

```
Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110

Ile Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125

Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140

Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155

Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170

Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185

Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                1210                1215

Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                1225                1230

Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                1240                1245

Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                1255                1260

Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                1270                1275

Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                1285                1290
```

Lys Asp Ile Glu Arg Ala Arg Tyr Thr Ser Ile Lys Glu Ile Phe
1295 1300 1305

Asp Ala Thr Ile Ile Tyr Gln Ser Thr Thr Gly Leu Tyr Glu Thr
1310 1315 1320

Arg Arg Lys Val Val Asp
1325

<210> 295
<211> 1280
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 295

Met Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu Lys
1 5 10 15

Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg Tyr
20 25 30

Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Asp Leu Asp Glu Asn Phe
35 40 45

Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys Trp
50 55 60

His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr His
65 70 75 80

Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp Ser
85 90 95

Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Ile
100 105 110

Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr Glu
115 120 125

```
Asn Thr Ser Val Lys Asp Gln Phe Gln Gln Phe Met Val Ile Tyr Asn
    130                 135                 140

Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu Ile
145                 150                 155                 160

Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu Lys
                165                 170                 175

Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly Gln
            180                 185                 190

Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val Phe
        195                 200                 205

Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr Glu
    210                 215                 220

Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser Asp
225                 230                 235                 240

Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser Thr
                245                 250                 255

Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser Ser
            260                 265                 270

Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Lys Phe Lys
        275                 280                 285

Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe Lys
    290                 295                 300

Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val Ser
305                 310                 315                 320

Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile Ala
                325                 330                 335
```

```
Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu Arg
            340                 345                 350

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu
        355                 360                 365

Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro Phe
    370                 375                 380

Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg Ile
385                 390                 395                 400

Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe Ala
                405                 410                 415

Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu Gln
            420                 425                 430

Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg Met
        435                 440                 445

Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys His
    450                 455                 460

Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys Ile
465                 470                 475                 480

Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys Glu
                485                 490                 495

Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val Lys
            500                 505                 510

Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu Ile
        515                 520                 525

Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe Ser
    530                 535                 540
```

```
Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu Asp
545                 550                 555                 560

His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu Thr
                565                 570                 575

Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe Lys
            580                 585                 590

Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His Tyr
        595                 600                 605

Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr Asp
    610                 615                 620

Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Val Asp Asp Gly Val
625                 630                 635                 640

Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser Gln
                645                 650                 655

Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His Glu
            660                 665                 670

Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala Ile
        675                 680                 685

Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val Ala
    690                 695                 700

Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg Glu
705                 710                 715                 720

Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu Lys
                725                 730                 735

Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys Glu
            740                 745                 750
```

```
Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu Tyr
        755                 760                 765

Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser Leu
    770                 775                 780

His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe
785                 790                 795                 800

Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr Glu
                805                 810                 815

Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys Asp
            820                 825                 830

Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser Gln
        835                 840                 845

Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr Leu
    850                 855                 860

Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln
865                 870                 875                 880

Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala Lys
                885                 890                 895

Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu Thr
            900                 905                 910

Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val Asn
        915                 920                 925

Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala Thr
    930                 935                 940

Thr Leu Leu Lys Val Tyr Pro Asn Leu Ala Pro Glu Phe Val Tyr Gly
945                 950                 955                 960
```

```
Glu Tyr Pro Lys Phe Gln Thr Phe Lys Glu Asn Lys Ala Thr Ala Lys
               965                 970                 975

Ala Ile Ile Tyr Thr Asn Leu Leu Arg Phe Phe Thr Glu Asp Glu Pro
           980                 985                 990

Arg Phe Thr Lys Asp Gly Glu Ile  Leu Trp Ser Asn Ser  Tyr Leu Lys
        995                1000                1005

Thr Ile  Lys Lys Glu Leu Asn  Tyr His Gln Met Asn  Ile Val Lys
    1010                1015                1020

Lys Val  Glu Val Gln Lys Gly  Gly Phe Ser Lys Glu  Ser Ile Lys
    1025                1030                1035

Pro Lys  Gly Pro Ser Asn Lys  Leu Ile Pro Val Lys  Asn Gly Leu
    1040                1045                1050

Asp Pro  Gln Lys Tyr Gly Gly  Phe Asp Ser Pro Val  Val Ala Tyr
    1055                1060                1065

Thr Val  Leu Phe Thr His Glu  Lys Gly Lys Lys Pro  Leu Ile Lys
    1070                1075                1080

Gln Glu  Ile Leu Gly Ile Thr  Ile Met Glu Lys Thr  Arg Phe Glu
    1085                1090                1095

Gln Asn  Pro Ile Leu Phe Leu  Glu Glu Lys Gly Phe  Leu Arg Pro
    1100                1105                1110

Arg Val  Leu Met Lys Leu Pro  Lys Tyr Thr Leu Tyr  Glu Phe Pro
    1115                1120                1125

Glu Gly  Arg Arg Arg Leu Leu  Ala Ser Ala Lys Glu  Ala Gln Lys
    1130                1135                1140

Gly Asn  Gln Met Val Leu Pro  Glu His Leu Leu Thr  Leu Leu Tyr
    1145                1150                1155
```

```
His Ala  Lys Gln Cys Leu Leu  Pro Asn Gln Ser Glu  Ser Leu Ala
    1160                1165                1170


Tyr Val  Glu Gln His Gln Pro  Glu Phe Gln Glu Ile  Leu Glu Arg
    1175                1180                1185


Val Val  Asp Phe Ala Glu Val  His Thr Leu Ala Lys  Ser Lys Val
    1190                1195                1200


Gln Gln  Ile Val Lys Leu Phe  Glu Ala Asn Gln Thr  Ala Asp Val
    1205                1210                1215


Lys Glu  Ile Ala Ala Ser Phe  Ile Gln Leu Met Gln  Phe Asn Ala
    1220                1225                1230


Met Gly  Ala Pro Ser Thr Phe  Lys Phe Phe Gln Lys  Asp Ile Glu
    1235                1240                1245


Arg Ala  Arg Tyr Thr Ser Ile  Lys Glu Ile Phe Asp  Ala Thr Ile
    1250                1255                1260


Ile Tyr  Gln Ser Pro Thr Gly  Leu Tyr Glu Thr Arg  Arg Lys Val
    1265                1270                1275


Val Asp
    1280


<210>  296
<211>  1072
<212>  PRT
<213>  Enterococcus durans

<400>  296

Met Asp Glu Glu Ala Lys Ile Gln Leu Ser Lys Glu Ser Tyr Glu Glu
1               5                  10                  15


Glu Leu Glu Ser Leu Leu Glu Lys Ser Gly Glu Glu Phe Arg Asp Val
            20                  25                  30
```

```
Phe Leu Gln Ala Lys Lys Val Tyr Asp Ala Ile Leu Leu Ser Asp Ile
        35                  40                  45

Leu Ser Thr Lys Lys Gln Asn Ser Lys Ala Lys Leu Ser Leu Gly Met
    50                  55                  60

Ile Glu Arg Tyr Asp Ser His Lys Lys Asp Leu Glu Glu Leu Lys Gln
65                  70                  75                  80

Phe Val Lys Ala Asn Leu Pro Glu Lys Thr Ala Ile Phe Phe Lys Asp
                85                  90                  95

Ser Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr Gln
            100                 105                 110

Glu Asp Phe Tyr Lys Phe Leu Lys Lys Glu Leu Asn Gly Ile Ala Gly
        115                 120                 125

Ser Glu Arg Phe Met Glu Lys Val Asp Gln Glu Asn Phe Leu Leu Lys
    130                 135                 140

Gln Arg Thr Thr Ala Asn Gly Val Ile Pro His Gln Val His Leu Thr
145                 150                 155                 160

Glu Leu Lys Ala Ile Ile Glu Arg Gln Lys Pro Tyr Tyr Pro Ser Leu
                165                 170                 175

Glu Glu Ala Arg Asp Lys Met Ile Arg Leu Leu Thr Phe Arg Ile Pro
            180                 185                 190

Tyr Tyr Val Gly Pro Leu Ala Gln Gly Glu Glu Thr Ser Ser Phe Ala
        195                 200                 205

Trp Leu Glu Arg Lys Thr Pro Glu Lys Val Thr Pro Trp Asn Ala Thr
    210                 215                 220

Glu Val Ile Asp Tyr Ser Ala Ser Ala Met Lys Phe Ile Gln Arg Met
225                 230                 235                 240
```

```
Ile Asn Tyr Asp Thr Tyr Leu Pro Thr Glu Lys Val Leu Pro Lys His
                245                 250                 255

Ser Ile Leu Tyr Gln Lys Tyr Thr Ile Phe Asn Glu Leu Thr Lys Val
            260                 265                 270

Ala Tyr Lys Asp Glu Arg Gly Ile Lys His Gln Phe Ser Ser Lys Glu
        275                 280                 285

Lys Arg Glu Ile Phe Lys Glu Leu Phe Gln Lys Gln Arg Lys Val Thr
    290                 295                 300

Val Lys Lys Leu Gln Gln Phe Leu Ser Ala Asn Tyr Asn Ile Glu Asp
305                 310                 315                 320

Ala Glu Ile Leu Gly Val Asp Lys Ala Phe Asn Ser Ser Tyr Ala Thr
                325                 330                 335

Tyr His Asp Phe Leu Asp Leu Ala Lys Pro Asn Glu Leu Leu Glu Gln
            340                 345                 350

Pro Glu Met Asn Ala Met Phe Glu Asp Ile Val Lys Ile Leu Thr Ile
        355                 360                 365

Phe Glu Asp Arg Glu Met Ile Arg Thr Gln Leu Lys Lys Tyr Gln Ser
    370                 375                 380

Val Leu Gly Asp Gly Phe Phe Lys Lys Leu Val Lys Lys His Tyr Thr
385                 390                 395                 400

Gly Trp Gly Arg Leu Ser Glu Arg Leu Ile Asn Gly Ile Arg Asp Lys
                405                 410                 415

Lys Thr Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe Pro
            420                 425                 430

Tyr Asn Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu
        435                 440                 445
```

```
Ser Phe Lys Glu Glu Leu Ala Asn Glu Leu Ala Leu Ala Gly Asn Gln
    450                 455                 460

Ser Leu Leu Glu Val Val Glu Ala Leu Leu Gly Ser Pro Ala Ile Lys
465                 470                 475                 480

Lys Gly Ile Trp Gln Thr Leu Lys Ile Val Glu Glu Leu Ile Glu Ile
                485                 490                 495

Ile Gly Tyr Asn Pro Lys Asn Ile Val Val Glu Met Ala Arg Glu Asn
            500                 505                 510

Gln Arg Thr Asn Arg Ser Lys Pro Arg Leu Lys Ala Leu Glu Glu Ala
        515                 520                 525

Leu Lys Ser Phe Asp Ser Pro Leu Leu Lys Glu Gln Pro Val Asp Asn
    530                 535                 540

Gln Ala Leu Gln Lys Asp Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
545                 550                 555                 560

Lys Asp Met Tyr Thr Gly Glu Ala Leu Asp Ile Asp Arg Leu Ser Glu
                565                 570                 575

Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe Ile Val Asp Asn Ser
            580                 585                 590

Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu Asn Arg Leu Lys Met
        595                 600                 605

Asp Asp Val Pro Asp Gln Lys Val Val Ile Arg Met Arg Arg Tyr Trp
    610                 615                 620

Glu Lys Leu Leu Arg Ala Asn Leu Ile Ser Glu Arg Lys Phe Ala Tyr
625                 630                 635                 640

Leu Thr Lys Leu Glu Leu Thr Pro Glu Asp Lys Ala Arg Phe Ile Gln
                645                 650                 655
```

```
Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Ala Ile
            660                 665                 670

Leu Asp Gln Tyr Phe Asn Gln Pro Glu Glu Ser Lys Asn Lys Gly Ile
        675                 680                 685

Arg Ile Ile Thr Leu Lys Ser Ser Leu Val Ser Gln Phe Arg Lys Thr
    690                 695                 700

Phe Gly Ile Asn Lys Val Arg Glu Ile Asn Asn His His His Ala His
705                 710                 715                 720

Asp Ala Tyr Leu Asn Gly Val Val Ala Ile Ala Leu Leu Lys Lys Tyr
                725                 730                 735

Pro Lys Leu Glu Pro Glu Phe Val Tyr Gly Asn Tyr Thr Lys Phe Asn
            740                 745                 750

Leu Ala Thr Glu Asn Lys Ala Thr Ala Lys Lys Glu Phe Tyr Ser Asn
        755                 760                 765

Ile Leu Arg Phe Phe Glu Lys Glu Glu Tyr Ser Tyr Asp Glu Asn Gly
    770                 775                 780

Glu Ile Phe Trp Asp Lys Ala Arg His Ile Pro Gln Ile Lys Lys Val
785                 790                 795                 800

Ile Ser Ser His Gln Val Asn Ile Val Lys Lys Val Glu Val Gln Thr
                805                 810                 815

Gly Gly Phe Tyr Lys Glu Thr Val Asn Pro Lys Gly Lys Pro Asp Lys
            820                 825                 830

Leu Ile Gln Arg Lys Ala Gly Trp Asp Val Ser Lys Tyr Gly Gly Phe
        835                 840                 845

Gly Ser Pro Val Val Ala Tyr Ala Val Ala Phe Ile Tyr Glu Lys Gly
    850                 855                 860
```

```
Lys Ala Arg Lys Lys Ala Lys Ala Ile Glu Gly Ile Thr Ile Met Lys
865                 870                 875                 880


Gln Ser Leu Phe Glu Gln Asp Pro Ile Gly Phe Leu Ser Asn Lys Gly
                885                 890                 895


Tyr Ser Asn Val Thr Lys Phe Ile Lys Leu Ser Lys Tyr Thr Leu Tyr
            900                 905                 910


Glu Leu Glu Asn Gly Arg Arg Arg Met Val Ala Ser Lys Glu Ala Gln
        915                 920                 925


Lys Ala Asn Ser Phe Ile Leu Pro Glu Lys Leu Val Thr Leu Leu Tyr
    930                 935                 940


His Ala Gln His Tyr Asp Glu Ile Ala His Lys Glu Ser Phe Asp Tyr
945                 950                 955                 960


Val Asn Asp His Leu Ser Glu Phe Arg Glu Ile Leu Asp Gln Val Ile
                965                 970                 975


Asp Phe Ser Asn Arg Tyr Thr Ile Ala Ala Lys Asn Thr Glu Lys Ile
            980                 985                 990


Ala Glu Leu Phe Glu Gln Asn Gln  Glu Ser Thr Val Gln  Ser Leu Ser
        995                 1000                1005


Gln Ser  Phe Ile Asn Leu Met  Gln Leu Asn Ala Met  Gly Ala Pro
    1010                1015                1020


Ala Asp  Phe Lys Phe Phe Asp  Val Ile Ile Pro Arg  Lys Arg Tyr
    1025                1030                1035


Pro Ser  Leu Thr Glu Ile Trp  Glu Ser Thr Ile Ile  Tyr Gln Ser
    1040                1045                1050


Ile Thr  Gly Leu Arg Glu Thr  Arg Thr Arg Met Ala  Thr Leu Trp
    1055                1060                1065
```

Asp Gly Glu Gln
    1070

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<212> PRT
<213> Enterococcus faecalis

<400> 297

Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20   25   30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35   40   45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65   70   75   80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Asp Leu Asp Glu Asn
                85   90   95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100   105   110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115   120   125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130   135   140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145   150   155   160

```
Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Thr Ser Val Lys Glu Gln Phe Gln Gln Phe Met Val Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Lys Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
        355                 360                 365
```

```
Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575
```

```
Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Val Asp Asp Gly
        675                 680                 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780
```

```
Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800


Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815


Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830


Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845


Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860


Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Lys Val Val Lys
865                 870                 875                 880


Lys Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895


Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910


Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925


Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940


Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960


Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975


Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990
```

```
Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005


Gly Glu  Tyr Pro Lys Phe Gln  Ala Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020


Ala Lys  Thr Ile Ile Tyr Thr  Asn Leu Met Arg Phe  Phe Thr Glu
    1025                1030                1035


Asp Glu  Pro Arg Phe Thr Lys  Asp Ser Glu Ile Leu  Trp Ser Asn
    1040                1045                1050


Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065


Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080


Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095


Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110


Val Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125


Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140


Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155


Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170


Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185
```

```
Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                 1195                 1200


Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                 1210                 1215


Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                 1225                 1230


Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                 1240                 1245


Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                 1255                 1260


Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                 1270                 1275


Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                 1285                 1290


Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                 1300                 1305


Asp Ala  Thr Ile Ile Tyr Gln  Ser Thr Thr Gly Leu  Tyr Glu Thr
    1310                 1315                 1320


Arg Arg  Lys Val Val Asp
    1325
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<400> 298

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Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
```

```
            20                  25                  30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
                85                  90                  95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
```

225 230 235 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
245 250 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
260 265 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
275 280 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
290 295 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305 310 315 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Asn Phe
325 330 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
340 345 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Thr His Ala Val
355 360 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
370 375 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385 390 395 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
405 410 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
420 425 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg

435 440 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Asn Thr Phe
450 455 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465 470 475 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
485 490 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
500 505 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
515 520 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
530 535 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545 550 555 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
565 570 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
580 585 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
595 600 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
610 615 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625 630 635 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His

645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
660 665 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
690 695 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705 710 715 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
725 730 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
740 745 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
755 760 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
770 775 780

Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785 790 795 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
805 810 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
820 825 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
835 840 845

Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr

```
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Asp Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990

Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Phe Gln  Thr Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020

Ala Lys  Ala Ile Ile Tyr Thr  Asn Leu Leu Arg Phe  Phe Thr Glu
    1025                1030                1035

Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050

Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
```

1055 1060 1065

Asn Ile Val Lys Lys Val Glu Val Gln Lys Gly Gly Phe Ser Lys
1070 1075 1080

Glu Ser Ile Lys Pro Lys Gly Pro Ser Asn Lys Leu Ile Pro Val
1085 1090 1095

Lys Asn Gly Leu Asp Pro Gln Lys Tyr Gly Gly Phe Asp Ser Pro
1100 1105 1110

Ile Val Ala Tyr Thr Val Leu Phe Thr His Glu Lys Gly Lys Lys
1115 1120 1125

Pro Leu Ile Lys Gln Glu Ile Leu Gly Ile Thr Ile Met Glu Lys
1130 1135 1140

Thr Arg Phe Glu Gln Asn Pro Ile Leu Phe Leu Glu Glu Lys Gly
1145 1150 1155

Phe Leu Arg Pro Arg Val Leu Met Lys Leu Pro Lys Tyr Thr Leu
1160 1165 1170

Tyr Gln Phe Pro Glu Gly Arg Arg Arg Leu Leu Ala Ser Ala Lys
1175 1180 1185

Glu Ala Gln Lys Gly Asn Gln Met Val Leu Pro Glu His Leu Leu
1190 1195 1200

Thr Leu Leu Tyr His Ala Lys Gln Cys Leu Leu Pro Asn Gln Ser
1205 1210 1215

Glu Ser Leu Ala Tyr Val Glu Gln His Gln Pro Glu Phe Gln Glu
1220 1225 1230

Ile Leu Glu Arg Val Val Asp Phe Ala Glu Val His Thr Leu Ala
1235 1240 1245

Lys Ser Lys Val Gln Gln Ile Val Lys Leu Phe Glu Ala Asn Gln

1250 1255 1260

Thr Ala Asp Val Lys Glu Ile Ala Ala Ser Phe Ile Gln Leu Met
1265 1270 1275

Gln Phe Asn Ala Met Gly Ala Pro Ser Thr Phe Lys Phe Phe Gln
1280 1285 1290

Lys Asp Ile Glu Arg Ala Arg Tyr Thr Ser Ile Lys Glu Ile Phe
1295 1300 1305

Asp Ala Thr Ile Ile Tyr Gln Ser Thr Thr Gly Leu Tyr Glu Thr
1310 1315 1320

Arg Arg Lys Val Val Asp
1325

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<400> 299

Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
20 25 30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65 70 75 80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
85 90 95

```
Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300
```

```
Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Asn Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Thr His Ala Val
        355                 360                 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510
```

```
His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Val Asp Asp Gly
        675                 680                 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720
```

```
Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780

Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845

Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Asp Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925
```

```
Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990

Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Phe Gln  Thr Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020

Ala Lys  Ala Ile Ile Tyr Thr  Asn Leu Leu Arg Phe  Phe Thr Glu
    1025                1030                1035

Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050

Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065

Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080

Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095

Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110

Ile Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125
```

```
Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140

Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155

Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170

Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185

Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                1210                1215

Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                1225                1230

Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                1240                1245

Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                1255                1260

Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                1270                1275

Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                1285                1290

Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                1300                1305

Asp Ala  Thr Ile Ile Tyr Gln  Ser Thr Thr Gly Leu  Tyr Glu Thr
    1310                1315                1320
```

Arg Arg Lys Val Val Asp
    1325

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Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20   25   30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35   40   45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65   70   75   80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Asp Leu Asp Glu Asn
                85   90   95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100   105   110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115   120   125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130   135   140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145   150   155   160

```
Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Lys Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
        355                 360                 365
```

```
Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575
```

```
Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Val Asp Asp Gly
        675                 680                 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780
```

```
Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845

Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Asp Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asn Gln Arg Tyr Asn Ala
    930                 935                 940

Asn Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990
```

```
Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005


Gly Glu  Tyr Pro Lys Phe Gln  Thr Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020


Ala Lys  Ala Ile Ile Tyr Thr  Asn Leu Leu Arg Phe  Phe Thr Glu
    1025                1030                1035


Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050


Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065


Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080


Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095


Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110


Val Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125


Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140


Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155


Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170


Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185
```

```
Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                1195                1200


Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                1210                1215


Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                1225                1230


Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                1240                1245


Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                1255                1260


Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                1270                1275


Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                1285                1290


Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                1300                1305


Asp Ala  Thr Ile Ile Tyr Gln  Ser Thr Thr Gly Leu  Tyr Glu Thr
    1310                1315                1320


Arg Arg  Lys Val Val Asp
    1325


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Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20                  25                  30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
                85                  90                  95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220
```

```
Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240


Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255


Phe Gly Leu Glu Glu Glu Ala Lys Ile Lys Ile Thr Tyr Ala Ser Glu
            260                 265                 270


Ser Tyr Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu
        275                 280                 285


Tyr Ser Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu
    290                 295                 300


Leu Ser Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu
305                 310                 315                 320


Ser Ser Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys
                325                 330                 335


Asn Phe Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn
            340                 345                 350


Leu Phe Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His
        355                 360                 365


Ala Val Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln
    370                 375                 380


Asp Ile Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn
385                 390                 395                 400


Phe Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln
                405                 410                 415


Ile His Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr
            420                 425                 430
```

```
Tyr Pro Phe Leu Lys Glu Asn Gln Lys Lys Ile Glu Gln Leu Val Thr
        435                 440                 445

Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser
    450                 455                 460

Thr Phe Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp
465                 470                 475                 480

Asn Leu Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile
                485                 490                 495

Glu Arg Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu
            500                 505                 510

Pro Lys His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu
        515                 520                 525

Thr Lys Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser
    530                 535                 540

Gly Lys Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg
545                 550                 555                 560

Lys Val Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn
                565                 570                 575

Thr Glu Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala
            580                 585                 590

Ser Phe Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala
        595                 600                 605

Glu Leu Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys
    610                 615                 620

Ile Leu Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser
625                 630                 635                 640
```

```
Thr Phe Lys Gly Gln Phe Ser Glu Glu Val Leu Lys Lys Leu Glu Arg
                645                 650                 655

Lys His Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly
            660                 665                 670

Ile Tyr Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp
        675                 680                 685

Asp Gly Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn
    690                 695                 700

Asp Ser Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser
705                 710                 715                 720

Glu His Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser
                725                 730                 735

Pro Ala Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu
            740                 745                 750

Leu Val Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met
        755                 760                 765

Ala Arg Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln
    770                 775                 780

Arg Leu Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu
785                 790                 795                 800

Leu Lys Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu
                805                 810                 815

Phe Leu Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu
            820                 825                 830

Leu Ser Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro
        835                 840                 845
```

```
Gln Ser Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly
    850                 855                 860

Ser Thr Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val
865                 870                 875                 880

Val Lys Lys Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu
                885                 890                 895

Ile Ser Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly
            900                 905                 910

Leu Thr Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu
        915                 920                 925

Thr Arg Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr
    930                 935                 940

Asn Ala Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala
945                 950                 955                 960

Ser Leu Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg
                965                 970                 975

Glu Val Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val
            980                 985                 990

Val Ala Thr Thr Leu Leu Lys Val  Tyr Pro Asn Leu Ala  Pro Glu Phe
        995                 1000                1005

Val Tyr  Gly Glu Tyr Pro Lys  Phe Gln Ala Phe Lys  Glu Asn Lys
    1010                1015                1020

Ala Thr  Ala Lys Ala Ile Ile  Tyr Thr Asn Leu Leu  Arg Phe Phe
    1025                1030                1035

Thr Glu  Asp Glu Pro Arg Phe  Thr Lys Asp Gly Glu  Ile Leu Trp
    1040                1045                1050
```

```
Ser Asn  Ser Tyr Leu Lys Thr  Ile Lys Lys Glu Leu  Asn Tyr His
    1055                1060                1065

Gln Met  Asn Ile Val Lys Lys  Val Glu Val Gln Lys  Gly Gly Phe
    1070                1075                1080

Ser Lys  Glu Ser Ile Lys Pro  Lys Gly Pro Ser Asn  Lys Leu Ile
    1085                1090                1095

Pro Val  Lys Asn Gly Leu Asp  Pro Gln Lys Tyr Gly  Gly Phe Asp
    1100                1105                1110

Ser Pro  Val Val Ala Tyr Thr  Val Leu Phe Thr His  Glu Lys Gly
    1115                1120                1125

Lys Lys  Pro Leu Ile Lys Gln  Glu Ile Leu Gly Ile  Thr Ile Met
    1130                1135                1140

Glu Lys  Thr Arg Phe Glu Gln  Asn Pro Ile Leu Phe  Leu Glu Glu
    1145                1150                1155

Lys Gly  Phe Leu Arg Pro Arg  Val Leu Met Lys Leu  Pro Lys Tyr
    1160                1165                1170

Thr Leu  Tyr Glu Phe Pro Glu  Gly Arg Arg Arg Leu  Leu Ala Ser
    1175                1180                1185

Ala Lys  Glu Ala Gln Lys Gly  Asn Gln Met Val Leu  Pro Glu His
    1190                1195                1200

Leu Leu  Thr Leu Leu Tyr His  Ala Lys Gln Cys Leu  Leu Pro Asn
    1205                1210                1215

Gln Ser  Glu Ser Leu Ala Tyr  Val Glu Gln His Gln  Pro Glu Phe
    1220                1225                1230

Gln Glu  Ile Leu Glu Arg Val  Val Asp Phe Ala Glu  Val His Thr
    1235                1240                1245
```

```
Leu Ala  Lys Ser Lys Val Gln  Gln Ile Val Lys Leu  Phe Glu Ala
    1250                1255                1260


Asn Gln  Thr Ala Asp Val Lys  Glu Ile Ala Ala Ser  Phe Ile Gln
    1265                1270                1275


Leu Met  Gln Phe Asn Ala Met  Gly Ala Pro Ser Thr  Phe Lys Phe
    1280                1285                1290


Phe Gln  Lys Asp Ile Glu Arg  Ala Arg Tyr Thr Ser  Ile Lys Glu
    1295                1300                1305


Ile Phe  Asp Ala Thr Ile Ile  Tyr Gln Ser Thr Thr  Gly Leu Tyr
    1310                1315                1320


Glu Thr  Arg Arg Lys Val Val  Asp
    1325                1330
```

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<400> 302

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Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20                  25                  30


Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80


Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
```

```
                85                  90                  95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
```

```
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Lys Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
        355                 360                 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
```

500 505 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
515 520 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
530 535 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545 550 555 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
565 570 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
580 585 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
595 600 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
610 615 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625 630 635 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
660 665 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Gly Tyr Leu Ile Asp Asp Gly
675 680 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
690 695 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His

705 710 715 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
725 730 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
740 745 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
755 760 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
770 775 780

Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785 790 795 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
805 810 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
820 825 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
835 840 845

Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
850 855 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865 870 875 880

Asp Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
885 890 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
900 905 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg

915 920 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
930 935 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945 950 955 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
965 970 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
980 985 990

Thr Thr Leu Leu Lys Val Tyr Pro Asn Leu Ala Pro Glu Phe Val Tyr
995 1000 1005

Gly Glu Tyr Pro Lys Phe Gln Thr Phe Lys Glu Asn Lys Ala Thr
1010 1015 1020

Ala Lys Ala Ile Ile Tyr Thr Asn Leu Leu Arg Phe Phe Thr Glu
1025 1030 1035

Asp Glu Pro Arg Phe Thr Lys Asp Gly Glu Ile Leu Trp Ser Asn
1040 1045 1050

Ser Tyr Leu Lys Thr Ile Lys Lys Glu Leu Asn Tyr His Gln Met
1055 1060 1065

Asn Ile Val Lys Lys Val Glu Val Gln Lys Gly Gly Phe Ser Lys
1070 1075 1080

Glu Ser Ile Lys Pro Lys Gly Pro Ser Asn Lys Leu Ile Pro Val
1085 1090 1095

Lys Asn Gly Leu Asp Pro Gln Lys Tyr Gly Gly Phe Asp Ser Pro
1100 1105 1110

Ile Val Ala Tyr Thr Val Leu Phe Thr His Glu Lys Gly Lys Lys

1115 1120 1125

Pro Leu Ile Lys Gln Glu Ile Leu Gly Ile Thr Ile Met Glu Lys
1130 1135 1140

Thr Arg Phe Glu Gln Asn Pro Ile Leu Phe Leu Glu Glu Lys Gly
1145 1150 1155

Phe Leu Arg Pro Arg Val Leu Met Lys Leu Pro Lys Tyr Thr Leu
1160 1165 1170

Tyr Glu Phe Pro Glu Gly Arg Arg Arg Leu Leu Ala Ser Ala Lys
1175 1180 1185

Glu Ala Gln Lys Gly Asn Gln Met Val Leu Pro Glu His Leu Leu
1190 1195 1200

Thr Leu Leu Tyr His Ala Lys Gln Cys Leu Leu Pro Asn Gln Ser
1205 1210 1215

Glu Ser Leu Ala Tyr Val Glu Gln His Gln Pro Glu Phe Gln Glu
1220 1225 1230

Ile Leu Glu Arg Val Val Asp Phe Ala Glu Val His Thr Leu Ala
1235 1240 1245

Lys Ser Lys Val Gln Gln Ile Val Lys Leu Phe Glu Ala Asn Gln
1250 1255 1260

Thr Ala Asp Val Lys Glu Ile Ala Ala Ser Phe Ile Gln Leu Met
1265 1270 1275

Gln Phe Asn Ala Met Gly Ala Pro Ser Thr Phe Lys Phe Phe Gln
1280 1285 1290

Lys Asp Ile Glu Arg Ala Arg Tyr Thr Ser Ile Lys Glu Ile Phe
1295 1300 1305

Asp Ala Thr Ile Ile Tyr Gln Ser Thr Thr Gly Leu Tyr Glu Thr

1310 1315 1320

Arg Arg Lys Val Val Asp
1325

<210> 303
<211> 1329
<212> PRT
<213> Enterococcus faecalis

<400> 303

Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Ser Asn Ser Val
1 5 10 15

Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
20 25 30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
50 55 60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65 70 75 80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Asp Leu Asp Glu Asn
85 90 95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
100 105 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
115 120 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
130 135 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145 150 155 160

```
Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Thr Ser Val Lys Asp Gln Phe Gln Gln Phe Met Val Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Asn Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Thr His Ala Val
        355                 360                 365
```

```
Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575
```

```
Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780
```

```
Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845

Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Asp Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Leu Tyr Asn Ala
    930                 935                 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990
```

```
Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005


Gly Glu  Tyr Pro Lys Phe Gln  Thr Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020


Ala Lys  Thr Ile Ile Tyr Thr  Asn Leu Met Arg Phe  Phe Thr Glu
    1025                1030                1035


Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050


Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065


Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080


Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095


Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110


Val Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125


Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140


Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155


Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170


Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185
```

```
Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                 1195                 1200


Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                 1210                 1215


Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                 1225                 1230


Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                 1240                 1245


Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                 1255                 1260


Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                 1270                 1275


Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                 1285                 1290


Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                 1300                 1305


Asp Ala  Thr Ile Ile Tyr Gln  Ser Thr Thr Gly Leu  Tyr Glu Thr
    1310                 1315                 1320


Arg Arg  Lys Val Val Asp
    1325
```

<210> 304
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<212> PRT
<213> Enterococcus faecalis

<400> 304

```
Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20                  25                  30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
                85                  90                  95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Lys Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Gly Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220
```

```
Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser Tyr Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Lys Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
        355                 360                 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430
```

```
Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640
```

```
Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Val Asp Asp Gly
        675                 680                 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780

Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845
```

```
Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Asp Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990

Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Phe Gln  Thr Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020

Ala Lys  Ala Ile Ile Tyr Thr  Asn Leu Leu Arg Phe  Phe Thr Glu
    1025                1030                1035

Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050
```

```
Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065

Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080

Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095

Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110

Ile Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125

Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140

Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155

Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170

Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185

Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                1210                1215

Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                1225                1230

Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                1240                1245
```

```
Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                1255                1260


Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                1270                1275


Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                1285                1290


Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                1300                1305


Asp Ala  Thr Ile Ile Tyr Gln  Ser Thr Thr Gly Leu  Tyr Glu Thr
    1310                1315                1320


Arg Arg  Lys Val Val Asp
    1325
```

<210> 305
<211> 1329
<212> PRT
<213> Enterococcus faecalis

<400> 305

```
Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20                  25                  30


Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80
```

```
Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
                85                  90                  95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Asp Gln Phe Gln Gln Phe Met Val Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285
```

```
Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Asn Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
        355                 360                 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430

Phe Leu Lys Glu Asn Gln Lys Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495
```

```
Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700
```

```
Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720


Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735


Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750


Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765


Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780


Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800


Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815


Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830


Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845


Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860


Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880


Lys Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895


Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910
```

```
Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990

Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Phe Gln  Ala Phe Lys Glu Asn  Lys Ala Met
    1010                1015                1020

Ala Lys  Ala Ile Ile Tyr Thr  Asn Leu Leu Arg Phe  Phe Thr Glu
    1025                1030                1035

Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050

Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065

Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080

Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095

Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110
```

```
Val Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125

Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140

Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155

Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170

Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185

Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  Arg Leu Leu
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                1210                1215

Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                1225                1230

Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                1240                1245

Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                1255                1260

Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                1270                1275

Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                1285                1290

Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                1300                1305
```

Asp Ala Thr Ile Ile Tyr Gln Ser Thr Thr Gly Leu Tyr Glu Thr
    1310   1315   1320

Arg Arg Lys Val Val Asp
    1325

<210> 306
<211> 1329
<212> PRT
<213> Enterococcus faecalis

<400> 306

Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20   25   30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35   40   45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50   55   60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65   70   75   80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
                85   90   95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100   105   110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115   120   125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130   135   140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His

```
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220

Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Lys Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
```

355 360 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
370 375 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385 390 395 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
405 410 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
420 425 430

Phe Leu Lys Glu Asn Gln Glu Lys Ile Glu Gln Leu Val Thr Phe Arg
435 440 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
450 455 460

Ala Trp Leu Lys Arg Gln Asn Glu Lys Pro Ile Arg Pro Trp Asn Leu
465 470 475 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
485 490 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
500 505 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
515 520 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
530 535 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545 550 555 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu

565 570 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
580 585 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
595 600 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
610 615 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625 630 635 640

Lys Gly Gln Phe Ser Ala Glu Val Leu Lys Lys Leu Glu Arg Lys His
645 650 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
660 665 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
675 680 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
690 695 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705 710 715 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
725 730 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
740 745 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
755 760 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu

```
    770                 775                 780

Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845

Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Lys Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
```

980 985 990

Thr Thr Leu Leu Lys Val Tyr Pro Asn Leu Ala Pro Glu Phe Val Tyr
995 1000 1005

Gly Glu Tyr Pro Lys Phe Gln Ala Phe Lys Glu Asn Lys Ala Thr
1010 1015 1020

Ala Lys Ala Ile Ile Tyr Thr Asn Leu Met Arg Phe Phe Thr Glu
1025 1030 1035

Val Glu Pro Arg Phe Thr Lys Asp Gly Glu Ile Leu Trp Ser Asn
1040 1045 1050

Ser Tyr Leu Lys Thr Ile Lys Lys Glu Leu Asn Tyr His Gln Met
1055 1060 1065

Asn Ile Val Lys Lys Val Glu Val Gln Lys Gly Gly Phe Ser Lys
1070 1075 1080

Glu Ser Ile Lys Pro Lys Gly Pro Ser Asn Lys Leu Ile Pro Val
1085 1090 1095

Lys Asn Gly Leu Asp Pro Gln Lys Tyr Gly Gly Phe Asp Ser Pro
1100 1105 1110

Val Val Ala Tyr Thr Val Leu Phe Thr His Glu Lys Gly Lys Lys
1115 1120 1125

Pro Leu Ile Lys Gln Glu Ile Leu Gly Ile Thr Ile Met Glu Lys
1130 1135 1140

Thr Lys Phe Glu Gln Asn Pro Ile Leu Phe Leu Glu Glu Lys Gly
1145 1150 1155

Phe Leu Arg Pro Arg Val Leu Met Lys Leu Pro Lys Tyr Thr Leu
1160 1165 1170

Tyr Glu Phe Pro Glu Gly Arg Arg Arg Leu Leu Ala Ser Ala Lys

```
    1175                1180                1185

Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                1210                1215

Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                1225                1230

Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                1240                1245

Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Thr Asn Gln
    1250                1255                1260

Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                1270                1275

Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                1285                1290

Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                1300                1305

Asp Ala  Thr Ile Ile Tyr Gln  Ser Thr Thr Gly Leu  Tyr Glu Thr
    1310                1315                1320

Arg Arg  Lys Val Val Asp
    1325
```

<210> 307
<211> 1329
<212> PRT
<213> Enterococcus faecalis

<400> 307

```
Met Lys Lys Asp Tyr Val Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly Trp Ala Val Met Thr Glu Asp Tyr Gln Leu Val Lys Lys Lys Met
            20                  25                  30

Pro Ile Tyr Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Glu Glu Gly His Thr Ala Glu Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Ile Ser Arg Arg Arg Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Ala Phe Phe Glu Glu Ala Met Thr Ala Leu Asp Glu Asn
                85                  90                  95

Phe Phe Ala Arg Leu Gln Glu Ser Phe Leu Val Pro Glu Asp Lys Lys
            100                 105                 110

Trp His Arg His Pro Ile Phe Ala Lys Leu Glu Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Thr Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Ala Asp
    130                 135                 140

Ser Ser Glu Gln Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Lys Leu Ser Thr
                165                 170                 175

Glu Asn Ile Ser Val Lys Glu Gln Phe Gln Gln Phe Met Ile Ile Tyr
            180                 185                 190

Asn Gln Thr Phe Val Asn Gly Glu Ser Pro Leu Pro Glu Ser Val Leu
        195                 200                 205

Ile Glu Glu Glu Leu Thr Glu Lys Ala Ser Arg Thr Lys Lys Ser Glu
    210                 215                 220
```

```
Lys Val Leu Gln Gln Phe Pro Gln Glu Lys Ala Asn Gly Leu Phe Gly
225                 230                 235                 240

Gln Phe Leu Lys Leu Met Val Gly Asn Lys Ala Asp Phe Lys Lys Val
                245                 250                 255

Phe Gly Leu Glu Glu Glu Ala Lys Ile Thr Tyr Ala Ser Glu Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Gly Ile Leu Ala Lys Val Gly Asp Glu Tyr Ser
        275                 280                 285

Asp Val Phe Leu Ala Ala Lys Asn Val Tyr Asp Ala Val Glu Leu Ser
    290                 295                 300

Thr Ile Leu Ala Asp Ser Asp Lys Lys Ser His Ala Lys Leu Ser Ser
305                 310                 315                 320

Ser Met Ile Val Arg Phe Thr Glu His Gln Glu Asp Leu Lys Asn Phe
                325                 330                 335

Lys Arg Phe Ile Arg Glu Asn Cys Pro Asp Glu Tyr Asp Asn Leu Phe
            340                 345                 350

Lys Asn Glu Gln Lys Asp Gly Tyr Ala Gly Tyr Ile Ala His Ala Val
        355                 360                 365

Ser Gln Leu Lys Phe Tyr Gln Tyr Val Lys Lys Ile Ile Gln Asp Ile
    370                 375                 380

Ala Gly Ala Glu Tyr Phe Leu Glu Lys Ile Ala Gln Glu Asn Phe Leu
385                 390                 395                 400

Arg Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His
                405                 410                 415

Leu Ala Glu Leu Gln Ala Ile Ile His Arg Gln Ala Ala Tyr Tyr Pro
            420                 425                 430
```

```
Phe Leu Lys Glu Asn Gln Lys Lys Ile Glu Gln Leu Val Thr Phe Arg
        435                 440                 445

Ile Pro Tyr Tyr Val Gly Pro Leu Ser Lys Gly Asp Ala Ser Thr Phe
    450                 455                 460

Ala Trp Leu Lys Arg Gln Ser Glu Glu Pro Ile Arg Pro Trp Asn Leu
465                 470                 475                 480

Gln Glu Thr Val Asp Leu Asp Gln Ser Ala Thr Ala Phe Ile Glu Arg
                485                 490                 495

Met Thr Asn Phe Asp Thr Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys
            500                 505                 510

His Ser Leu Leu Tyr Glu Lys Phe Met Val Phe Asn Glu Leu Thr Lys
        515                 520                 525

Ile Ser Tyr Thr Asp Asp Arg Gly Ile Lys Ala Asn Phe Ser Gly Lys
    530                 535                 540

Glu Lys Glu Lys Ile Phe Asp Tyr Leu Phe Lys Thr Arg Arg Lys Val
545                 550                 555                 560

Lys Lys Lys Asp Ile Ile Gln Phe Tyr Arg Asn Glu Tyr Asn Thr Glu
                565                 570                 575

Ile Val Thr Leu Ser Gly Leu Glu Glu Asp Gln Phe Asn Ala Ser Phe
            580                 585                 590

Ser Thr Tyr Gln Asp Leu Leu Lys Cys Gly Leu Thr Arg Ala Glu Leu
        595                 600                 605

Asp His Pro Asp Asn Ala Glu Lys Leu Glu Asp Ile Ile Lys Ile Leu
    610                 615                 620

Thr Ile Phe Glu Asp Arg Gln Arg Ile Arg Thr Gln Leu Ser Thr Phe
625                 630                 635                 640
```

```
Lys Gly Gln Phe Ser Glu Glu Val Leu Lys Lys Leu Glu Arg Lys His
                645                 650                 655

Tyr Thr Gly Trp Gly Arg Leu Ser Lys Lys Leu Ile Asn Gly Ile Tyr
            660                 665                 670

Asp Lys Glu Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly
        675                 680                 685

Val Ser Lys His Tyr Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Ser
    690                 695                 700

Gln Leu Ser Phe Lys Asn Ala Ile Gln Lys Ala Gln Ser Ser Glu His
705                 710                 715                 720

Glu Glu Thr Leu Ser Glu Thr Val Asn Glu Leu Ala Gly Ser Pro Ala
                725                 730                 735

Ile Lys Lys Gly Ile Tyr Gln Ser Leu Lys Ile Val Asp Glu Leu Val
            740                 745                 750

Ala Ile Met Gly Tyr Ala Pro Lys Arg Ile Val Val Glu Met Ala Arg
        755                 760                 765

Glu Asn Gln Thr Thr Ser Thr Gly Lys Arg Arg Ser Ile Gln Arg Leu
    770                 775                 780

Lys Ile Val Glu Lys Ala Met Ala Glu Ile Gly Ser Asn Leu Leu Lys
785                 790                 795                 800

Glu Gln Pro Thr Thr Asn Glu Gln Leu Arg Asp Thr Arg Leu Phe Leu
                805                 810                 815

Tyr Tyr Met Gln Asn Gly Lys Asp Met Tyr Thr Gly Asp Glu Leu Ser
            820                 825                 830

Leu His Arg Leu Ser His Tyr Asp Ile Asp His Ile Ile Pro Gln Ser
        835                 840                 845
```

```
Phe Met Lys Asp Asp Ser Leu Asp Asn Leu Val Leu Val Gly Ser Thr
    850                 855                 860

Glu Asn Arg Gly Lys Ser Asp Asp Val Pro Ser Lys Glu Val Val Lys
865                 870                 875                 880

Lys Met Lys Ala Tyr Trp Glu Lys Leu Tyr Ala Ala Gly Leu Ile Ser
                885                 890                 895

Gln Arg Lys Phe Gln Arg Leu Thr Lys Gly Glu Gln Gly Gly Leu Thr
            900                 905                 910

Leu Glu Asp Lys Ala His Phe Ile Gln Arg Gln Leu Val Glu Thr Arg
        915                 920                 925

Gln Ile Thr Lys Asn Val Ala Gly Ile Leu Asp Gln Arg Tyr Asn Ala
    930                 935                 940

Lys Ser Lys Glu Lys Lys Val Gln Ile Ile Thr Leu Lys Ala Ser Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Ser Ile Phe Gly Leu Tyr Lys Val Arg Glu Val
                965                 970                 975

Asn Asp Tyr His His Gly Gln Asp Ala Tyr Leu Asn Cys Val Val Ala
            980                 985                 990

Thr Thr Leu Leu Lys Val Tyr Pro  Asn Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Pro Lys Phe Gln  Ala Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020

Ala Lys  Ala Ile Ile Tyr Thr  Asn Leu Leu Arg Phe  Phe Thr Glu
    1025                1030                1035

Asp Glu  Pro Arg Phe Thr Lys  Asp Gly Glu Ile Leu  Trp Ser Asn
    1040                1045                1050
```

```
Ser Tyr  Leu Lys Thr Ile Lys  Lys Glu Leu Asn Tyr  His Gln Met
    1055                1060                1065

Asn Ile  Val Lys Lys Val Glu  Val Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080

Glu Ser  Ile Lys Pro Lys Gly  Pro Ser Asn Lys Leu  Ile Pro Val
    1085                1090                1095

Lys Asn  Gly Leu Asp Pro Gln  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110

Val Val  Ala Tyr Thr Val Leu  Phe Thr His Glu Lys  Gly Lys Lys
    1115                1120                1125

Pro Leu  Ile Lys Gln Glu Ile  Leu Gly Ile Thr Ile  Met Glu Lys
    1130                1135                1140

Thr Arg  Phe Glu Gln Asn Pro  Ile Leu Phe Leu Glu  Glu Lys Gly
    1145                1150                1155

Phe Leu  Arg Pro Arg Val Leu  Met Lys Leu Pro Lys  Tyr Thr Leu
    1160                1165                1170

Tyr Glu  Phe Pro Glu Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185

Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Glu  His Leu Leu
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Cys Leu Leu Pro  Asn Gln Ser
    1205                1210                1215

Glu Ser  Leu Ala Tyr Val Glu  Gln His Gln Pro Glu  Phe Gln Glu
    1220                1225                1230

Ile Leu  Glu Arg Val Val Asp  Phe Ala Glu Val His  Thr Leu Ala
    1235                1240                1245
```

```
Lys Ser  Lys Val Gln Gln Ile  Val Lys Leu Phe Glu  Ala Asn Gln
    1250                 1255                 1260


Thr Ala  Asp Val Lys Glu Ile  Ala Ala Ser Phe Ile  Gln Leu Met
    1265                 1270                 1275


Gln Phe  Asn Ala Met Gly Ala  Pro Ser Thr Phe Lys  Phe Phe Gln
    1280                 1285                 1290


Lys Asp  Ile Glu Arg Ala Arg  Tyr Thr Ser Ile Lys  Glu Ile Phe
    1295                 1300                 1305


Asp Ala  Thr Ile Ile Tyr Gln  Ser Thr Thr Gly Leu  Tyr Glu Thr
    1310                 1315                 1320


Arg Arg  Lys Val Val Asp
    1325
```

<210> 308
<211> 1328
<212> PRT
<213> Enterococcus faecium

<400> 308

```
Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
            20                  25                  30


Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu
65                  70                  75                  80
```

```
Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
                85                  90                  95

Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Leu Asp Glu Lys Lys
            100                 105                 110

Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
        115                 120                 125

His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
    130                 135                 140

Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
            180                 185                 190

Asn Gln Gln Phe Ser Glu Ala Asp Lys Leu Asp Glu Ala Val Asp Cys
        195                 200                 205

Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr
    210                 215                 220

Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225                 230                 235                 240

Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
                245                 250                 255

Gly Leu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu Glu
            260                 265                 270

Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp Leu
        275                 280                 285
```

```
Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu Ile
    290                 295                 300

Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly Met
305                 310                 315                 320

Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys Arg
                325                 330                 335

Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly Asp
            340                 345                 350

Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr Gln
        355                 360                 365

Glu Asp Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg Gly
    370                 375                 380

Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu Thr
                405                 410                 415

Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe Ala
    450                 455                 460

Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu Pro
465                 470                 475                 480

Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg Met
                485                 490                 495
```

```
Ile Asn Thr Asp Met Tyr Met Pro His Asn Lys Val Leu Pro Lys Asn
            500                 505                 510

Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile Glu
    530                 535                 540

Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val Thr
545                 550                 555                 560

Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys His
                565                 570                 575

Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr Thr
            580                 585                 590

Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu Asp
        595                 600                 605

Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr Val
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu Ala
625                 630                 635                 640

Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe Pro
        675                 680                 685

His His Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu
    690                 695                 700
```

```
Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr Glu
705                 710                 715                 720

Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly Ile
            740                 745                 750

Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys Ala
    770                 775                 780

Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile His
            820                 825                 830

Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe Thr
        835                 840                 845

Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu Asn
    850                 855                 860

Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys Met
865                 870                 875                 880

Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys Arg
                885                 890                 895

Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys Ala
            900                 905                 910
```

```
Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr Asn
    930                 935                 940

Glu Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu Val
945                 950                 955                 960

Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975

Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Leu
            980                 985                 990

Ala Leu Leu Lys Lys Tyr Pro Gln  Leu Ala Pro Glu Phe  Val Tyr Gly
        995                 1000                1005

Glu Tyr  Leu Lys Phe Asn Ala  His Lys Ala Asn Lys  Ala Thr Val
    1010                1015                1020

Lys Lys  Glu Phe Tyr Ser Asn  Ile Met Lys Phe Phe  Glu Ser Asp
    1025                1030                1035

Thr Pro  Val Cys Asp Glu Asn  Gly Glu Ile Phe Trp  Asp Lys Ser
    1040                1045                1050

Lys Ser  Ile Ala Gln Val Lys  Lys Val Ile Asn His  His His Met
    1055                1060                1065

Asn Ile  Val Lys Lys Thr Glu  Ile Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080

Glu Thr  Val Glu Pro Lys Lys  Asp Ser Ser Lys Leu  Leu Pro Arg
    1085                1090                1095

Lys Asn  Asn Trp Asp Pro Ala  Lys Tyr Gly Gly Leu  Gly Ser Pro
    1100                1105                1110
```

```
Asn Val  Ala Tyr Thr Val Ala  Phe Thr Tyr Glu Lys  Gly Lys Ala
    1115                1120                1125

Arg Lys  Arg Thr Asn Ala Leu  Glu Gly Ile Thr Ile  Met Glu Arg
    1130                1135                1140

Glu Ala  Phe Glu Gln Ser Pro  Val Leu Phe Leu Lys  Asn Lys Gly
    1145                1150                1155

Tyr Glu  Gln Ala Glu Ile Glu  Met Lys Leu Pro Lys  Tyr Ala Leu
    1160                1165                1170

Phe Glu  Leu Glu Asn Gly Arg  Lys Arg Met Val Ala  Ser Lys Glu
    1175                1180                1185

Ala Gln  Lys Ala Asn Ser Phe  Leu Leu Pro Glu His  Leu Val Thr
    1190                1195                1200

Leu Leu  Tyr His Ala Lys Gln  Tyr Asp Glu Ile Ser  His Lys Glu
    1205                1210                1215

Ser Phe  Asp Tyr Val Asn Glu  His His Lys Glu Phe  Ser Glu Val
    1220                1225                1230

Phe Ala  Arg Val Leu Glu Phe  Ala Gly Lys Tyr Thr  Leu Ala Glu
    1235                1240                1245

Lys Asn  Ile Glu Lys Leu Glu  Lys Ile Tyr Lys Glu  Asn Gln Thr
    1250                1255                1260

Asp Asp  Leu Ala Lys Leu Ala  Ser Ser Phe Val Asn  Leu Met Gln
    1265                1270                1275

Phe Asn  Ala Met Gly Ala Pro  Ala Asp Phe Lys Phe  Phe Asp Val
    1280                1285                1290

Thr Ile  Pro Arg Lys Arg Tyr  Thr Ser Leu Thr Glu  Ile Trp Gln
    1295                1300                1305
```

```
Ser Thr  Ile Ile His Gln Ser  Ile Thr Gly Leu Tyr  Glu Thr Arg
    1310                1315                1320


Ile Arg  Met Gly Lys
    1325
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Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
            20                  25                  30


Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu
65                  70                  75                  80


Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
                85                  90                  95


Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Pro Asp Glu Lys Lys
            100                 105                 110


Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
        115                 120                 125


His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
    130                 135                 140
```

```
Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145                 150                 155                 160


Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175


Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
            180                 185                 190


Asn Gln Gln Phe Ser Glu Ala Gly Lys Leu Asp Glu Ala Val Asp Cys
        195                 200                 205


Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr
    210                 215                 220


Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225                 230                 235                 240


Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
                245                 250                 255


Gly Leu Glu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu
            260                 265                 270


Glu Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp
        275                 280                 285


Leu Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu
    290                 295                 300


Ile Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly
305                 310                 315                 320


Met Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys
                325                 330                 335


Arg Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly
            340                 345                 350
```

```
Asp Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg
    370                 375                 380

Gly Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu
                405                 410                 415

Ser Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe
    450                 455                 460

Ala Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu
465                 470                 475                 480

Pro Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg
                485                 490                 495

Met Ile Asn Thr Asp Met Tyr Met Pro His Asn Lys Val Leu Pro Lys
            500                 505                 510

Asn Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys
        515                 520                 525

Val Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile
    530                 535                 540

Glu Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val
545                 550                 555                 560
```

```
Thr Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys
                565                 570                 575

His Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr
            580                 585                 590

Thr Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu
        595                 600                 605

Asp Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr
    610                 615                 620

Val Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu
625                 630                 635                 640

Ala Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe
        675                 680                 685

Pro His His Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser
    690                 695                 700

Leu Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr
705                 710                 715                 720

Glu Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile
                725                 730                 735

Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly
            740                 745                 750

Ile Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu
        755                 760                 765
```

```
Asn Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys
    770                 775                 780

Ala Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu
785                 790                 795                 800

Tyr Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr
                805                 810                 815

Tyr Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile
            820                 825                 830

His Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe
        835                 840                 845

Thr Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu
    850                 855                 860

Asn Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys
865                 870                 875                 880

Met Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys
                885                 890                 895

Arg Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr
    930                 935                 940

Asn Asp Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu
945                 950                 955                 960

Val Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile
                965                 970                 975
```

```
Asn Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala
            980                 985                 990


Leu Ala Leu Leu Lys Lys Tyr Pro  Gln Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005


Gly Glu  Tyr Leu Lys Phe Asn  Ala His Lys Ala Asn  Lys Ala Thr
    1010                1015                1020


Val Lys  Lys Glu Phe Tyr Ser  Asn Ile Met Lys Phe  Phe Glu Ser
    1025                1030                1035


Asp Thr  Pro Val Cys Asp Glu  Asn Gly Glu Ile Phe  Trp Asp Lys
    1040                1045                1050


Ser Lys  Ser Ile Ala Gln Val  Lys Lys Val Ile Asn  His His His
    1055                1060                1065


Met Asn  Ile Val Lys Lys Thr  Glu Ile Gln Lys Gly  Gly Phe Ser
    1070                1075                1080


Lys Glu  Thr Val Glu Pro Lys  Lys Asp Ser Ser Lys  Leu Leu Pro
    1085                1090                1095


Arg Lys  Asn Asn Trp Asp Pro  Ala Lys Tyr Gly Gly  Leu Gly Ser
    1100                1105                1110


Pro Asn  Val Ala Tyr Thr Val  Ala Phe Thr Tyr Glu  Lys Gly Lys
    1115                1120                1125


Ala Arg  Lys Arg Thr Asn Ala  Leu Glu Gly Ile Thr  Ile Met Glu
    1130                1135                1140


Arg Glu  Ala Phe Glu Gln Ser  Pro Val Leu Phe Leu  Lys Asn Lys
    1145                1150                1155


Gly Tyr  Glu Gln Ala Glu Ile  Glu Met Lys Leu Pro  Lys Tyr Ala
    1160                1165                1170
```

Leu Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Val Ala Ser Lys
1175 1180 1185

Glu Ala Gln Lys Ala Asn Ser Phe Leu Leu Pro Glu His Leu Val
1190 1195 1200

Thr Leu Leu Tyr His Ala Lys Gln Tyr Asp Glu Ile Ser His Lys
1205 1210 1215

Glu Ser Phe Asp Tyr Val Asn Glu His His Lys Glu Phe Ser Glu
1220 1225 1230

Val Phe Ala Arg Val Leu Glu Phe Ala Gly Lys Tyr Thr Leu Ala
1235 1240 1245

Glu Lys Asn Ile Glu Lys Leu Glu Lys Ile Tyr Lys Glu Asn Gln
1250 1255 1260

Thr Asp Asp Leu Ala Lys Leu Ala Ser Ser Phe Val Asn Leu Met
1265 1270 1275

Gln Phe Asn Ala Met Gly Ala Pro Ala Asp Phe Lys Phe Phe Asp
1280 1285 1290

Val Thr Ile Pro Arg Lys Arg Tyr Thr Ser Leu Thr Glu Ile Trp
1295 1300 1305

Gln Ser Thr Ile Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr
1310 1315 1320

Arg Ile Arg Met Gly Lys
1325

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Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val

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Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
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Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
50 55 60

Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu
65 70 75 80

Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
85 90 95

Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Leu Asp Glu Lys Lys
100 105 110

Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
115 120 125

His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
130 135 140

Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145 150 155 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
165 170 175

Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
180 185 190

Asn Gln Gln Phe Ser Glu Ala Asp Lys Leu Asp Glu Ala Val Asp Cys
195 200 205

Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr

210 215 220

Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225 230 235 240

Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
245 250 255

Gly Leu Glu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu
260 265 270

Glu Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp
275 280 285

Leu Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu
290 295 300

Ile Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly
305 310 315 320

Met Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys
325 330 335

Arg Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly
340 345 350

Asp Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr
355 360 365

Gln Glu Asp Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg
370 375 380

Gly Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu
405 410 415

Thr Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe

420 425 430

Leu Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe
450 455 460

Ala Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu
465 470 475 480

Pro Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg
485 490 495

Met Asn Asn Thr Asp Met Tyr Ile Pro His Asn Lys Val Leu Pro Lys
500 505 510

Asn Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys
515 520 525

Val Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile
530 535 540

Glu Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val
545 550 555 560

Thr Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys
565 570 575

His Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr
580 585 590

Thr Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu
595 600 605

Asp Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr
610 615 620

Val Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu

625 630 635 640

Ala Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr
645 650 655

Thr Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp
660 665 670

Lys Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe
675 680 685

Pro His His Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser
690 695 700

Leu Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr
705 710 715 720

Glu Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile
725 730 735

Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly
740 745 750

Ile Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu
755 760 765

Asn Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys
770 775 780

Ala Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu
785 790 795 800

Tyr Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr
805 810 815

Tyr Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile
820 825 830

His Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe

835 840 845

Thr Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu
850 855 860

Asn Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys
865 870 875 880

Met Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys
885 890 895

Arg Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys
900 905 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
915 920 925

His Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr
930 935 940

Asn Glu Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu
945 950 955 960

Val Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile
965 970 975

Asn Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala
980 985 990

Leu Ala Leu Leu Lys Lys Tyr Pro Gln Leu Ala Pro Glu Phe Val Tyr
995 1000 1005

Gly Glu Tyr Leu Lys Phe Asn Ala His Lys Ala Asn Lys Ala Thr
1010 1015 1020

Val Lys Lys Glu Phe Tyr Ser Asn Ile Met Lys Phe Phe Glu Ser
1025 1030 1035

Asp Thr Pro Val Cys Asp Glu Asn Gly Glu Ile Phe Trp Asp Lys

1040 1045 1050

Ser Lys Ser Ile Ala Gln Val Lys Lys Val Ile Asn His His His
1055 1060 1065

Met Asn Ile Val Lys Lys Thr Glu Ile Gln Lys Gly Gly Phe Ser
1070 1075 1080

Lys Glu Thr Val Glu Pro Lys Lys Asp Ser Ser Lys Leu Leu Pro
1085 1090 1095

Arg Lys Asn Asn Trp Asp Pro Ala Lys Tyr Gly Gly Leu Gly Ser
1100 1105 1110

Pro Asn Val Ala Tyr Thr Val Ala Phe Thr Tyr Glu Lys Gly Lys
1115 1120 1125

Ala Arg Lys Arg Thr Asn Ala Leu Glu Gly Ile Thr Ile Met Glu
1130 1135 1140

Arg Glu Ala Phe Glu Gln Ser Pro Val Leu Phe Leu Lys Asn Lys
1145 1150 1155

Gly Tyr Glu Gln Ala Glu Ile Glu Met Lys Leu Pro Lys Tyr Ala
1160 1165 1170

Leu Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Val Ala Ser Lys
1175 1180 1185

Glu Ala Gln Lys Ala Asn Ser Phe Leu Leu Pro Glu His Leu Val
1190 1195 1200

Thr Leu Leu Tyr His Ala Lys Gln Tyr Asp Glu Ile Ser His Lys
1205 1210 1215

Glu Ser Phe Asp Tyr Val Asn Glu His His Lys Glu Phe Ser Glu
1220 1225 1230

Val Phe Ala Arg Val Leu Glu Phe Ala Gly Lys Tyr Thr Leu Ala

1235 1240 1245

Glu Lys Asn Ile Glu Lys Leu Glu Lys Ile Tyr Lys Glu Asn Gln
1250 1255 1260

Thr Asp Asp Leu Ala Lys Leu Ala Ser Ser Phe Val Asn Leu Met
1265 1270 1275

Gln Phe Asn Ala Met Gly Ala Pro Ala Asp Phe Lys Phe Phe Asp
1280 1285 1290

Val Thr Ile Pro Arg Lys Arg Tyr Thr Ser Leu Thr Glu Ile Trp
1295 1300 1305

Gln Ser Thr Ile Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr
1310 1315 1320

Arg Ile Arg Met Gly Lys
1325

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Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
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Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
20 25 30

Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
50 55 60

Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu
65 70 75 80

```
Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
                85                  90                  95

Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Leu Asp Glu Lys Lys
            100                 105                 110

Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
        115                 120                 125

His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
    130                 135                 140

Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
            180                 185                 190

Asn Gln Gln Phe Ser Glu Ala Asp Lys Leu Asp Glu Ala Val Asp Cys
        195                 200                 205

Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr
    210                 215                 220

Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225                 230                 235                 240

Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
                245                 250                 255

Gly Leu Glu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp
        275                 280                 285
```

```
Leu Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu
    290                 295                 300

Ile Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly
305                 310                 315                 320

Met Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys
                325                 330                 335

Arg Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly
            340                 345                 350

Asp Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr
        355                 360                 365

Gln Glu Asp Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg
    370                 375                 380

Gly Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu
                405                 410                 415

Thr Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe
    450                 455                 460

Ala Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu
465                 470                 475                 480

Pro Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg
                485                 490                 495
```

```
Met Ile Asn Thr Asp Met Tyr Ile Pro His Asn Lys Val Leu Pro Lys
            500                 505                 510

Asn Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys
        515                 520                 525

Val Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile
    530                 535                 540

Glu Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val
545                 550                 555                 560

Thr Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys
                565                 570                 575

His Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr
            580                 585                 590

Thr Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu
        595                 600                 605

Asp Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr
    610                 615                 620

Val Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu
625                 630                 635                 640

Ala Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe
        675                 680                 685

Pro His His Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser
    690                 695                 700
```

```
Leu Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr
705                 710                 715                 720

Glu Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile
                725                 730                 735

Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly
            740                 745                 750

Ile Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu
        755                 760                 765

Asn Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys
    770                 775                 780

Ala Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu
785                 790                 795                 800

Tyr Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr
                805                 810                 815

Tyr Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile
            820                 825                 830

His Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe
        835                 840                 845

Thr Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu
    850                 855                 860

Asn Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys
865                 870                 875                 880

Met Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys
                885                 890                 895

Arg Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys
            900                 905                 910
```

```
Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr
    930                 935                 940

Asn Glu Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu
945                 950                 955                 960

Val Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala
            980                 985                 990

Leu Ala Leu Leu Lys Lys Tyr Pro  Gln Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Leu Lys Phe Asn  Ala His Lys Ala Asn  Lys Ala Thr
    1010                1015                1020

Val Lys  Lys Glu Phe Tyr Ser  Asn Ile Met Lys Phe  Phe Glu Ser
    1025                1030                1035

Asp Thr  Pro Val Cys Asp Glu  Asn Gly Glu Ile Phe  Trp Asp Lys
    1040                1045                1050

Ser Lys  Ser Ile Ala Gln Val  Lys Lys Val Ile Asn  His His His
    1055                1060                1065

Met Asn  Ile Val Lys Lys Thr  Glu Ile Gln Lys Gly  Gly Phe Ser
    1070                1075                1080

Lys Glu  Thr Val Glu Pro Lys  Lys Asp Ser Ser Lys  Leu Leu Pro
    1085                1090                1095

Arg Lys  Asn Asn Trp Asp Pro  Ala Lys Tyr Gly Gly  Leu Gly Ser
    1100                1105                1110
```

```
Pro Asn  Val Ala Tyr Thr Val  Ala Phe Thr Tyr Glu  Lys Gly Lys
    1115                1120                1125

Ala Arg  Lys Arg Thr Asn Ala  Leu Glu Gly Ile Thr  Ile Met Glu
    1130                1135                1140

Arg Glu  Ala Phe Glu Gln Ser  Pro Val Leu Phe Leu  Lys Asn Lys
    1145                1150                1155

Gly Tyr  Glu Gln Ala Glu Ile  Glu Met Lys Leu Pro  Lys Tyr Ala
    1160                1165                1170

Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg Met Val  Ala Ser Lys
    1175                1180                1185

Glu Ala  Gln Lys Ala Asn Ser  Phe Leu Leu Pro Glu  His Leu Val
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Tyr Asp Glu Ile  Ser His Lys
    1205                1210                1215

Glu Ser  Phe Asp Tyr Val Asn  Glu His His Lys Glu  Phe Ser Glu
    1220                1225                1230

Val Phe  Ala Arg Val Leu Glu  Phe Ala Gly Lys Tyr  Thr Leu Ala
    1235                1240                1245

Glu Lys  Asn Ile Glu Lys Leu  Glu Lys Ile Tyr Lys  Glu Asn Gln
    1250                1255                1260

Thr Asp  Asp Leu Ala Lys Leu  Ala Ser Ser Phe Val  Asn Leu Met
    1265                1270                1275

Gln Phe  Asn Ala Met Gly Ala  Pro Ala Asp Phe Lys  Phe Phe Asp
    1280                1285                1290

Val Thr  Ile Pro Arg Lys Arg  Tyr Thr Ser Leu Thr  Glu Ile Trp
    1295                1300                1305
```

```
Gln Ser  Thr Ile Ile His Gln  Ser Ile Thr Gly Leu  Tyr Glu Thr
    1310                1315                1320


Arg Ile  Arg Met Gly Lys
    1325
```

<210> 312
<211> 1328
<212> PRT
<213> Enterococcus faecium

<400> 312

```
Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
            20                  25                  30


Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu
65                  70                  75                  80


Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
                85                  90                  95


Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Leu Asp Glu Lys Lys
            100                 105                 110


Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
        115                 120                 125


His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
    130                 135                 140
```

```
Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
            180                 185                 190

Asn Gln Gln Phe Ser Glu Ala Asp Lys Leu Asp Glu Ala Val Asp Cys
        195                 200                 205

Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr
    210                 215                 220

Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225                 230                 235                 240

Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
                245                 250                 255

Gly Leu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu Glu
            260                 265                 270

Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp Leu
        275                 280                 285

Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu Ile
    290                 295                 300

Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly Met
305                 310                 315                 320

Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys Arg
                325                 330                 335

Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly Asp
            340                 345                 350
```

```
Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr Gln
        355                 360                 365

Glu Asp Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg Gly
    370                 375                 380

Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu Thr
                405                 410                 415

Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe Leu
            420                 425                 430

Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe Ala
    450                 455                 460

Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu Pro
465                 470                 475                 480

Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg Met
                485                 490                 495

Ile Asn Thr Asp Met Tyr Ile Pro His Asn Lys Val Leu Pro Lys Asn
            500                 505                 510

Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys Val
        515                 520                 525

Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile Glu
    530                 535                 540

Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val Thr
545                 550                 555                 560
```

```
Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys His
                565                 570                 575

Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr Thr
            580                 585                 590

Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu Asp
        595                 600                 605

Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr Val
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu Ala
625                 630                 635                 640

Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe Pro
        675                 680                 685

His His Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser Leu
    690                 695                 700

Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr Glu
705                 710                 715                 720

Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly Ile
            740                 745                 750

Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu Asn
        755                 760                 765
```

```
Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys Ala
    770                 775                 780

Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu Tyr
785                 790                 795                 800

Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr Tyr
                805                 810                 815

Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile His
            820                 825                 830

Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe Thr
        835                 840                 845

Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu Asn
    850                 855                 860

Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys Met
865                 870                 875                 880

Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys Arg
                885                 890                 895

Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr Asn
    930                 935                 940

Glu Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu Val
945                 950                 955                 960

Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile Asn
                965                 970                 975
```

```
Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Leu
            980                 985                 990


Ala Leu Leu Lys Lys Tyr Pro Gln  Leu Ala Pro Glu Phe  Val Tyr Gly
        995                 1000                1005


Glu Tyr  Leu Lys Phe Asn Ala  His Lys Ala Asn Lys  Ala Thr Val
    1010                1015                1020


Lys Lys  Glu Phe Tyr Ser Asn  Ile Met Lys Phe Phe  Glu Ser Asp
    1025                1030                1035


Thr Pro  Val Cys Asp Glu Asn  Gly Glu Ile Phe Trp  Asp Lys Ser
    1040                1045                1050


Lys Ser  Ile Ala Gln Val Lys  Lys Val Ile Asn His  His His Met
    1055                1060                1065


Asn Ile  Val Lys Lys Thr Glu  Ile Gln Lys Gly Gly  Phe Ser Glu
    1070                1075                1080


Glu Thr  Val Glu Pro Lys Lys  Asp Ser Ser Lys Leu  Leu Pro Arg
    1085                1090                1095


Lys Asn  Asn Trp Asp Pro Ala  Lys Tyr Gly Gly Leu  Gly Ser Pro
    1100                1105                1110


Asn Val  Ala Tyr Thr Val Ala  Phe Thr Tyr Glu Lys  Gly Lys Ala
    1115                1120                1125


Arg Lys  Arg Thr Asn Ala Leu  Glu Gly Ile Thr Ile  Met Glu Arg
    1130                1135                1140


Glu Ala  Phe Glu Gln Ser Pro  Val Leu Phe Leu Lys  Asn Lys Gly
    1145                1150                1155


Tyr Glu  Gln Ala Glu Ile Glu  Met Lys Leu Pro Lys  Tyr Ala Leu
    1160                1165                1170
```

```
Phe Glu  Leu Glu Asn Gly Arg  Lys Arg Met Val Ala  Ser Lys Glu
    1175                1180                1185


Ala Gln  Lys Ala Asn Ser Phe  Leu Leu Pro Glu His  Leu Val Thr
    1190                1195                1200


Leu Leu  Tyr His Ala Lys Gln  Tyr Asp Glu Ile Ser  His Lys Glu
    1205                1210                1215


Ser Phe  Asp Tyr Val Asn Glu  His His Lys Glu Phe  Ser Glu Val
    1220                1225                1230


Phe Ala  Arg Val Leu Glu Phe  Ala Gly Lys Tyr Thr  Leu Ala Glu
    1235                1240                1245


Lys Asn  Ile Glu Lys Leu Glu  Lys Ile Tyr Lys Glu  Asn Gln Thr
    1250                1255                1260


Asp Asp  Leu Ala Lys Leu Ala  Ser Ser Phe Val Asn  Leu Met Gln
    1265                1270                1275


Phe Asn  Ala Met Gly Ala Pro  Ala Asp Phe Lys Phe  Phe Asp Val
    1280                1285                1290


Thr Ile  Pro Arg Lys Arg Tyr  Thr Ser Leu Thr Glu  Ile Trp Gln
    1295                1300                1305


Ser Thr  Ile Ile His Gln Ser  Ile Thr Gly Leu Tyr  Glu Thr Arg
    1310                1315                1320


Ile Arg  Met Gly Lys
    1325
```

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<213> Enterococcus faecium

<400> 313

```
Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
            20                  25                  30

Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu
65                  70                  75                  80

Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
                85                  90                  95

Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Leu Asp Glu Lys Lys
            100                 105                 110

Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
        115                 120                 125

His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
    130                 135                 140

Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
            180                 185                 190

Asn Gln Gln Phe Ser Glu Ala Asp Lys Leu Asp Glu Ala Val Asp Cys
        195                 200                 205
```

```
Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr
    210                 215                 220

Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225                 230                 235                 240

Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
                245                 250                 255

Gly Leu Glu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp
        275                 280                 285

Leu Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu
    290                 295                 300

Ile Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly
305                 310                 315                 320

Met Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys
                325                 330                 335

Arg Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly
            340                 345                 350

Asp Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr
        355                 360                 365

Gln Glu Asp Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg
    370                 375                 380

Gly Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu
                405                 410                 415
```

```
Thr Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe
    450                 455                 460

Ala Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu
465                 470                 475                 480

Pro Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg
                485                 490                 495

Met Ile Asn Thr Asp Met Tyr Met Pro His Asn Lys Val Leu Pro Lys
            500                 505                 510

Asn Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys
        515                 520                 525

Val Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile
    530                 535                 540

Glu Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val
545                 550                 555                 560

Thr Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys
                565                 570                 575

His Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr
            580                 585                 590

Thr Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu
        595                 600                 605

Asp Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr
    610                 615                 620
```

```
Val Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu
625                 630                 635                 640

Ala Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe
        675                 680                 685

Pro His His Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser
    690                 695                 700

Leu Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr
705                 710                 715                 720

Glu Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile
                725                 730                 735

Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly
            740                 745                 750

Ile Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu
        755                 760                 765

Asn Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys
    770                 775                 780

Ala Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu
785                 790                 795                 800

Tyr Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr
                805                 810                 815

Tyr Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile
            820                 825                 830
```

```
His Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe
        835                 840                 845

Thr Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu
    850                 855                 860

Asn Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys
865                 870                 875                 880

Met Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys
                885                 890                 895

Arg Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr
    930                 935                 940

Asn Glu Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu
945                 950                 955                 960

Val Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala
            980                 985                 990

Leu Ala Leu Leu Lys Lys Tyr Pro  Gln Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Leu Lys Phe Asn  Ala His Lys Ala Asn  Lys Ala Thr
    1010                1015                1020

Val Lys  Lys Glu Phe Tyr Ser  Asn Ile Met Lys Phe  Phe Glu Ser
    1025                1030                1035
```

```
Asp Thr  Pro Val Cys Asp Glu  Asn Gly Glu Ile Phe  Trp Asp Lys
    1040                1045                1050

Ser Lys  Ser Ile Ala Gln Val  Lys Lys Val Ile Asn  His His His
    1055                1060                1065

Met Asn  Ile Val Lys Lys Thr  Glu Ile Gln Lys Gly  Gly Phe Ser
    1070                1075                1080

Lys Glu  Thr Val Glu Pro Lys  Lys Asp Ser Ser Lys  Leu Leu Pro
    1085                1090                1095

Arg Lys  Asn Asn Trp Asp Pro  Ala Lys Tyr Gly Gly  Leu Gly Ser
    1100                1105                1110

Pro Asn  Val Ala Tyr Thr Val  Ala Phe Thr Tyr Glu  Lys Gly Lys
    1115                1120                1125

Ala Arg  Lys Arg Thr Asn Ala  Leu Glu Gly Ile Thr  Ile Met Glu
    1130                1135                1140

Arg Glu  Ala Phe Glu Gln Ser  Pro Val Leu Phe Leu  Lys Asn Lys
    1145                1150                1155

Gly Tyr  Glu Gln Ala Glu Ile  Glu Met Lys Leu Pro  Lys Tyr Ala
    1160                1165                1170

Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg Met Val  Ala Ser Lys
    1175                1180                1185

Glu Ala  Gln Lys Ala Asn Ser  Phe Leu Leu Pro Glu  His Leu Val
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Tyr Asp Glu Ile  Ser His Lys
    1205                1210                1215

Glu Ser  Phe Asp Tyr Val Asn  Glu His His Lys Glu  Phe Ser Glu
    1220                1225                1230
```

Val Phe Ala Arg Val Leu Glu Phe Ala Gly Lys Tyr Thr Leu Ala
1235 1240 1245

Glu Lys Asn Ile Glu Lys Leu Glu Lys Ile Tyr Lys Glu Asn Gln
1250 1255 1260

Thr Asp Asp Leu Ala Lys Leu Ala Ser Ser Phe Val Asn Leu Met
1265 1270 1275

Gln Phe Asn Ala Met Gly Ala Pro Ala Asp Phe Lys Phe Phe Asp
1280 1285 1290

Val Thr Ile Pro Arg Lys Arg Tyr Thr Ser Leu Thr Glu Ile Trp
1295 1300 1305

Gln Ser Thr Ile Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr
1310 1315 1320

Arg Ile Arg Met Gly Lys
1325

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<400> 314

Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
20 25 30

Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
50 55 60

Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu

65 70 75 80

Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
85 90 95

Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Leu Asp Glu Lys Lys
100 105 110

Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
115 120 125

His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
130 135 140

Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145 150 155 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
165 170 175

Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
180 185 190

Asn Gln Gln Phe Ser Glu Ala Asp Lys Leu Asp Glu Ala Val Asp Cys
195 200 205

Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr
210 215 220

Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225 230 235 240

Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
245 250 255

Gly Leu Glu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu
260 265 270

Glu Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp

```
        275                 280                 285

Leu Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu
    290                 295                 300

Ile Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly
305                 310                 315                 320

Met Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys
                325                 330                 335

Arg Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly
            340                 345                 350

Asp Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr
        355                 360                 365

Gln Glu Asp Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg
    370                 375                 380

Gly Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu
                405                 410                 415

Thr Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe
    450                 455                 460

Ala Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu
465                 470                 475                 480

Pro Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg
```

485 490 495

Met Ile Asn Thr Asp Met Tyr Ile Pro His Asn Lys Val Leu Pro Lys
500 505 510

Asn Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys
515 520 525

Val Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile
530 535 540

Glu Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val
545 550 555 560

Thr Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys
565 570 575

His Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr
580 585 590

Thr Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu
595 600 605

Asp Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr
610 615 620

Val Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu
625 630 635 640

Ala Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr
645 650 655

Thr Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp
660 665 670

Lys Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe
675 680 685

Pro His His Arg Asn Arg Asn Cys Met Gln Leu Ile Asn Asp Asp Ser

690 695 700

Leu Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr
705 710 715 720

Glu Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile
725 730 735

Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly
740 745 750

Ile Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu
755 760 765

Asn Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys
770 775 780

Ala Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu
785 790 795 800

Tyr Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr
805 810 815

Tyr Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile
820 825 830

His Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe
835 840 845

Thr Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu
850 855 860

Asn Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys
865 870 875 880

Met Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys
885 890 895

Arg Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys

```
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr
    930                 935                 940

Asn Glu Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu
945                 950                 955                 960

Val Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala
            980                 985                 990

Leu Ala Leu Leu Lys Lys Tyr Pro  Gln Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Leu Lys Phe Asn  Ala His Lys Ala Asn  Lys Ala Thr
    1010                1015                1020

Val Lys  Lys Glu Phe Tyr Ser  Asn Ile Met Lys Phe  Phe Glu Ser
    1025                1030                1035

Asp Thr  Pro Val Cys Asp Glu  Asn Gly Glu Ile Phe  Trp Asp Lys
    1040                1045                1050

Ser Lys  Ser Ile Ala Gln Val  Lys Lys Val Ile Asn  His His His
    1055                1060                1065

Met Asn  Ile Val Lys Lys Thr  Glu Ile Gln Lys Gly  Gly Phe Ser
    1070                1075                1080

Lys Glu  Thr Val Glu Pro Lys  Lys Asp Ser Ser Lys  Leu Leu Pro
    1085                1090                1095

Arg Lys  Asn Asn Trp Asp Pro  Thr Lys Tyr Gly Gly  Leu Gly Ser
```

1100 1105 1110

Pro Asn Val Ala Tyr Thr Val Ala Phe Thr Tyr Glu Lys Gly Lys
1115 1120 1125

Ala Arg Lys Arg Thr Asn Ala Leu Glu Gly Ile Thr Ile Met Glu
1130 1135 1140

Arg Glu Ala Phe Glu Gln Ser Pro Val Leu Phe Leu Lys Asn Lys
1145 1150 1155

Gly Tyr Glu Gln Ala Glu Ile Glu Met Lys Leu Pro Lys Tyr Ala
1160 1165 1170

Leu Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Val Ala Ser Lys
1175 1180 1185

Glu Ala Gln Lys Ala Asn Ser Phe Leu Leu Pro Glu His Leu Val
1190 1195 1200

Thr Leu Leu Tyr His Ala Lys Gln Tyr Asp Glu Ile Ser His Lys
1205 1210 1215

Glu Ser Phe Asp Tyr Val Asn Glu His His Lys Glu Phe Ser Glu
1220 1225 1230

Val Phe Ala Arg Val Leu Glu Phe Ala Gly Lys Tyr Thr Leu Ala
1235 1240 1245

Glu Lys Asn Ile Glu Lys Leu Glu Lys Ile Tyr Lys Glu Asn Gln
1250 1255 1260

Thr Asp Asp Leu Ala Lys Leu Ala Ser Ser Phe Val Asn Leu Met
1265 1270 1275

Gln Phe Asn Ala Met Gly Ala Pro Ala Asp Phe Lys Phe Phe Asp
1280 1285 1290

Val Thr Ile Pro Arg Lys Arg Tyr Thr Ser Leu Thr Glu Ile Trp

1295 1300 1305

Gln Ser Thr Ile Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr
1310 1315 1320

Arg Ile Arg Met Gly Lys
1325

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Met Thr Lys Asp Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Leu Thr Asp Asp Tyr Gln Leu Met Lys Arg Lys Met
20 25 30

Ser Val His Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
35 40 45

Gly Ala Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Phe Arg Arg Thr
50 55 60

Lys Arg Thr Asn Arg Arg Arg Leu Ala Arg Arg Lys Tyr Arg Leu Ser
65 70 75 80

Lys Leu Gln Asp Leu Phe Ala Glu Glu Leu Cys Lys Gln Asp Asp Cys
85 90 95

Phe Phe Val Arg Leu Glu Glu Ser Phe Leu Val Pro Glu Glu Lys Gln
100 105 110

Tyr Lys Pro Ala Ser Ile Phe Pro Thr Leu Glu Glu Glu Lys Glu Tyr
115 120 125

Tyr Gln Lys Tyr Pro Thr Ile Tyr His Leu Arg Gln Lys Leu Val Asp
130 135 140

```
Ser Thr Glu Lys Glu Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Asp Thr
                165                 170                 175

Glu Asn Thr Ser Ile Glu Glu Ser Phe Arg Val Phe Leu Glu Gln Tyr
            180                 185                 190

Ser Lys Gln Ser Asp Gln Pro Leu Ile Val His Gln Pro Val Leu Thr
        195                 200                 205

Ile Leu Thr Asp Lys Leu Ser Lys Thr Lys Lys Val Glu Glu Ile Leu
    210                 215                 220

Lys Tyr Tyr Pro Thr Glu Lys Ile Asn Ser Phe Phe Ala Gln Cys Leu
225                 230                 235                 240

Lys Leu Ile Val Gly Asn Gln Ala Asn Phe Lys Arg Ile Phe Asp Leu
                245                 250                 255

Glu Ala Glu Val Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu Glu Asp
            260                 265                 270

Leu Glu Ser Leu Leu Glu Lys Ile Gly Asp Glu Tyr Leu Asp Ile Phe
        275                 280                 285

Leu Gln Ala Lys Lys Val His Asp Ala Ile Leu Leu Ser Glu Ile Ile
    290                 295                 300

Ser Ser Thr Val Lys His Thr Lys Ala Lys Leu Ser Ser Gly Met Val
305                 310                 315                 320

Glu Arg Tyr Glu Arg His Lys Ala Asp Leu Ala Lys Phe Lys Gln Phe
                325                 330                 335

Val Lys Glu Asn Val Pro Gln Lys Ala Thr Val Phe Phe Lys Asp Thr
            340                 345                 350
```

```
Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Lys Gly Lys Thr Thr Gln Glu
        355                 360                 365

Glu Phe Tyr Lys Phe Val Lys Lys Glu Leu Ser Gly Val Val Gly Ser
    370                 375                 380

Glu Pro Phe Leu Glu Lys Ile Asp Gln Glu Thr Phe Leu Leu Lys Gln
385                 390                 395                 400

Arg Thr Tyr Thr Asn Gly Val Ile Pro His Gln Val His Leu Ile Glu
                405                 410                 415

Leu Lys Ala Ile Ile Asp Gln Gln Lys Gln His Tyr Pro Phe Leu Glu
            420                 425                 430

Glu Ala Gly Pro Lys Ile Ile Ala Leu Phe Lys Phe Arg Ile Pro Tyr
        435                 440                 445

Tyr Val Gly Pro Leu Ala Lys Glu Gln Glu Ala Ser Ser Phe Ala Trp
    450                 455                 460

Ile Glu Arg Lys Thr Ala Glu Lys Ile Asn Pro Trp Asn Phe Ser Glu
465                 470                 475                 480

Val Val Asp Ile Glu Lys Ser Ala Met Arg Phe Ile Gln Arg Met Thr
                485                 490                 495

Lys Gln Asp Thr Tyr Leu Pro Thr Glu Lys Val Leu Pro Lys Asn Ser
            500                 505                 510

Leu Leu Tyr Gln Lys Tyr Met Ile Phe Asn Glu Leu Thr Lys Val Ser
        515                 520                 525

Tyr Lys Asp Glu Arg Gly Val Lys Gln Tyr Phe Ser Gly Asp Glu Lys
    530                 535                 540

Gln Gln Ile Phe Lys Gln Leu Phe Gln Lys Glu Arg Gly Lys Ile Thr
545                 550                 555                 560
```

```
Val Lys Lys Leu Gln Asn Phe Leu Tyr Thr His Tyr His Ile Glu Asn
                565                 570                 575

Ala Gln Ile Phe Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Ser Thr
            580                 585                 590

Tyr His Asp Phe Met Lys Leu Ala Lys Thr Asn Glu Trp Leu Glu Gln
        595                 600                 605

Pro Glu Met Glu Pro Ile Phe Glu Asp Ile Val Lys Ile Leu Thr Ile
    610                 615                 620

Phe Glu Asp Arg Gln Met Ile Lys His Gln Leu Ser Lys Tyr Gln Glu
625                 630                 635                 640

Val Phe Gly Glu Lys Leu Leu Lys Glu Phe Ala Arg Lys His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Phe Ser Ala Lys Leu Ile His Gly Ile Arg Asp Arg
            660                 665                 670

Lys Thr Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Val Pro
        675                 680                 685

Ala Asn Arg Asn Arg Asn Leu Met Gln Leu Ile Asn Asp Glu His Leu
    690                 695                 700

Ser Phe Lys Glu Glu Ile Ala Lys Ala Thr Val Phe Ser Lys His Lys
705                 710                 715                 720

Ser Leu Val Asp Val Ile Gln Asp Leu Pro Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Trp Gln Ser Leu Lys Ile Val Glu Glu Leu Ile Ala Ile
            740                 745                 750

Ile Gly Tyr Lys Pro Lys Asn Ile Val Ile Glu Met Ala Arg Glu Asn
        755                 760                 765
```

```
Gln Lys Thr His Arg Thr Ser Pro Arg Leu Lys Ala Leu Glu Asn Gly
    770                 775                 780

Leu Lys Gln Ile Gly Ser Thr Leu Leu Lys Glu Gln Pro Thr Asp Asn
785                 790                 795                 800

Lys Ala Leu Gln Lys Glu Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Thr Gly Glu Pro Leu Glu Ile Glu Asn Leu His Gln
            820                 825                 830

Tyr Glu Val Asp His Ile Ile Pro Arg Ser Phe Ile Val Asp Asn Ser
        835                 840                 845

Ile Asp Asp Lys Val Leu Val Ala Ser Lys Gln Asn Gln Lys Lys Arg
    850                 855                 860

Asp Asp Val Pro Lys Lys Gln Ile Val Asn Glu Gln Arg Ile Phe Trp
865                 870                 875                 880

Asn Gln Leu Lys Glu Ala Lys Leu Ile Ser Thr Lys Lys Tyr Ala Tyr
                885                 890                 895

Leu Thr Lys Ile Glu Leu Thr Pro Glu Asp Lys Ala Arg Phe Ile Gln
            900                 905                 910

Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Asn Ile
        915                 920                 925

Leu His Gln Ser Phe Asn Gln Glu Glu Glu Gly Thr Asp Cys Asp Gly
    930                 935                 940

Val Gln Ile Ile Thr Leu Lys Ala Thr Leu Thr Ser Gln Phe Arg Gln
945                 950                 955                 960

Thr Phe Gly Leu Tyr Lys Val Arg Glu Ile Asn Pro His His His Ala
                965                 970                 975
```

```
His Asp Ala Tyr Leu Asn Gly Phe Ile Ala Asn Val Leu Leu Lys Arg
           980                 985                 990

Tyr Pro Lys Leu Ala Pro Glu Phe  Val Tyr Gly Lys Tyr  Val Lys Tyr
        995                 1000                1005

Ser Leu  Ala Arg Glu Asn Lys  Ala Thr Ala Lys Lys  Glu Phe Tyr
    1010                1015                1020

Ser Asn  Ile Leu Lys Phe Leu  Glu Ser Asp Glu Pro  Phe Cys Asp
    1025                1030                1035

Glu Asn  Gly Glu Ile Tyr Trp  Glu Lys Ser His His  Leu Pro Arg
    1040                1045                1050

Ile Lys  Lys Val Leu Ser Ser  His Gln Val Asn Val  Val Lys Lys
    1055                1060                1065

Val Glu  Gln Gln Lys Gly Gly  Phe Tyr Lys Glu Thr  Val Asn Ser
    1070                1075                1080

Lys Glu  Lys Pro Asp Lys Leu  Ile Glu Arg Lys Asn  Asn Trp Asp
    1085                1090                1095

Val Thr  Lys Tyr Gly Gly Phe  Gly Ser Pro Val Ile  Ala Tyr Ala
    1100                1105                1110

Ile Ala  Phe Val Tyr Ala Lys  Gly Lys Thr Gln Lys  Lys Thr Arg
    1115                1120                1125

Ala Ile  Glu Gly Ile Thr Ile  Met Glu Gln Ala Ala  Phe Glu Lys
    1130                1135                1140

Asp Pro  Thr Thr Phe Leu Lys  Glu Lys Gly Phe Pro  Gln Val Thr
    1145                1150                1155

Glu Phe  Ile Lys Leu Pro Lys  Tyr Thr Leu Phe Glu  Phe Asp Asn
    1160                1165                1170
```

```
Gly Arg  Arg Arg Phe Leu Ala  Ser Lys Glu Ser Gln  Lys Gly Asn
    1175                 1180                 1185

Pro Phe  Ile Leu Ser Asp Gln  Leu Val Thr Leu Leu  Tyr His Ala
    1190                 1195                 1200

Gln His  Tyr Asp Lys Ile Thr  Tyr Gln Glu Ser Phe  Asp Tyr Val
    1205                 1210                 1215

Asn Thr  His Leu Ser Asp Phe  Ser Ala Ile Leu Thr  Glu Val Leu
    1220                 1225                 1230

Ala Phe  Ala Glu Lys Tyr Thr  Leu Ala Asp Lys Asn  Ile Glu Arg
    1235                 1240                 1245

Ile Gln  Glu Leu Tyr Glu Glu  Asn Lys Tyr Gly Glu  Thr Ser Met
    1250                 1255                 1260

Ile Ala  Gln Ser Phe Leu Gln  Leu Leu Gln Phe Asn  Ala Ile Gly
    1265                 1270                 1275

Ala Pro  Ala Asp Phe Lys Phe  Phe Gly Val Thr Ile  Pro Arg Lys
    1280                 1285                 1290

Arg Tyr  Thr Ser Leu Thr Glu  Ile Trp Asp Ala Thr  Ile Ile Tyr
    1295                 1300                 1305

Gln Ser  Val Thr Gly Leu Tyr  Glu Thr Arg Ile Arg  Met Gly Asp
    1310                 1315                 1320

Leu Trp  Ala Gly Glu Gln
    1325
```

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```
Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ser Val Leu Thr Asp Asp Tyr Arg Leu Val Ser Lys Lys Met
            20                  25                  30

Lys Val Ala Gly Asn Thr Glu Lys Ser Ser Thr Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Ala Arg Arg Ser
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Leu Ala Arg Arg Arg Gln Arg Ile Leu
65                  70                  75                  80

Glu Leu Gln Lys Ile Phe Ala Pro Glu Ile Leu Lys Ile Asp Glu His
                85                  90                  95

Phe Phe Ala Arg Leu Asn Glu Ser Phe Leu Val Leu Asp Glu Lys Lys
            100                 105                 110

Gln Ser Arg His Pro Val Phe Ala Thr Ile Lys Gln Glu Lys Ser Tyr
        115                 120                 125

His Gln Thr Tyr Pro Thr Ile Tyr His Leu Arg Gln Ala Leu Ala Asp
    130                 135                 140

Ser Ser Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Met Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Ser Ser Val Thr Glu Thr Phe Arg Gln Phe Leu Ser Thr Tyr
            180                 185                 190

Asn Gln Gln Phe Ser Glu Ala Asp Lys Leu Asp Glu Ala Val Asp Cys
        195                 200                 205
```

```
Ser Phe Val Phe Thr Glu Lys Met Ser Lys Thr Lys Lys Ala Glu Thr
    210                 215                 220

Leu Leu Lys Tyr Phe Pro His Glu Lys Ser Asn Gly Tyr Leu Ser Gln
225                 230                 235                 240

Phe Ile Lys Leu Met Val Gly Asn Gln Gly Asn Phe Lys Asn Val Phe
                245                 250                 255

Gly Leu Glu Glu Glu Ala Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu
            260                 265                 270

Glu Asp Leu Glu Glu Leu Leu Glu Lys Ile Gly Asp Asp Tyr Ile Asp
        275                 280                 285

Leu Phe Val Gln Ala Lys Asn Val Tyr Asp Ala Val Leu Leu Ser Glu
    290                 295                 300

Ile Leu Ser Asp Ser Thr Lys Asn Thr Arg Ala Lys Leu Ser Ala Gly
305                 310                 315                 320

Met Ile Arg Arg Tyr Asp Ala His Lys Glu Asp Leu Val Leu Leu Lys
                325                 330                 335

Arg Phe Val Lys Glu Asn Leu Pro Lys Lys Tyr Arg Ala Phe Phe Gly
            340                 345                 350

Asp Asn Ser Val Asn Gly Tyr Ala Gly Tyr Ile Glu Gly His Ala Thr
        355                 360                 365

Gln Glu Asp Phe Tyr Lys Phe Val Lys Lys Glu Leu Thr Gly Ile Arg
    370                 375                 380

Gly Ser Glu Val Phe Leu Thr Lys Ile Glu Gln Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Ile His Leu
                405                 410                 415
```

```
Thr Glu Leu Arg Ala Ile Ile Ala Asn Gln Lys Lys His Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Glu Gln Glu Lys Leu Glu Ser Leu Leu Thr Phe Lys Ile
        435                 440                 445

Pro Tyr Tyr Val Gly Pro Leu Ala Lys Lys Gln Glu Asn Ser Pro Phe
    450                 455                 460

Ala Trp Leu Ile Arg Lys Ser Glu Glu Lys Ile Lys Pro Trp Asn Leu
465                 470                 475                 480

Pro Glu Ile Val Asp Met Glu Gly Ser Ala Val Arg Phe Ile Glu Arg
                485                 490                 495

Met Ile Asn Thr Asp Met Tyr Met Pro His Asn Lys Val Leu Pro Lys
            500                 505                 510

Asn Ser Leu Leu Tyr Gln Lys Phe Ser Ile Tyr Asn Glu Leu Thr Lys
        515                 520                 525

Val Arg Tyr Gln Asp Glu Arg Gly Gln Met Asn Tyr Phe Ser Ser Ile
    530                 535                 540

Glu Lys Lys Glu Ile Phe His Glu Leu Phe Glu Lys Asn Arg Lys Val
545                 550                 555                 560

Thr Lys Lys Asp Leu Gln Glu Phe Leu Tyr Leu Lys Tyr Asp Ile Lys
                565                 570                 575

His Ala Glu Leu Ser Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Thr
            580                 585                 590

Thr Tyr His Asp Phe Leu Thr Met Ser Glu Asn Lys Gln Trp Leu Glu
        595                 600                 605

Asp Pro Glu Leu Ala Ser Met Phe Glu Glu Ile Ile Lys Thr Leu Thr
    610                 615                 620
```

```
Val Phe Glu Asp Arg Glu Met Ile Lys Thr Arg Leu Ser His His Glu
625                 630                 635                 640

Ala Thr Leu Gly Lys His Ile Ile Lys Lys Leu Thr Lys Lys His Tyr
                645                 650                 655

Thr Gly Trp Gly Arg Leu Ser Lys Glu Leu Ile Gln Gly Ile Arg Asp
            660                 665                 670

Lys Gln Ser Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe
        675                 680                 685

Pro His His Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp Ser
    690                 695                 700

Leu Ser Phe Lys Lys Glu Ile Lys Lys Ala Gln Met Ile Thr Asp Thr
705                 710                 715                 720

Glu Asn Leu Glu Glu Ile Val Lys Glu Leu Thr Gly Ser Pro Ala Ile
                725                 730                 735

Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Ile Val Gly
            740                 745                 750

Ile Met Gly Tyr Glu Pro Ala Asn Ile Val Val Glu Met Ala Arg Glu
        755                 760                 765

Asn Gln Thr Thr Gly Arg Gly Leu Lys Ser Ser Arg Pro Arg Leu Lys
    770                 775                 780

Ala Leu Glu Glu Ser Leu Lys Asp Phe Gly Ser Gln Leu Leu Lys Glu
785                 790                 795                 800

Tyr Pro Thr Asp Asn Ser Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr
                805                 810                 815

Tyr Leu Gln Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Ile
            820                 825                 830
```

```
His Arg Leu Ser Asp Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe
        835                 840                 845

Thr Thr Asp Asn Ser Ile Asp Asn Lys Val Leu Val Ser Ser Lys Glu
    850                 855                 860

Asn Arg Leu Lys Lys Asp Asp Val Pro Ser Glu Lys Val Val Lys Lys
865                 870                 875                 880

Met Arg Ser Phe Trp Tyr Asp Leu Tyr Ser Ser Lys Leu Ile Ser Lys
                885                 890                 895

Arg Lys Leu Asp Asn Leu Thr Lys Ile Lys Leu Thr Glu Glu Asp Lys
            900                 905                 910

Ala Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
        915                 920                 925

His Val Ala Gly Ile Leu His His Arg Phe Asn Lys Ala Glu Asp Thr
    930                 935                 940

Asn Glu Pro Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu
945                 950                 955                 960

Val Ser Gln Phe Arg Asn Arg Phe Gly Ile Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Glu Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Ile Ala
            980                 985                 990

Leu Ala Leu Leu Lys Lys Tyr Pro  Gln Leu Ala Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Tyr Leu Lys Phe Asn  Ala His Lys Ala Asn  Lys Ala Thr
    1010                1015                1020

Val Lys  Lys Glu Phe Tyr Ser  Asn Ile Met Lys Phe  Phe Glu Ser
    1025                1030                1035
```

```
Asp Thr  Pro Val Cys Asp Glu  Asn Gly Glu Ile Phe  Trp Asp Lys
    1040                1045                1050

Ser Lys  Ser Ile Ala Gln Val  Lys Lys Val Ile Asn  His His His
    1055                1060                1065

Met Asn  Ile Val Lys Lys Thr  Glu Ile Gln Lys Gly  Gly Phe Ser
    1070                1075                1080

Lys Glu  Thr Val Glu Pro Lys  Lys Asp Ser Ser Lys  Leu Leu Pro
    1085                1090                1095

Arg Lys  Asn Asn Trp Asp Pro  Ala Lys Tyr Gly Gly  Leu Gly Ser
    1100                1105                1110

Pro Asn  Val Ala Tyr Thr Val  Ala Phe Thr Tyr Glu  Lys Gly Lys
    1115                1120                1125

Ala Arg  Lys Arg Thr Asn Ala  Leu Glu Gly Ile Thr  Ile Met Glu
    1130                1135                1140

Arg Glu  Ala Phe Glu Gln Ser  Pro Val Leu Phe Leu  Lys Asn Lys
    1145                1150                1155

Gly Tyr  Glu Gln Ala Glu Ile  Glu Met Lys Leu Pro  Lys Tyr Ala
    1160                1165                1170

Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg Met Val  Ala Ser Lys
    1175                1180                1185

Glu Ala  Gln Lys Ala Asn Ser  Phe Leu Leu Pro Glu  His Leu Val
    1190                1195                1200

Thr Leu  Leu Tyr His Ala Lys  Gln Tyr Asp Glu Ile  Ser His Lys
    1205                1210                1215

Glu Ser  Phe Asp Tyr Val Asn  Glu His His Lys Glu  Phe Ser Glu
    1220                1225                1230
```

```
Val Phe  Ala Arg Val Leu Glu  Phe Ala Gly Lys Tyr  Thr Leu Ala
    1235                1240                1245


Glu Lys  Asn Ile Glu Lys Leu  Glu Lys Ile Tyr Lys  Glu Asn Gln
    1250                1255                1260


Thr Asp  Asp Leu Ala Lys Leu  Ala Ser Ser Phe Val  Asn Leu Met
    1265                1270                1275


Gln Phe  Asn Ala Met Gly Ala  Pro Ala Asp Phe Lys  Phe Phe Asp
    1280                1285                1290


Val Thr  Ile Pro Arg Lys Arg  Tyr Thr Ser Leu Thr  Glu Ile Trp
    1295                1300                1305


Gln Ser  Thr Ile Ile His Gln  Ser Ile Thr Gly Leu  Tyr Glu Thr
    1310                1315                1320


Arg Ile  Arg Met Gly Lys
    1325
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```
Met Thr Lys Asp Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Leu Thr Asp Asp Tyr Gln Leu Met Lys Arg Lys Met
            20                  25                  30


Ser Val His Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Ala Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Phe Arg Arg Thr
    50                  55                  60
```

```
Lys Arg Thr Asn Arg Arg Arg Leu Ala Arg Arg Lys Tyr Arg Leu Ser
65                  70                  75                  80

Lys Leu Gln Asp Leu Phe Ala Glu Glu Leu Cys Lys Gln Asp Asp Cys
                85                  90                  95

Phe Phe Val Arg Leu Glu Glu Ser Phe Leu Val Pro Glu Glu Lys Gln
            100                 105                 110

Tyr Lys Pro Ala Ser Ile Phe Pro Thr Leu Glu Glu Glu Lys Glu Tyr
        115                 120                 125

Tyr Gln Lys Tyr Pro Thr Ile Tyr His Leu Arg Gln Lys Leu Val Asp
    130                 135                 140

Ser Thr Glu Lys Gly Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Asp Thr
                165                 170                 175

Glu Asn Thr Ser Ile Glu Glu Ser Phe Arg Val Phe Leu Glu Gln Tyr
            180                 185                 190

Gly Lys Gln Ser Asp Gln Pro Leu Ile Val His Gln Pro Val Leu Thr
        195                 200                 205

Ile Leu Thr Asp Lys Leu Ser Lys Thr Lys Lys Val Glu Glu Ile Leu
    210                 215                 220

Lys Tyr Tyr Pro Thr Glu Lys Ile Asn Ser Phe Phe Ala Gln Cys Leu
225                 230                 235                 240

Lys Leu Ile Val Gly Asn Gln Ala Asn Phe Lys Arg Ile Phe Asp Leu
                245                 250                 255

Glu Ala Glu Val Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu Glu Asp
            260                 265                 270
```

```
Leu Glu Ser Leu Leu Glu Lys Ile Gly Asp Glu Tyr Leu Asp Ile Phe
        275                 280                 285

Leu Gln Ala Lys Lys Val His Asp Ala Ile Leu Leu Ser Glu Ile Ile
    290                 295                 300

Ser Ser Thr Val Lys His Thr Gln Ala Lys Leu Ser Ser Gly Met Val
305                 310                 315                 320

Glu Arg Tyr Glu Arg His Lys Ala Asp Leu Ala Lys Phe Lys Gln Phe
                325                 330                 335

Val Lys Glu Asn Val Pro Gln Lys Ala Thr Val Phe Phe Lys Asp Thr
            340                 345                 350

Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Lys Gly Lys Thr Thr Gln Glu
        355                 360                 365

Glu Phe Tyr Lys Phe Val Lys Lys Glu Leu Ser Gly Val Val Gly Ser
    370                 375                 380

Glu Pro Phe Leu Glu Lys Ile Asp Gln Glu Thr Phe Leu Leu Lys Gln
385                 390                 395                 400

Arg Thr Tyr Thr Asn Gly Val Ile Pro His Gln Val His Leu Ile Glu
                405                 410                 415

Leu Lys Ala Ile Ile Asp Gln Gln Lys Gln His Tyr Pro Phe Leu Glu
            420                 425                 430

Glu Ala Gly Pro Lys Ile Ile Ala Leu Phe Lys Phe Arg Ile Pro Tyr
        435                 440                 445

Tyr Val Gly Pro Leu Ala Lys Glu Gln Glu Ala Ser Ser Phe Ala Trp
    450                 455                 460

Ile Glu Arg Lys Thr Ala Glu Lys Ile Asn Pro Trp Asn Phe Ser Glu
465                 470                 475                 480
```

```
Val Val Asp Ile Glu Lys Ser Ala Met Arg Phe Ile Gln Arg Met Thr
                485                 490                 495

Lys Gln Asp Thr Tyr Leu Pro Thr Glu Lys Val Leu Pro Lys Asn Ser
            500                 505                 510

Leu Phe Tyr Gln Lys Tyr Met Ile Phe Asn Glu Leu Thr Lys Val Ser
        515                 520                 525

Tyr Lys Asp Glu Arg Gly Val Lys Gln Tyr Phe Ser Gly Asp Glu Lys
    530                 535                 540

Gln Gln Ile Phe Lys Gln Leu Phe Gln Lys Glu Arg Gly Lys Ile Thr
545                 550                 555                 560

Val Lys Lys Leu Gln Asn Phe Leu Tyr Thr His Tyr His Ile Glu Asn
                565                 570                 575

Ala Gln Ile Phe Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Ser Thr
            580                 585                 590

Tyr His Asp Phe Met Lys Leu Ala Lys Thr Asn Glu Trp Leu Glu Gln
        595                 600                 605

Pro Glu Met Glu Pro Ile Phe Glu Asp Ile Val Lys Ile Leu Thr Ile
    610                 615                 620

Phe Glu Asp Arg Gln Met Ile Lys His Gln Leu Ser Lys Tyr Gln Glu
625                 630                 635                 640

Val Phe Gly Glu Lys Leu Leu Lys Glu Phe Ala Arg Lys His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Phe Ser Ala Lys Leu Ile His Gly Ile Arg Asp Arg
            660                 665                 670

Lys Thr Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Val Pro
        675                 680                 685
```

```
Ala Asn Arg Asn Arg Asn Leu Met Gln Leu Ile Asn Asp Glu His Leu
    690                 695                 700

Ser Phe Lys Glu Glu Ile Ala Lys Ala Thr Val Phe Ser Lys His Lys
705                 710                 715                 720

Ser Leu Val Asp Val Ile Gln Asp Leu Pro Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Trp Gln Ser Leu Lys Ile Val Glu Glu Leu Ile Ala Ile
            740                 745                 750

Ile Gly Tyr Lys Pro Lys Asn Ile Val Ile Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Lys Thr His Arg Thr Lys Pro Arg Leu Lys Ala Leu Glu Asn Gly
    770                 775                 780

Leu Lys Gln Ile Gly Ser Thr Leu Leu Lys Glu Gln Pro Thr Asp Asn
785                 790                 795                 800

Lys Ala Leu Gln Lys Glu Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Thr Gly Glu Pro Leu Glu Ile Glu Asn Leu His Gln
            820                 825                 830

Tyr Glu Val Asp His Ile Ile Pro Arg Ser Phe Ile Val Asp Asn Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Val Ala Ser Lys Gln Asn Gln Lys Lys Arg
    850                 855                 860

Asp Asp Val Pro Lys Lys Gln Ile Val Asn Glu Gln Arg Ile Phe Trp
865                 870                 875                 880

Asn Gln Leu Lys Glu Ala Lys Leu Ile Ser Pro Lys Lys Tyr Ala Tyr
                885                 890                 895
```

```
Leu Thr Lys Ile Glu Leu Thr Pro Glu Asp Lys Ala Arg Phe Ile Gln
            900                 905                 910

Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Asn Ile
        915                 920                 925

Leu His Gln Ser Phe Asn Gln Glu Glu Glu Gly Thr Asp Cys Asp Gly
    930                 935                 940

Val Gln Ile Ile Thr Leu Lys Ala Thr Leu Thr Ser Gln Phe Arg Gln
945                 950                 955                 960

Thr Phe Gly Leu Tyr Lys Val Arg Glu Ile Asn Pro His His His Ala
                965                 970                 975

His Asp Ala Tyr Leu Asn Gly Phe Ile Ala Asn Val Leu Leu Lys Arg
            980                 985                 990

Tyr Pro Lys Leu Ala Pro Glu Phe  Val Tyr Gly Lys Tyr  Val Lys Tyr
        995                 1000                1005

Ser Leu  Ala Arg Glu Asn Lys  Ala Thr Ala Lys Lys  Glu Phe Tyr
    1010                1015                1020

Ser Asn  Ile Leu Lys Phe Leu  Glu Ser Asp Glu Pro  Phe Cys Asp
    1025                1030                1035

Glu Asn  Gly Glu Ile Tyr Trp  Glu Lys Ser His His  Leu Pro Arg
    1040                1045                1050

Ile Lys  Lys Val Leu Ser Ser  His Gln Val Asn Val  Val Lys Lys
    1055                1060                1065

Val Glu  Gln Gln Lys Gly Gly  Phe Tyr Lys Glu Thr  Val Asn Ser
    1070                1075                1080

Lys Glu  Lys Pro Asp Lys Leu  Ile Glu Arg Lys Asn  Asn Trp Asp
    1085                1090                1095
```

```
Val Thr  Lys Tyr Gly Gly Phe  Gly Ser Pro Val Ile  Ala Tyr Ala
    1100                1105                1110

Ile Ala  Phe Val Tyr Ala Lys  Gly Lys Thr Gln Lys  Lys Thr Lys
    1115                1120                1125

Ala Ile  Glu Gly Ile Thr Ile  Met Glu Gln Ala Ala  Phe Glu Lys
    1130                1135                1140

Asp Pro  Thr Thr Phe Leu Lys  Asp Lys Gly Phe Pro  Gln Val Thr
    1145                1150                1155

Glu Phe  Ile Lys Leu Pro Lys  Tyr Thr Leu Phe Glu  Phe Asp Asn
    1160                1165                1170

Gly Arg  Arg Arg Phe Leu Ala  Ser Lys Glu Ser Gln  Lys Gly Asn
    1175                1180                1185

Pro Phe  Ile Leu Ser Asp Gln  Leu Val Thr Leu Leu  Tyr His Ala
    1190                1195                1200

Gln His  Tyr Asp Lys Ile Thr  Tyr Gln Glu Ser Phe  Asp Tyr Val
    1205                1210                1215

Asn Thr  His Leu Ser Asp Phe  Ser Ala Ile Leu Thr  Glu Val Leu
    1220                1225                1230

Ala Phe  Ala Glu Lys Tyr Thr  Leu Ala Asp Lys Asn  Ile Glu Arg
    1235                1240                1245

Ile Gln  Glu Leu Tyr Glu Glu  Asn Lys Tyr Gly Glu  Ile Ser Met
    1250                1255                1260

Ile Ala  Gln Ser Phe Leu Gln  Leu Leu Gln Phe Asn  Ala Ile Gly
    1265                1270                1275

Ala Pro  Ala Asp Phe Lys Phe  Phe Gly Val Thr Ile  Pro Arg Lys
    1280                1285                1290
```

Arg Tyr Thr Ser Leu Thr Glu Ile Trp Asp Ala Thr Ile Ile Tyr
1295 1300 1305

Gln Ser Val Thr Gly Leu Tyr Glu Thr Arg Ile Arg Met Gly Asp
1310 1315 1320

Leu Trp Ala Gly Glu Gln
1325

<210> 318
<211> 1329
<212> PRT
<213> Enterococcus faecium

<400> 318

Met Thr Lys Asp Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Leu Thr Asp Asp Tyr Gln Leu Met Lys Arg Lys Met
20 25 30

Ser Val His Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
35 40 45

Gly Ala Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Phe Arg Arg Thr
50 55 60

Lys Arg Thr Asn Arg Arg Arg Leu Ala Arg Arg Lys Tyr Arg Leu Ser
65 70 75 80

Lys Leu Gln Asp Leu Phe Ala Glu Glu Leu Cys Lys Gln Asp Asp Cys
85 90 95

Phe Phe Val Arg Leu Glu Glu Ser Phe Leu Val Pro Glu Glu Lys Gln
100 105 110

Tyr Lys Pro Ala Ser Ile Phe Pro Thr Leu Glu Glu Glu Lys Glu Tyr
115 120 125

Tyr Gln Lys Tyr Pro Thr Ile Tyr His Leu Arg Gln Lys Leu Val Asp

130 135 140

Ser Thr Glu Lys Glu Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Asp Thr
165 170 175

Glu Asn Thr Ser Ile Glu Glu Ser Phe Arg Val Phe Leu Glu Gln Tyr
180 185 190

Ser Lys Gln Ser Asp Gln Pro Leu Ile Val His Gln Pro Val Leu Thr
195 200 205

Ile Leu Thr Asp Lys Leu Ser Lys Thr Lys Lys Val Glu Glu Ile Leu
210 215 220

Lys Tyr Tyr Pro Thr Glu Lys Ile Asn Ser Phe Phe Ala Gln Cys Leu
225 230 235 240

Lys Leu Ile Val Gly Asn Gln Ala Asn Phe Lys Arg Ile Phe Asp Leu
245 250 255

Glu Ala Glu Val Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu Glu Asp
260 265 270

Leu Glu Ser Leu Leu Glu Lys Ile Gly Asp Glu Tyr Leu Asp Ile Phe
275 280 285

Leu Gln Ala Lys Lys Val His Asp Ala Ile Leu Leu Ser Glu Ile Ile
290 295 300

Ser Ser Thr Val Lys His Thr Lys Ala Lys Leu Ser Ser Gly Met Val
305 310 315 320

Glu Arg Tyr Glu Arg His Lys Ala Asp Leu Ala Lys Phe Lys Gln Phe
325 330 335

Val Lys Glu Asn Val Pro Gln Lys Ala Thr Val Phe Phe Lys Asp Thr

340 345 350

Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Lys Gly Lys Thr Thr Gln Glu
355 360 365

Glu Phe Tyr Lys Phe Val Lys Lys Glu Leu Ser Gly Val Val Gly Ser
370 375 380

Glu Pro Phe Leu Glu Lys Ile Asp Gln Glu Thr Phe Leu Leu Lys Gln
385 390 395 400

Arg Thr Tyr Thr Asn Gly Val Ile Pro His Gln Val His Leu Ile Glu
405 410 415

Leu Lys Ala Ile Ile Asp Gln Gln Lys Gln His Tyr Pro Phe Leu Glu
420 425 430

Glu Ala Gly Pro Lys Ile Ile Ala Leu Phe Lys Phe Arg Ile Pro Tyr
435 440 445

Tyr Val Gly Pro Leu Ala Lys Glu Gln Glu Ala Ser Ser Phe Ala Trp
450 455 460

Ile Glu Arg Lys Thr Ala Glu Lys Ile Asn Pro Trp Asn Phe Ser Glu
465 470 475 480

Val Val Asp Ile Glu Lys Ser Ala Met Arg Phe Ile Gln Arg Met Thr
485 490 495

Lys Gln Asp Thr Tyr Leu Pro Thr Glu Lys Val Leu Pro Lys Asn Ser
500 505 510

Leu Leu Tyr Gln Lys Tyr Met Ile Phe Asn Glu Leu Thr Lys Val Ser
515 520 525

Tyr Lys Asp Glu Arg Gly Val Lys Gln Tyr Phe Ser Gly Asp Glu Lys
530 535 540

Gln Gln Ile Phe Lys Gln Leu Phe Gln Lys Glu Arg Gly Lys Ile Thr

545 550 555 560

Val Lys Lys Leu Gln Asn Phe Leu Tyr Thr His Tyr His Ile Glu Asn
565 570 575

Ala Gln Ile Phe Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Ser Thr
580 585 590

Tyr His Asp Phe Met Lys Leu Ala Lys Thr Asn Glu Trp Leu Glu Gln
595 600 605

Pro Glu Met Glu Pro Ile Phe Glu Asp Ile Val Lys Ile Leu Thr Ile
610 615 620

Phe Glu Asp Arg Gln Met Ile Lys His Gln Leu Ser Lys Tyr Gln Glu
625 630 635 640

Val Phe Gly Glu Lys Leu Leu Lys Glu Phe Ala Arg Lys His Tyr Thr
645 650 655

Gly Trp Gly Arg Phe Ser Ala Lys Leu Ile His Gly Ile Arg Asp Arg
660 665 670

Lys Thr Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Val Pro
675 680 685

Ala Asn Arg Asn Arg Asn Leu Met Gln Leu Ile Asn Asp Glu His Leu
690 695 700

Ser Phe Lys Glu Glu Ile Ala Lys Ala Thr Val Phe Ser Lys His Lys
705 710 715 720

Ser Leu Val Asp Val Ile Gln Asp Leu Pro Gly Ser Pro Ala Ile Lys
725 730 735

Lys Gly Ile Trp Gln Ser Leu Lys Ile Val Glu Glu Leu Ile Ala Ile
740 745 750

Ile Gly Tyr Lys Pro Lys Asn Ile Val Ile Glu Met Ala Arg Glu Asn

```
        755                 760                 765

Gln Lys Thr His Arg Thr Ser Pro Arg Leu Lys Ala Leu Glu Asn Gly
    770                 775                 780

Leu Lys Gln Ile Gly Ser Thr Leu Leu Lys Glu Gln Pro Thr Asp Asn
785                 790                 795                 800

Lys Ala Leu Gln Lys Glu Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Thr Gly Glu Pro Leu Glu Ile Glu Asn Leu His Gln
            820                 825                 830

Tyr Glu Val Asp His Ile Ile Pro Arg Ser Phe Ile Val Asp Asn Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Val Ala Ser Lys Gln Asn Gln Lys Lys Arg
    850                 855                 860

Asp Asp Val Pro Lys Lys Gln Ile Val Asn Glu Gln Arg Ile Phe Trp
865                 870                 875                 880

Asn Gln Leu Lys Glu Ala Lys Leu Ile Ser Pro Lys Lys Tyr Ala Tyr
                885                 890                 895

Leu Thr Lys Ile Glu Leu Thr Pro Glu Asp Lys Ala Arg Phe Ile Gln
            900                 905                 910

Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Asn Ile
        915                 920                 925

Leu His Gln Ser Phe Asn Gln Glu Glu Glu Gly Thr Asp Cys Asp Gly
    930                 935                 940

Val Gln Ile Ile Thr Leu Lys Ala Thr Leu Thr Ser Gln Phe Arg Gln
945                 950                 955                 960

Thr Phe Gly Leu Tyr Lys Val Arg Glu Ile Asn Pro His His His Ala
```

965 970 975

His Asp Ala Tyr Leu Asn Gly Phe Ile Ala Asn Val Leu Leu Lys Arg
980 985 990

Tyr Pro Lys Leu Ala Pro Glu Phe Val Tyr Gly Lys Tyr Val Lys Tyr
995 1000 1005

Ser Leu Ala Arg Glu Asn Lys Ala Thr Ala Lys Lys Glu Phe Tyr
1010 1015 1020

Ser Asn Ile Leu Lys Phe Leu Glu Ser Asp Glu Pro Phe Cys Asp
1025 1030 1035

Glu Asn Gly Glu Ile Tyr Trp Glu Lys Ser His His Leu Pro Arg
1040 1045 1050

Ile Lys Lys Val Leu Ser Ser His Gln Val Asn Val Val Lys Lys
1055 1060 1065

Val Glu Gln Gln Lys Gly Gly Phe Tyr Lys Glu Thr Val Asn Ser
1070 1075 1080

Lys Glu Lys Pro Asp Lys Leu Ile Glu Arg Lys Asn Asn Trp Asp
1085 1090 1095

Val Thr Lys Tyr Gly Gly Phe Gly Ser Pro Val Ile Ala Tyr Ala
1100 1105 1110

Ile Ala Phe Val Tyr Ala Lys Gly Lys Thr Gln Lys Lys Thr Arg
1115 1120 1125

Ala Ile Glu Gly Ile Thr Ile Met Glu Gln Ala Ala Phe Glu Lys
1130 1135 1140

Asp Pro Thr Thr Phe Leu Lys Glu Lys Gly Phe Pro Gln Val Thr
1145 1150 1155

Glu Phe Ile Lys Leu Pro Lys Tyr Thr Leu Phe Glu Phe Asp Asn

```
    1160                1165                1170

Gly Arg  Arg Arg Phe Leu Ala  Ser Lys Glu Ser Gln  Lys Gly Asn
    1175                1180                1185

Pro Phe  Ile Leu Ser Asp Gln  Leu Val Thr Leu Leu  Tyr His Ala
    1190                1195                1200

Gln His  Tyr Asp Lys Ile Thr  Tyr Gln Glu Ser Phe  Asp Tyr Val
    1205                1210                1215

Asn Thr  His Leu Ser Asp Phe  Ser Ala Ile Leu Thr  Glu Val Leu
    1220                1225                1230

Ala Phe  Ala Glu Lys Tyr Thr  Leu Ala Asp Lys Asn  Ile Glu Arg
    1235                1240                1245

Ile Gln  Glu Leu Tyr Glu Glu  Asn Lys Tyr Gly Glu  Thr Ser Met
    1250                1255                1260

Ile Ala  Gln Ser Phe Leu Gln  Leu Leu Gln Phe Asn  Ala Ile Gly
    1265                1270                1275

Ala Pro  Ala Asp Phe Lys Phe  Phe Gly Val Thr Ile  Pro Arg Lys
    1280                1285                1290

Arg Tyr  Thr Ser Leu Thr Glu  Ile Trp Asp Ala Thr  Ile Ile Tyr
    1295                1300                1305

Gln Ser  Val Thr Gly Leu Tyr  Glu Thr Arg Ile Arg  Met Gly Asp
    1310                1315                1320

Leu Trp  Ala Gly Glu Gln
    1325
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Met Thr Lys Asp Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Leu Thr Asp Asp Tyr Gln Leu Met Lys Arg Lys Met
            20                  25                  30

Ser Val His Gly Asn Thr Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Ala Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Phe Arg Arg Thr
    50                  55                  60

Lys Arg Thr Asn Arg Arg Arg Leu Ala Arg Arg Lys Tyr Arg Leu Ser
65                  70                  75                  80

Lys Leu Gln Asp Leu Phe Ala Glu Glu Leu Cys Lys Gln Asp Asp Cys
                85                  90                  95

Phe Phe Val Arg Leu Glu Glu Ser Phe Leu Val Pro Glu Glu Lys Gln
            100                 105                 110

Tyr Lys Pro Ala Ser Ile Phe Pro Thr Leu Glu Glu Glu Lys Glu Tyr
        115                 120                 125

Tyr Gln Lys Tyr Pro Thr Ile Tyr His Leu Arg Gln Lys Leu Val Asp
    130                 135                 140

Ser Thr Glu Lys Glu Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Leu Leu Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Asp Leu Asp Thr
                165                 170                 175

Glu Asn Thr Ser Ile Glu Glu Ser Phe Arg Val Phe Leu Glu Gln Tyr
            180                 185                 190

Gly Lys Gln Ser Asp Gln Pro Leu Ile Val His Gln Pro Val Leu Thr
        195                 200                 205
```

```
Ile Leu Thr Asp Lys Leu Ser Lys Thr Lys Lys Val Glu Glu Ile Leu
    210                 215                 220

Lys Tyr Tyr Pro Thr Glu Lys Ile Asn Ser Phe Phe Ala Gln Cys Leu
225                 230                 235                 240

Lys Leu Ile Val Gly Asn Gln Ala Asn Phe Lys Arg Ile Phe Asp Leu
                245                 250                 255

Glu Ala Glu Val Lys Leu Gln Phe Ser Lys Glu Thr Tyr Glu Glu Asp
            260                 265                 270

Leu Glu Ser Leu Leu Glu Lys Ile Gly Asp Glu Tyr Leu Asp Ile Phe
        275                 280                 285

Leu Gln Ala Lys Lys Val His Asp Ala Ile Leu Leu Ser Glu Ile Ile
    290                 295                 300

Ser Ser Thr Val Lys His Thr Gln Ala Lys Leu Ser Ser Gly Met Val
305                 310                 315                 320

Glu Arg Tyr Glu Arg His Lys Ala Asp Leu Ala Lys Phe Lys Gln Phe
                325                 330                 335

Val Lys Glu Asn Val Pro Gln Lys Ala Thr Val Phe Phe Lys Asp Thr
            340                 345                 350

Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Lys Gly Lys Thr Thr Gln Glu
        355                 360                 365

Glu Phe Tyr Lys Phe Val Lys Lys Glu Leu Ser Gly Val Val Gly Ser
    370                 375                 380

Glu Pro Phe Leu Glu Lys Ile Asp Gln Glu Thr Phe Leu Leu Lys Gln
385                 390                 395                 400

Arg Thr Tyr Thr Asn Gly Val Ile Pro His Gln Val His Leu Ile Glu
                405                 410                 415
```

```
Leu Lys Ala Ile Ile Asp Gln Gln Lys Gln His Tyr Pro Phe Leu Glu
            420                 425                 430

Glu Ala Gly Pro Lys Ile Ile Ala Leu Phe Lys Phe Arg Ile Pro Tyr
        435                 440                 445

Tyr Val Gly Pro Leu Ala Lys Glu Gln Glu Ala Ser Ser Phe Ala Trp
    450                 455                 460

Ile Glu Arg Lys Thr Ala Glu Lys Ile Asn Pro Trp Asn Phe Ser Glu
465                 470                 475                 480

Val Val Asp Ile Glu Lys Ser Ala Met Arg Phe Ile Gln Arg Met Thr
                485                 490                 495

Lys Gln Asp Thr Tyr Leu Pro Thr Glu Lys Val Leu Pro Lys Asn Ser
            500                 505                 510

Leu Leu Tyr Gln Lys Tyr Met Ile Phe Asn Glu Leu Thr Lys Val Ser
        515                 520                 525

Tyr Lys Asp Glu Arg Gly Val Lys Gln Tyr Phe Ser Gly Asp Glu Lys
    530                 535                 540

Gln Gln Ile Phe Lys Gln Leu Phe Gln Lys Glu Arg Gly Lys Ile Thr
545                 550                 555                 560

Val Lys Lys Leu Gln Asn Phe Leu Tyr Thr His Tyr His Ile Glu Asn
                565                 570                 575

Ala Gln Ile Phe Gly Ile Glu Lys Ala Phe Asn Ala Ser Tyr Ser Thr
            580                 585                 590

Tyr His Asp Phe Met Lys Leu Ala Lys Thr Asn Glu Trp Leu Glu Gln
        595                 600                 605

Pro Glu Met Glu Pro Ile Phe Glu Asp Ile Val Lys Ile Leu Thr Ile
    610                 615                 620
```

```
Phe Glu Asp Arg Gln Met Ile Lys His Gln Leu Ser Lys Tyr Gln Glu
625                 630                 635                 640

Val Phe Gly Glu Lys Leu Leu Lys Glu Phe Ala Arg Lys His Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Phe Ser Ala Lys Leu Ile His Gly Ile Arg Asp Arg
            660                 665                 670

Lys Thr Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Val Pro
        675                 680                 685

Ala Asn Arg Asn Arg Asn Leu Met Gln Leu Ile Asn Asp Glu His Leu
    690                 695                 700

Ser Phe Lys Glu Glu Ile Ala Lys Ala Thr Val Phe Ser Lys His Lys
705                 710                 715                 720

Ser Leu Val Asp Val Ile Gln Asp Leu Pro Gly Ser Pro Ala Ile Lys
                725                 730                 735

Lys Gly Ile Trp Gln Ser Leu Lys Ile Val Glu Glu Leu Ile Ala Ile
            740                 745                 750

Ile Gly Tyr Lys Pro Lys Asn Ile Val Ile Glu Met Ala Arg Glu Asn
        755                 760                 765

Gln Lys Thr His Arg Thr Lys Pro Arg Leu Lys Ala Leu Glu Asn Gly
    770                 775                 780

Leu Lys Gln Ile Gly Ser Thr Leu Leu Lys Glu Gln Pro Thr Asp Asn
785                 790                 795                 800

Lys Ala Leu Gln Lys Glu Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly
                805                 810                 815

Arg Asp Met Tyr Thr Gly Glu Pro Leu Glu Ile Glu Asn Leu His Gln
            820                 825                 830
```

```
Tyr Glu Val Asp His Ile Ile Pro Arg Ser Phe Ile Val Asp Asn Ser
        835                 840                 845

Ile Asp Asn Lys Val Leu Val Ala Ser Lys Gln Asn Gln Lys Lys Arg
    850                 855                 860

Asp Asp Val Pro Asn Lys Gln Ile Val Asn Glu Gln Arg Ile Phe Trp
865                 870                 875                 880

Asn Gln Leu Lys Glu Ala Lys Leu Ile Ser Pro Lys Lys Tyr Ala Tyr
                885                 890                 895

Leu Thr Lys Ile Glu Leu Thr Pro Glu Asp Lys Ala Arg Phe Ile Gln
            900                 905                 910

Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Asn Ile
        915                 920                 925

Leu His Gln Ser Phe Asn Gln Glu Glu Glu Gly Thr Asp Cys Asp Gly
    930                 935                 940

Val Gln Ile Ile Thr Leu Lys Ala Thr Leu Thr Ser Gln Phe Arg Gln
945                 950                 955                 960

Thr Phe Gly Leu Tyr Lys Val Arg Glu Ile Asn Pro His His His Ala
                965                 970                 975

His Asp Ala Tyr Leu Asn Gly Phe Ile Ala Asn Val Leu Leu Lys Arg
            980                 985                 990

Tyr Pro Lys Leu Ala Pro Glu Phe  Val Tyr Gly Lys Tyr  Val Lys Tyr
        995                 1000                1005

Ser Leu  Ala Arg Glu Asn Lys  Ala Thr Ala Lys Lys  Glu Phe Tyr
    1010                1015                1020

Ser Asn  Ile Leu Lys Phe Leu  Glu Ser Asp Glu Pro  Phe Cys Asp
    1025                1030                1035
```

```
Glu Asn  Gly Glu Ile Tyr Trp  Glu Lys Ser His His  Leu Pro Arg
    1040                1045                1050

Ile Lys  Lys Val Leu Ser Ser  His Gln Val Asn Val  Val Lys Lys
    1055                1060                1065

Val Glu  Gln Gln Lys Gly Gly  Phe Tyr Lys Glu Thr  Val Asn Ser
    1070                1075                1080

Lys Glu  Lys Pro Asp Lys Leu  Ile Glu Arg Lys Asn  Asn Trp Asp
    1085                1090                1095

Val Thr  Lys Tyr Gly Gly Phe  Gly Ser Pro Val Ile  Ala Tyr Ala
    1100                1105                1110

Ile Ala  Phe Val Tyr Ala Lys  Gly Lys Thr Gln Lys  Lys Thr Arg
    1115                1120                1125

Ala Ile  Glu Gly Ile Thr Ile  Met Glu Gln Ala Ala  Phe Glu Lys
    1130                1135                1140

Asp Pro  Thr Thr Phe Leu Lys  Asp Lys Gly Phe Pro  His Val Thr
    1145                1150                1155

Glu Phe  Ile Lys Leu Pro Lys  Tyr Thr Leu Phe Glu  Phe Asp Asn
    1160                1165                1170

Gly Arg  Arg Arg Phe Leu Ala  Ser Lys Glu Ser Gln  Lys Gly Asn
    1175                1180                1185

Pro Phe  Ile Leu Ser Asp Gln  Leu Val Thr Leu Leu  Tyr His Ala
    1190                1195                1200

Gln His  Tyr Asp Lys Ile Thr  Tyr Gln Glu Ser Phe  Asp Tyr Val
    1205                1210                1215

Asn Thr  His Leu Ser Asp Phe  Ser Ala Ile Leu Thr  Glu Val Leu
    1220                1225                1230
```

```
Ala Phe  Ala Glu Lys Tyr Thr  Leu Ala Asp Lys Asn  Ile Glu Arg
    1235                 1240                 1245


Ile Gln  Glu Leu Tyr Glu Glu  Asn Lys Tyr Gly Glu  Ile Ser Met
    1250                 1255                 1260


Ile Ala  Gln Ser Phe Leu Gln  Leu Leu Gln Phe Asn  Ala Ile Gly
    1265                 1270                 1275


Ala Pro  Ala Asp Phe Lys Phe  Phe Gly Val Thr Ile  Pro Arg Lys
    1280                 1285                 1290


Arg Tyr  Thr Ser Leu Thr Glu  Ile Trp Asp Ala Thr  Ile Ile Tyr
    1295                 1300                 1305


Gln Ser  Val Thr Gly Leu Tyr  Glu Thr Arg Ile Arg  Met Gly Asp
    1310                 1315                 1320


Leu Trp  Ala Gly Glu Gln
    1325


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<212>  PRT
<213>  Enterococcus italicus

<400>  320

Met Lys Asn Asp Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Tyr Ser Val Val Thr Asp Asp Tyr Lys Val Ile Ser Lys Lys Met
            20                  25                  30


Asn Val Phe Gly Asn Thr Glu Lys Lys Ser Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Glu Ser Gly Gln Thr Ala Gln Glu Ala Arg Met
    50                  55                  60
```

```
Lys Arg Thr Ser Arg Arg Arg Ile Ala Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Gln Pro Glu Met Asn His Leu Asp Asn Asn
                85                  90                  95

Phe Phe Tyr Arg Leu Asn Glu Ser Phe Leu Val Ala Asp Asp Ala Lys
            100                 105                 110

Tyr Asp Lys His Pro Ile Phe Gly Thr Leu Asp Glu Glu Ile His Phe
        115                 120                 125

His Glu Gln Phe Pro Thr Ile Tyr His Leu Arg Lys Tyr Leu Ala Asp
    130                 135                 140

Gly Asp Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Ile Ala His
145                 150                 155                 160

Ile Ile Lys Phe Arg Gly Asn Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Asn Ser Val Ile Glu Leu Ser Lys Val Phe Val Gln Leu Tyr
            180                 185                 190

Asn Gln Thr Leu Ser Glu Leu Glu Phe Ile Asp Glu Ser Ile Asp Phe
        195                 200                 205

Ser Glu Val Leu Thr Gln Gln Leu Ser Lys Ser Glu Arg Ala Asp Asn
    210                 215                 220

Val Leu Lys Leu Phe Pro Asp Glu Lys Gly Thr Gly Ile Phe Ala Gln
225                 230                 235                 240

Phe Ile Lys Leu Ile Val Gly Asn Gln Gly Asn Phe Lys Lys Val Phe
                245                 250                 255

Gln Leu Glu Glu Asp Gln Lys Leu Gln Leu Ser Thr Asp Asp Tyr Glu
            260                 265                 270
```

```
Glu Asn Ile Glu Asn Leu Leu Ala Ile Ile Gly Asp Glu Tyr Gly Asp
        275                 280                 285

Ile Phe Val Ala Ala Gln Asn Leu Tyr Gln Ala Ile Leu Leu Ala Gly
    290                 295                 300

Ile Leu Thr Ser Thr Glu Lys Thr Arg Ala Lys Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Gln Arg Tyr Glu Glu His Ala Lys Asp Leu Lys Leu Leu Lys Arg
                325                 330                 335

Phe Val Lys Glu His Ile Pro Asp Lys Tyr Ala Glu Ile Phe Asn Asp
            340                 345                 350

Ala Thr Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Lys Glu
        355                 360                 365

Glu Glu Phe Tyr Lys Tyr Leu Lys Thr Thr Leu Val Gln Lys Ser Gly
    370                 375                 380

Tyr Gln Tyr Phe Ile Glu Lys Ile Glu Gln Glu Asn Phe Leu Arg Lys
385                 390                 395                 400

Gln Arg Ile Tyr Asp Asn Gly Val Ile Pro His Gln Val His Ala Glu
                405                 410                 415

Glu Leu Arg Ala Ile Leu Arg Lys Gln Glu Lys Tyr Tyr Ser Phe Leu
            420                 425                 430

Lys Glu Asn His Glu Lys Ile Glu Gln Ile Phe Lys Val Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Lys His Asn Glu Gln Ser Arg Phe Ala
    450                 455                 460

Trp Asn Ile Arg Lys Ser Asp Glu Pro Ile Arg Pro Trp Asn Met Asn
465                 470                 475                 480
```

```
Asp Val Val Asp Glu Asn Ala Ser Ala Val Ala Phe Ile Glu Arg Met
                485                 490                 495

Thr Ile Lys Asp Ile Tyr Leu Asn Glu Asn Val Leu Pro Arg His Ser
            500                 505                 510

Leu Ile Tyr Glu Lys Phe Thr Val Phe Asn Glu Leu Thr Lys Val Leu
        515                 520                 525

Tyr Ala Asp Asp Arg Gly Val Phe Gln Arg Phe Ser Ala Glu Glu Lys
    530                 535                 540

Glu Asp Ile Phe Glu Lys Leu Phe Lys Ser Glu Arg Lys Val Thr Lys
545                 550                 555                 560

Lys Lys Leu Glu Asn Tyr Leu Arg Ile Glu Leu Ser Ile Ser Ser Pro
                565                 570                 575

Ser Val Lys Gly Ile Glu Glu Gln Phe Asn Ala Asn Phe Gly Thr Tyr
            580                 585                 590

Leu Asp Leu Lys Lys Phe Asp Glu Leu His Pro Tyr Leu Asp Asp Glu
        595                 600                 605

Lys Tyr Gln Asp Thr Leu Glu Glu Val Ile Lys Val Leu Thr Val Phe
    610                 615                 620

Glu Asp Arg Ser Met Ile Gln Asn Gln Leu Glu Gln Leu Pro Leu Asn
625                 630                 635                 640

Leu Ser Thr Lys Thr Ile Lys Ala Leu Ser Arg Arg Lys Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Arg Leu Ile Asp Gly Ile His Asp Lys Asn
            660                 665                 670

Ser Gly Lys Thr Ile Leu Asp Tyr Leu Ile Asp Glu Ser Asp Ser Tyr
        675                 680                 685
```

```
Ile Val Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp His Leu Ser
    690                 695                 700

Phe Lys Lys Ile Ile Glu Asp Ser Gln Pro Tyr Lys Glu Gln Gln Ser
705                 710                 715                 720

Ala Glu Glu Ile Val Ser Glu Leu Ser Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Ala Ile Met
            740                 745                 750

Gly Tyr Lys Pro Lys Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
        755                 760                 765

Thr Thr Gly Arg Gly Lys Gln Asn Ser Lys Pro Arg Leu Lys Gly Ile
    770                 775                 780

Glu Asn Gly Leu Lys Glu Phe Ser Asp Ser Val Leu Lys Gly Ser Ser
785                 790                 795                 800

Ile Asp Asn Lys Gln Leu Gln Asn Asp Arg Leu Tyr Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Lys Asp Met Tyr Thr Gly His Glu Leu Asp Ile Asp His
            820                 825                 830

Leu Ser Thr Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Leu Thr
        835                 840                 845

Asp Asn Ser Ile Asp Asn Arg Val Leu Thr Thr Ser Lys Ser Asn Arg
    850                 855                 860

Gly Lys Ser Asp Asn Val Pro Ser Glu Glu Val Val Arg Lys Met Asp
865                 870                 875                 880

Arg Phe Trp Arg Lys Leu Leu Asn Ala Lys Leu Ile Ser Glu Arg Lys
                885                 890                 895
```

```
Tyr Thr Asn Leu Thr Lys Lys Glu Leu Thr Glu Ser Asp Lys Ala Gly
            900                 905                 910

Phe Leu Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Thr Ile Leu Asp Ser Lys Phe Asn Glu Asp Ser Asn Asn Arg Asp
    930                 935                 940

Val Gln Ile Ile Thr Leu Lys Ser Ala Leu Val Ser Glu Phe Arg Lys
945                 950                 955                 960

Thr Phe Asn Leu Tyr Lys Val Arg Glu Ile Asn Asp Leu His His Ala
                965                 970                 975

His Asp Ala Tyr Leu Asn Ala Val Val Ala Leu Ser Leu Leu Arg Val
            980                 985                 990

Tyr Pro Gln Leu Lys Pro Glu Phe  Val Tyr Gly Glu Tyr  Gly Lys Asn
        995                 1000                1005

Ser Ile  His Asp Gln Asn Lys  Ala Thr Ile Lys Lys  Gln Phe Tyr
    1010                1015                1020

Ser Asn  Ile Thr Arg Tyr Phe  Ala Ser Lys Asp Ile  Ile Asn Asp
    1025                1030                1035

Asp Gly  Glu Ile Leu Trp Asn  Lys Gln Glu Thr Ile  Ala Gln Val
    1040                1045                1050

Ile Lys  Thr Leu Gly Met His  Gln Val Asn Val Val  Lys Lys Val
    1055                1060                1065

Glu Ile  Gln Lys Gly Gly Phe  Ser Lys Glu Ser Ile  Gln Pro Lys
    1070                1075                1080

Gly Glu  Ser Gln Lys Leu Ile  Arg Arg Lys Gln Gln  Trp Asn Thr
    1085                1090                1095
```

```
Lys Lys  Tyr Gly Gly Phe Asp  Ser Pro Val Val Ala  Tyr Ala Ile
    1100                1105                1110

Leu Leu  Ser Phe Asp Lys Gly  Lys Arg Lys Ala Arg  Ser Phe Lys
    1115                1120                1125

Ile Val  Gly Ile Thr Ile Gln  Asp Arg Glu Ser Phe  Glu Gly Asn
    1130                1135                1140

Pro Ile  Leu Tyr Leu Ser Lys  Lys Asp Tyr His Asn  Pro Lys Val
    1145                1150                1155

Glu Ala  Ile Leu Pro Lys Tyr  Ser Leu Phe Glu Phe  Glu Asn Gly
    1160                1165                1170

Arg Arg  Arg Met Val Ala Ser  Ser Glu Thr Gln Lys  Gly Asn Gln
    1175                1180                1185

Leu Ile  Ile Pro Gly His Leu  Met Glu Leu Leu Tyr  His Ser Lys
    1190                1195                1200

Lys Ile  Ile Asn Gly Lys Asn  Ser Asp Ser Val Ser  Tyr Ile Gln
    1205                1210                1215

Asn Asn  Lys Glu Lys Phe Arg  Glu Ile Phe Glu Tyr  Ile Val Asp
    1220                1225                1230

Phe Ser  Ser Lys Tyr Ile Ser  Ala Asp Ala Asn Leu  Asn Lys Ile
    1235                1240                1245

Glu Lys  Ile Phe Glu Asn Asn  Phe His Lys Ala Ser  Glu Gln Glu
    1250                1255                1260

Ile Ala  Lys Ser Phe Ile Asn  Leu Leu Thr Phe Thr  Ala Met Gly
    1265                1270                1275

Ala Pro  Ala Asp Phe Glu Phe  Phe Gly Glu Lys Ile  Pro Arg Lys
    1280                1285                1290
```

```
Arg Tyr  Val Ser Ile Ser Glu  Ile Ile Asp Ala Val  Phe Ile His
    1295                 1300                 1305


Gln Ser  Ile Thr Gly Leu Tyr  Glu Thr Arg Val Arg  Leu Thr Glu
    1310                 1315                 1320


Val
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<400> 321

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Met Glu Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Leu Thr Asp Asp Tyr Arg Leu Val Ala Arg Lys Met
            20                  25                  30


Ser Ile Gln Gly Asp Ser Asn Arg Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Ala Arg Leu Phe Glu Glu Gly Lys Thr Ala Gln Phe Arg Arg Ile
    50                  55                  60


Lys Arg Thr Asn Arg Arg Arg Arg Ile Ala Arg Arg Arg Gln Arg Val Leu
65                  70                  75                  80


Ala Leu Gln Asp Ile Phe Ala Glu Glu Ile His Lys Lys Asp Pro Asn
                85                  90                  95


Phe Phe Ala Arg Leu Glu Glu Gly Asp Arg Val Glu Ala Asp Lys Arg
            100                 105                 110


Phe Ala Lys Phe Pro Val Phe Ala Thr Leu Ser Glu Glu Lys Asn Tyr
        115                 120                 125
```

```
His Arg Gln Tyr Pro Thr Ile Tyr His Leu Arg His Asp Leu Ala Asn
    130                 135                 140

Ser Lys Glu Gln Ala Asp Ile Arg Leu Val Tyr Leu Ala Ile Ala His
145                 150                 155                 160

Cys Leu Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Glu Leu Asp Thr
                165                 170                 175

Glu Asn Thr Ser Val Thr Glu Asn Tyr Gln Gln Phe Leu Gln Ala Tyr
            180                 185                 190

Gln Gln Phe Phe Pro Glu Pro Ile Gly Asp Leu Asp Asp Ala Val Pro
        195                 200                 205

Ile Leu Thr Glu Arg Leu Ser Lys Ala Lys Arg Val Glu Lys Val Leu
    210                 215                 220

Ala Tyr Tyr Pro Ser Glu Lys Ser Thr Gly Asn Phe Ala Gln Phe Leu
225                 230                 235                 240

Lys Leu Met Val Gly Asn Gln Ala Asn Phe Lys Lys Thr Phe Asp Leu
                245                 250                 255

Glu Glu Glu Met Lys Leu Asn Phe Thr Arg Asp Cys Tyr Glu Glu Asp
            260                 265                 270

Leu Asn Glu Leu Leu Glu Lys Thr Ser Asp Asp Tyr Ala Glu Leu Phe
        275                 280                 285

Leu Lys Ala Lys Gly Val Tyr Asp Ala Ile Leu Leu Ser Gln Ile Leu
    290                 295                 300

Ser Lys Ser Asp Asp Glu Thr Lys Ala Lys Leu Ser Ala Asn Met Lys
305                 310                 315                 320

Leu Arg Phe Glu Glu His Gln Arg Asp Leu Lys Gln Leu Lys Glu Leu
                325                 330                 335
```

```
Val Arg Arg Asp Leu Pro Lys Lys Tyr Asp Asp Phe Phe Lys Asn Arg
            340                 345                 350

Ser Lys Asn Gly Tyr Ala Gly Tyr Val Lys Gly Lys Ala Thr Gln Glu
        355                 360                 365

Asp Phe Tyr Lys Phe Leu Arg Thr Glu Leu Ala Gly Leu Glu Glu Ser
    370                 375                 380

Gln Ser Ile Met Glu Lys Ile Asp Leu Glu Ile Tyr Leu Leu Lys Gln
385                 390                 395                 400

Arg Thr Phe Ala Asn Gly Val Ile Pro His Gln Ile His Leu Val Glu
                405                 410                 415

Met Arg Glu Ile Met Asp Arg Gln Lys Arg Phe Tyr Pro Phe Leu Lys
            420                 425                 430

Gly Ala Gln Gly Lys Ile Glu Lys Leu Leu Thr Phe Arg Ile Pro Tyr
        435                 440                 445

Tyr Val Gly Pro Leu Ala Gln Glu Gly Gln Ser Pro Phe Ala Trp Ile
    450                 455                 460

Lys Arg Lys Ser Pro Ser Gln Ile Thr Pro Trp Asn Phe Ala Glu Val
465                 470                 475                 480

Val Asp Lys Glu Asn Ser Ala Ile Glu Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Gln Asp Thr Tyr Leu Pro Lys Glu Lys Val Leu Pro Lys Gln Ser Leu
            500                 505                 510

Ile Tyr Gln Arg Phe Met Ile Phe Asn Glu Leu Thr Lys Val Ser Tyr
        515                 520                 525

Thr Asp Glu Arg Gly Lys Ser His Tyr Phe Ser Ser Glu Gln Lys Arg
    530                 535                 540
```

```
Lys Ile Phe Asn Glu Leu Phe Lys Gln His Pro Arg Val Thr Glu Lys
545                 550                 555                 560

Gln Leu Arg Lys Phe Leu Glu Leu Asn Glu Gln Ile Asp Ser Thr Glu
                565                 570                 575

Ile Lys Gly Ile Glu Thr Ser Phe Asn Ala Ser Tyr Ser Thr Tyr His
            580                 585                 590

Asp Leu Leu Lys Leu Ser Thr Leu Leu Asp Asp Pro Asp Met Thr Thr
        595                 600                 605

Met Phe Glu Glu Ile Ile Lys Ile Leu Thr Ile Phe Glu Asp Arg Glu
    610                 615                 620

Met Ile Arg Glu Gln Leu Lys Pro Tyr Glu Thr Val Leu Gly Leu Pro
625                 630                 635                 640

Ala Ile Lys Lys Leu Ala Lys Lys His Tyr Thr Gly Trp Gly Arg Leu
                645                 650                 655

Ser Glu Lys Met Ile Gln Gly Met Arg Glu Lys Gln Ser Arg Lys Thr
            660                 665                 670

Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe Pro Cys Asn Arg Asn Arg
        675                 680                 685

Asn Phe Met Gln Leu Ile Asn Asp Asp His Leu Ser Phe Lys Glu Thr
    690                 695                 700

Ile Ala Asn Glu Leu Ile Met Ser Asp Ser Asn Val Leu Leu Asp Gln
705                 710                 715                 720

Val Lys Ala Ile Pro Gly Ser Pro Ala Val Lys Lys Gly Ile Trp Gln
                725                 730                 735

Ser Ile Lys Ile Val Glu Glu Ile Ile Gly Ile Ile Gly Lys Ala Pro
            740                 745                 750
```

```
Lys Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Arg Thr Ser Arg
        755                 760                 765

Ser Arg Pro Arg Leu Lys Ala Leu Glu Glu Ala Leu Lys Asn Ile Asp
    770                 775                 780

Ser Pro Leu Leu Lys Asp Tyr Pro Thr Asp Asn Gln Ala Leu Gln Lys
785                 790                 795                 800

Asp Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys Asp Met Tyr Thr
                805                 810                 815

Gly Glu Pro Leu Glu Ile His Arg Leu Ser Glu Tyr Asp Ile Asp His
            820                 825                 830

Ile Ile Pro Arg Ser Phe Ile Val Asp Asn Ser Leu Asp Asn Lys Val
        835                 840                 845

Leu Val Ser Ser Lys Val Asn Arg Gly Lys Leu Asp Asn Ala Pro Asp
    850                 855                 860

Pro Leu Val Val Lys Arg Met Arg Ser His Trp Glu Lys Leu His Gln
865                 870                 875                 880

Ala Lys Leu Ile Ser Asp Lys Lys Leu Ala Asn Leu Thr Lys Gln Asn
                885                 890                 895

Leu Thr Glu Ala Asp Lys Ala Arg Phe Ile Gln Arg Gln Leu Val Glu
            900                 905                 910

Thr Arg Gln Ile Thr Lys His Val Ala Asn Leu Leu His Gln His Phe
        915                 920                 925

Asn Leu Pro Glu Glu Val Ser Ala Thr Glu Lys Thr Ser Ile Ile Thr
    930                 935                 940

Leu Lys Ser Thr Leu Thr Ser Gln Phe Arg Gln Met Phe Asp Ile Tyr
945                 950                 955                 960
```

```
Lys Val Arg Glu Ile Asn His His His His Ala His Asp Ala Tyr Leu
               965                 970                 975

Asn Gly Val Val Ala Met Thr Leu Leu Lys Lys Tyr Pro Lys Leu Ala
           980                 985                 990

Pro Glu Phe Val Tyr Gly Ser Tyr  Ile Lys Gly Asp Ile  Asn Gln Ile
        995                 1000                1005

Asn Lys  Ala Thr Ala Lys Lys  Glu Phe Tyr Ser Asn  Ile Met Lys
    1010                1015                1020

Phe Phe  Glu Ser Glu Glu Ile  Ile Cys Asp Glu Gln  Gly Glu Val
    1025                1030                1035

Ile Trp  Asn Lys Lys Arg Asp  Leu Ser Thr Ile Lys  Lys Thr Ile
    1040                1045                1050

Gly Ala  His Gln Val Asn Ile  Val Lys Lys Val Glu  Lys Gln Lys
    1055                1060                1065

Gly Gly  Phe Tyr Lys Glu Thr  Ile Asn Ser Lys Ala  Asn Pro Glu
    1070                1075                1080

Lys Leu  Ile Pro Arg Lys Ala  Ser Leu Asp Pro Leu  Lys Tyr Gly
    1085                1090                1095

Gly Tyr  Gly Ser Pro Leu Val  Ala Tyr Thr Val Ile  Phe Ile Phe
    1100                1105                1110

Glu Lys  Gly Lys Gln Lys Lys  Val Thr Lys Gly Ile  Glu Gly Ile
    1115                1120                1125

Thr Val  Met Glu Gln Leu Arg  Phe Glu Gln Asp Pro  Arg Glu Phe
    1130                1135                1140

Leu Lys  Thr Lys Gly Tyr Glu  Gly Val Lys Gln Trp  Leu Ile Leu
    1145                1150                1155
```

```
Pro Lys  Tyr Ile Leu Phe Glu  Ala Gln Gly Gly Tyr  Arg Arg Met
    1160                1165                1170


Ile Ala  Ser Gln Glu Thr Gln  Lys Ala Asn Ser Leu  Ile Leu Pro
    1175                1180                1185


Glu Asn  Leu Val Thr Leu Leu  Tyr His Ala Arg His  Tyr Asp Glu
    1190                1195                1200


Ile Asn  His Lys Val Ser Phe  Asp Tyr Val Asn Ala  His Lys Glu
    1205                1210                1215


Gly Phe  Asn Asp Ile Phe Asp  Phe Ile Ser Asp Phe  Gly Val Arg
    1220                1225                1230


Tyr Ile  Leu Ala Pro Gln His  Leu Glu Lys Ile Lys  Val Ala Tyr
    1235                1240                1245


Glu Lys  Asn Lys Glu Val Asp  Leu Lys Glu Met Ile  Asp Ala Ile
    1250                1255                1260


Leu Ser  Leu Leu Lys Phe Thr  Leu Phe Gly Ala Ser  Val Glu Phe
    1265                1270                1275


Lys Phe  Phe Asp Ile Lys Ile  Leu Lys Arg Tyr Lys  Ser Leu Thr
    1280                1285                1290


Asp Ile  Trp Glu Ala Thr Ile  Ile Tyr Gln Ser Val  Thr Gly Leu
    1295                1300                1305


Tyr Glu  Arg Arg Val Glu Val  Arg Lys Leu Trp Asp  Gly Glu Arg
    1310                1315                1320


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Met Lys Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
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1               5                   10                  15

Gly Trp Ala Val Leu Thr Glu Asn Tyr Asp Leu Val Lys Lys Lys Met
            20                  25                  30

Lys Val Tyr Gly Asn Thr Glu Thr Lys Tyr Leu Lys Lys Asn Leu Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Glu Gly Glu Thr Ala Ala Asp Arg Arg Leu
    50                  55                  60

Lys Arg Thr Thr Arg Arg Arg Tyr Ser Arg Arg Arg Asn Arg Ile Cys
65                  70                  75                  80

Arg Leu Gln Asp Leu Phe Thr Glu Glu Met Asn Gln Val Asp Ala Asn
                85                  90                  95

Phe Phe His Arg Leu Gln Glu Ser Phe Leu Val Pro Asp Glu Lys Glu
            100                 105                 110

Phe Glu Arg His Ala Ile Phe Gly Lys Met Glu Glu Glu Val Ser Tyr
        115                 120                 125

Tyr Arg Glu Phe Pro Thr Ile Tyr His Leu Arg Lys His Leu Ala Asp
    130                 135                 140

Thr Ser Glu Gln Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Val Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Glu Leu Asn Thr
                165                 170                 175

Glu Asn Ser Ser Val Ser Glu Thr Phe Arg Thr Phe Ile Gln Val Tyr
            180                 185                 190

Asn Gln Ile Phe Arg Glu Asn Glu Pro Leu Ala Val Pro Asp Asn Ile
        195                 200                 205

Glu Glu Leu Phe Ser Glu Lys Val Ser Arg Ala Arg Lys Val Glu Ala
```

```
    210                 215                 220

Ile Leu Ser Val Tyr Ser Glu Glu Lys Ser Thr Gly Thr Leu Ala Gln
225                 230                 235                 240

Phe Leu Lys Leu Met Val Gly Asn Gln Gly Arg Phe Lys Lys Thr Phe
                245                 250                 255

Asp Leu Glu Glu Asp Gly Ile Ile Gln Ile Pro Lys Glu Glu Tyr Glu
            260                 265                 270

Glu Glu Leu Glu Thr Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala Glu
        275                 280                 285

Ile Phe Ser Ala Thr Lys Ser Val Tyr Asp Ala Val Ala Leu Ser Gly
    290                 295                 300

Ile Leu Ser Val Thr Asp Gly Asp Thr Lys Ala Lys Leu Ser Ala Ser
305                 310                 315                 320

Met Val Glu Arg Tyr Glu Ala His Gln Lys Asp Leu Val Gln Phe Lys
                325                 330                 335

Gln Phe Ile Arg Lys Glu Leu Pro Glu Met Tyr Ala Pro Ile Phe Arg
            340                 345                 350

Asp Asn Ser Val Ser Gly Tyr Ala Gly Tyr Val Glu Asn Ser Val Thr
        355                 360                 365

Gln Ala Glu Phe Tyr Lys Tyr Ile Lys Lys Ala Ile Glu Lys Val Pro
    370                 375                 380

Gly Ala Glu Tyr Phe Leu Glu Lys Ile Glu Gln Glu Thr Phe Leu Asp
385                 390                 395                 400

Lys Gln Arg Thr Phe Asn Asn Gly Val Ile Pro His Gln Ile His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Ile Gln Lys Gln Ala Thr Tyr Tyr Pro Phe
```

420 425 430

Leu Ala Asp Asn Lys Glu Glu Met Lys Gln Leu Val Thr Phe Arg Ile
435 440 445

Pro Tyr Tyr Val Gly Pro Leu Ala Asp Gly Asn Ser Pro Phe Ala Trp
450 455 460

Leu Glu Arg Ile Ser Ser Glu Pro Ile Arg Pro Gly Asn Leu Ala Glu
465 470 475 480

Val Val Asp Ile Lys Lys Ser Ala Thr Lys Phe Ile Glu Arg Met Thr
485 490 495

Asn Phe Asp Thr Tyr Leu Pro Thr Glu Lys Val Leu Pro Lys His Ser
500 505 510

Met Ile Tyr Glu Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Val Ser
515 520 525

Tyr Val Asp Glu Arg Gly Met Asn Gln Arg Phe Ser Gly Glu Glu Lys
530 535 540

Lys Gln Ile Val Glu Glu Leu Phe Lys Gln Ser Arg Lys Val Thr Lys
545 550 555 560

Lys Leu Leu Glu Lys Phe Leu Ser Asn Glu Phe Gly Leu Val Asp Val
565 570 575

Ala Ile Lys Gly Ile Glu Thr Ser Phe Asn Ala Gly Tyr Gly Thr Tyr
580 585 590

His Asp Phe Leu Lys Ile Gly Ile Thr Arg Glu Gln Leu Asp Lys Glu
595 600 605

Glu Asn Ser Glu Thr Leu Glu Glu Ile Val Lys Ile Leu Thr Val Phe
610 615 620

Glu Asp Arg Lys Met Ile Arg Glu Gln Leu Lys Lys Tyr Thr Tyr Leu

625 630 635 640

Phe Asp Glu Glu Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
645 650 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Ile Gly Ile Lys Glu Lys Arg
660 665 670

Thr His Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Gly Gly Lys Gln
675 680 685

Pro Ile Asn Arg Asn Leu Met Gln Leu Ile Asn Asp Ser Asp Leu Ser
690 695 700

Phe Lys Ser Glu Ile Ala Glu Ala Gln Ser Asp Met Asn Thr Glu Asp
705 710 715 720

Leu His Glu Val Val Gln Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys
725 730 735

Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu Leu Val Asp Ile Met
740 745 750

Gly Ser Leu Pro Lys Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln
755 760 765

Thr Thr Ser Arg Gly Arg Thr Asn Ser Asn Pro Arg Met Lys Ala Leu
770 775 780

Glu Glu Ala Met Arg Asn Leu Arg Ser Asn Leu Leu Lys Glu Tyr Pro
785 790 795 800

Thr Asp Asn Gln Ala Leu Gln Asn Asp Arg Leu Tyr Leu Tyr Tyr Leu
805 810 815

Gln Asn Gly Lys Asp Met Tyr Thr Gly Leu Asp Leu Ser Leu His Asn
820 825 830

Leu Ser Ser Tyr Asp Ile Asp His Ile Val Pro Gln Ser Phe Thr Thr

835 840 845

Asp Asn Ser Leu Asp Asn Arg Val Leu Val Ser Ser Lys Glu Asn Arg
850 855 860

Gly Lys Lys Asp Asp Val Pro Ser Lys Glu Val Val Gln Lys Asn Ile
865 870 875 880

Thr Leu Trp Glu Thr Leu Lys Asn Ser Asn Leu Ile Ser Gln Lys Lys
885 890 895

Tyr Asp Asn Leu Thr Lys Gly Leu Arg Gly Gly Leu Thr Glu Asp Asp
900 905 910

Arg Ala His Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
915 920 925

Lys His Val Ala Arg Ile Leu Asp Gln Arg Phe Asn Ser Gln Lys Asp
930 935 940

Glu Glu Gly Lys Thr Ile Arg Ala Val Arg Val Val Thr Leu Lys Ser
945 950 955 960

Ser Leu Thr Ser Gln Phe Arg Lys Gln Phe Ala Ile His Lys Val Arg
965 970 975

Glu Ile Asn Asp Tyr His His Gly His Asp Ala Tyr Leu Asn Gly Val
980 985 990

Val Ala Asn Ser Leu Leu Arg Val Tyr Pro Gln Leu Gln Pro Glu Phe
995 1000 1005

Val Tyr Gly Asp Tyr Pro Lys Phe Asn Ala Tyr Lys Ala Asn Lys
1010 1015 1020

Ala Thr Ala Lys Lys Gln Leu Tyr Thr Asn Ile Met Lys Phe Phe
1025 1030 1035

Ala Glu Asp Ala Val Ile Ile Asp Glu Asn Gly Glu Ile Leu Trp

1040 1045 1050

Asp Lys Lys Asn Ile Ala Thr Val Lys Lys Val Met Ser Tyr Pro
1055 1060 1065

Gln Met Asn Ile Val Lys Lys Pro Glu Ile Gln Thr Gly Ser Phe
1070 1075 1080

Ser Lys Glu Thr Ile Lys Pro Lys Gly Asp Ser Asp Lys Leu Ile
1085 1090 1095

Ser Arg Lys Thr Asn Trp Ser Pro Lys Leu Tyr Gly Gly Phe Asp
1100 1105 1110

Ser Pro Gln Val Ala Tyr Ser Val Ile Ile Thr Tyr Glu Lys Gly
1115 1120 1125

Lys Lys Lys Val Arg Ala Lys Ala Ile Val Gly Ile Thr Ile Met
1130 1135 1140

Glu Gln Ser Leu Phe Lys Lys Asp Pro Val Ser Leu Leu Glu Glu
1145 1150 1155

Lys Gly Tyr Ala Asn Pro Glu Val Leu Ile His Leu Pro Lys Tyr
1160 1165 1170

Thr Leu Tyr Glu Leu Glu Asn Gly Arg Arg Arg Leu Leu Ala Ser
1175 1180 1185

Ala Asn Glu Ala Gln Lys Gly Asn Gln Leu Val Leu Pro Ala Ser
1190 1195 1200

Leu Val Thr Leu Leu Tyr His Ala Lys Gln Val Asp Glu Asp Ser
1205 1210 1215

Gly Lys Ser Glu Glu Tyr Val Arg Glu His Arg Ala Glu Phe Ala
1220 1225 1230

Glu Ile Leu Asn Tyr Val Gln Ala Phe Ser Glu Thr Lys Ile Leu

1235 1240 1245

Ala Asn Lys Asn Leu Gln Thr Ile Leu Lys Leu Tyr Glu Glu Asn
1250 1255 1260

Lys Glu Ala Asp Ile Lys Glu Ile Ala Glu Ser Phe Val Asn Leu
1265 1270 1275

Met Lys Phe Ser Ala Tyr Gly Ala Pro Met Asp Phe Lys Phe Phe
1280 1285 1290

Gly Lys Thr Ile Pro Arg Ser Arg Tyr Thr Ser Val Gly Glu Leu
1295 1300 1305

Leu Ser Ala Thr Ile Ile Asn Gln Ser Ile Thr Gly Leu Tyr Glu
1310 1315 1320

Thr Arg Arg Lys Leu Val Asp
1325 1330

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Met Gly Lys Glu Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
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Gly Trp Ala Val Leu Gln Glu Asp Leu Asp Leu Val Arg Arg Lys Met
20 25 30

Lys Val Tyr Gly Asn Thr Glu Lys Asn Tyr Leu Lys Lys Asn Phe Trp
35 40 45

Gly Val Asp Leu Phe Asp Glu Gly Met Thr Ala Lys Asp Thr Arg Leu
50 55 60

Lys Arg Thr Thr Arg Arg Arg Tyr Phe Arg Arg Arg Gln Arg Ile Ser
65 70 75 80

```
Tyr Leu Gln Thr Phe Phe Gln Glu Glu Met Asn Arg Ile Asp Pro Asn
                85                  90                  95

Phe Phe Asn Arg Leu Asp Glu Ser Phe Leu Ile Glu Glu Asp Lys Leu
            100                 105                 110

Ser Glu Arg His Pro Ile Phe Gly Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Ala Thr Ile Tyr His Leu Arg Lys Glu Leu Ala Asp
    130                 135                 140

Ala Glu Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Arg Leu Ser Thr
                165                 170                 175

Glu Asn Thr Ser Thr Glu Glu Thr Phe Lys Thr Phe Leu Gln Lys Tyr
            180                 185                 190

Asn Gln Thr Phe Asn Pro Val Asp Glu Thr Ile Ser Ile Gly Ser Ile
        195                 200                 205

Phe Ala Asp Lys Val Ser Arg Ala Lys Lys Ala Glu Gly Val Leu Ala
    210                 215                 220

Leu Phe Pro Asp Glu Lys Arg Asn Gly Thr Phe Asp Gln Phe Leu Lys
225                 230                 235                 240

Met Ile Val Gly Asn Gln Gly Asn Phe Lys Lys Thr Phe Glu Leu Glu
                245                 250                 255

Glu Asp Ala Lys Leu Gln Phe Ser Lys Glu Glu Tyr Asp Glu Ser Leu
            260                 265                 270

Glu Ala Leu Leu Gly Glu Ile Gly Asp Glu Tyr Ala Asp Val Phe Glu
        275                 280                 285
```

```
Ala Ala Lys Asn Val Tyr Asn Ala Val Glu Leu Ser Gly Ile Leu Thr
    290                 295                 300

Val Thr Asp Asn Ser Thr Lys Ala Lys Leu Ser Ala Ser Met Ile Lys
305                 310                 315                 320

Arg Tyr Glu Asp His Lys Thr Asp Leu Lys Leu Phe Lys Glu Phe Ile
                325                 330                 335

Arg Lys Asn Leu Pro Glu Lys Tyr His Glu Ile Phe Asn Asp Lys Asn
            340                 345                 350

Thr Asp Gly Tyr Ala Gly Tyr Ile Asp Asn Ser Thr Ser Gln Glu Lys
        355                 360                 365

Phe Tyr Lys Tyr Ile Thr Asn Leu Ile Glu Lys Ile Asp Gly Ala Glu
    370                 375                 380

Tyr Phe Leu Lys Lys Ile Glu Asn Glu Asp Phe Leu Arg Lys Gln Arg
385                 390                 395                 400

Thr Phe Asp Asn Gly Ile Ile Pro His Gln Ile His Leu Glu Glu Leu
                405                 410                 415

Lys Ala Ile Leu His His Gln Ala Met Tyr Tyr Pro Phe Leu Gln Glu
            420                 425                 430

Lys Phe Ser Asn Phe Val Asp Leu Leu Thr Phe Arg Ile Pro Tyr Tyr
        435                 440                 445

Val Gly Pro Leu Ala Asn Gly Asn Ser Arg Phe Ser Trp Leu Ser Arg
    450                 455                 460

Lys Ser Asp Glu Pro Ile Arg Pro Trp Asn Leu Ala Glu Val Val Asp
465                 470                 475                 480

Leu Ser Lys Ser Ala Glu Leu Phe Ile Glu Arg Met Thr Asn Phe Asp
                485                 490                 495
```

```
Leu Tyr Leu Pro Ser Glu Lys Val Leu Pro Lys His Ser Met Leu Tyr
            500                 505                 510

Glu Lys Tyr Thr Val Tyr Asn Glu Leu Thr Lys Val Thr Tyr Lys Asp
        515                 520                 525

Glu Gln Gly Lys Val Gln Asn Phe Ser Ser Glu Glu Lys Glu Arg Ile
    530                 535                 540

Phe Ile Asp Leu Phe Lys Gln His Arg Lys Val Thr Lys Lys Asp Leu
545                 550                 555                 560

Ser Asn Phe Leu Arg Asn Glu Tyr Asn Leu Asp Asp Val Ile Ile Asp
                565                 570                 575

Gly Ile Glu Asn Lys Phe Asn Ala Ser Phe Asn Thr Tyr His Asp Phe
            580                 585                 590

Leu Lys Leu Lys Ile Asp Pro Lys Val Leu Asp Asp Pro Ala Asn Glu
        595                 600                 605

Pro Met Phe Glu Glu Ile Val Lys Ile Leu Thr Ile Phe Glu Asp Arg
    610                 615                 620

Lys Met Leu Arg Glu Gln Leu Ser Lys Phe Ser Asp Arg Leu Ser Glu
625                 630                 635                 640

Lys Thr Ile Lys Asp Leu Glu Arg Arg His Tyr Thr Gly Trp Gly Arg
                645                 650                 655

Leu Ser Ala Lys Leu Ile Asn Gly Ile His Asp Lys Gln Ser Asn Lys
            660                 665                 670

Thr Ile Leu Asp Tyr Leu Ile Asp Asp Ala Pro Lys Lys Asn Ile Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile Asn Asp Asn Arg Leu Thr Phe Lys Glu
    690                 695                 700
```

```
Glu Ile Glu Lys Glu Gln Leu Lys Ala Asn Ser Glu Glu Ser Leu Ile
705                 710                 715                 720

Glu Ile Val Gln Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile
                725                 730                 735

Phe Gln Ser Leu Lys Ile Val Asp Glu Leu Val Glu Ile Met Gly Tyr
            740                 745                 750

Ala Pro Thr Asn Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Ala Asn Gly Arg Arg Asn Ser Arg Pro Arg Leu Lys Asn Leu Glu Lys
    770                 775                 780

Ala Ile Asp Asp Leu Asp Ser Glu Ile Leu Lys Lys His Pro Val Asp
785                 790                 795                 800

Asn Lys Ala Leu Gln Lys Asp Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Lys Asp Met Tyr Thr Asn Glu Glu Leu Asp Ile His Lys Leu Ser
            820                 825                 830

Thr Tyr Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Val Asp Asn
        835                 840                 845

Ser Leu Asp Asn Arg Val Leu Val Ser Ser Ser Lys Asn Arg Gly Lys
    850                 855                 860

Leu Asp Asp Val Pro Ser Lys Glu Val Val Lys Lys Met Arg Ala Phe
865                 870                 875                 880

Trp Glu Ser Leu Tyr Arg Ser Gly Leu Ile Ser Lys Lys Lys Phe Asp
                885                 890                 895

Asn Leu Val Lys Ala Glu Ser Gly Gly Leu Ser Glu Asp Asp Lys Ala
            900                 905                 910
```

```
Gly Phe Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn
        915                 920                 925

Val Ala Arg Ile Leu His Gln Arg Phe Asn Ser Glu Lys Asp Glu Glu
    930                 935                 940

Gly Asn Leu Ile Arg Lys Val Arg Ile Ile Thr Leu Lys Ser Ala Leu
945                 950                 955                 960

Thr Ser Gln Phe Arg Lys Asn Tyr Gly Ile Tyr Lys Ile Arg Glu Ile
                965                 970                 975

Asn Asp Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala
            980                 985                 990

Thr Ala Leu Leu Lys Ile Tyr Pro  Gln Leu Glu Pro Glu  Phe Val Tyr
        995                 1000                1005

Gly Glu  Phe His Arg Phe Asn  Ala Phe Lys Glu Asn  Lys Ala Thr
    1010                1015                1020

Ala Lys  Lys Gln Phe Tyr Ser  Asn Leu Met Glu Phe  Ser Lys Ser
    1025                1030                1035

Asp Lys  Val Ile Ile Asp Glu  Asn Gly Glu Ile Leu  Trp Asn Gln
    1040                1045                1050

Lys Lys  Ile Val Thr Val Lys  Lys Val Met Asn Tyr  Arg Gln Met
    1055                1060                1065

Asn Ile  Val Lys Lys Val Glu  Ile Gln Lys Gly Gly  Phe Ser Lys
    1070                1075                1080

Glu Ser  Ile Leu Pro Lys Gly  Asp Ser Asp Lys Leu  Ile Ser Arg
    1085                1090                1095

Lys Lys  Glu Trp Asp Thr Thr  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1100                1105                1110
```

```
Asn Val  Ala Tyr Ser Val Val  Ile Arg Tyr Glu Lys  Gly Lys Thr
    1115                1120                1125

Arg Lys  Leu Val Lys Thr Ile  Val Gly Ile Thr Ile  Met Glu Arg
    1130                1135                1140

Ala Ala  Phe Glu Lys Asn Glu  Arg Glu Phe Leu Lys  Asn Lys Gly
    1145                1150                1155

Tyr Gln  Asn Pro Gln Ile Cys  Met Lys Leu Pro Lys  Tyr Ser Leu
    1160                1165                1170

Tyr Glu  Phe Asp Asp Gly Arg  Arg Arg Leu Leu Ala  Ser Ala Lys
    1175                1180                1185

Glu Ala  Gln Lys Gly Asn Gln  Met Val Leu Pro Ala  His Leu Val
    1190                1195                1200

Thr Phe  Leu Tyr His Ala Lys  His Cys Asn Glu Lys  Pro Asp Ser
    1205                1210                1215

Leu Lys  Tyr Val Thr Glu His  Gln Ser Gly Phe Ser  Glu Ile Met
    1220                1225                1230

Ala His  Val Lys Asp Phe Ala  Glu Lys Tyr Thr Leu  Val Asp Lys
    1235                1240                1245

Asn Leu  Glu Lys Ile Leu Ser  Leu Tyr Ala Lys Asn  Met Asp Ser
    1250                1255                1260

Glu Val  Lys Glu Ile Ala Gln  Ser Phe Val Asp Leu  Met Gln Leu
    1265                1270                1275

Asn Ala  Phe Gly Ala Pro Ala  Asp Phe Lys Phe Phe  Gly Glu Thr
    1280                1285                1290

Ile Pro  Arg Lys Arg Tyr Thr  Ser Val Asn Glu Leu  Leu Glu Ala
    1295                1300                1305
```

```
Thr Ile  Ile Asn Gln Ser Ile  Thr Gly Leu Tyr Glu  Thr Arg Arg
    1310                1315                1320


Arg Leu  Gly Asp
    1325
```

<210> 324
<211> 1332
<212> PRT
<213> Enterococcus villorum

<400> 324

```
Met Asn Lys Ala Tyr Thr Leu Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Thr Asp Asp Tyr Arg Leu Met Ala Lys Lys Met
            20                  25                  30


Pro Val His Ser Lys Met Glu Lys Lys Lys Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Ala Arg Leu Phe Asp Glu Gly Gln Thr Ala Glu Glu Arg Arg Asn
    50                  55                  60


Lys Arg Ala Thr Arg Arg Arg Leu Arg Arg Arg Lys Tyr Arg Ile Leu
65                  70                  75                  80


Glu Leu Gln Lys Ile Phe Ser Glu Glu Ile Leu Lys Lys Asp Ser His
                85                  90                  95


Phe Phe Ala Arg Leu Asp Glu Ser Phe Leu Ile Pro Glu Asp Lys Gln
            100                 105                 110


Tyr Ala Arg Phe Pro Ile Phe Pro Thr Leu Leu Glu Glu Lys Ala Tyr
        115                 120                 125


Tyr Gln Asn Tyr Pro Thr Ile Tyr His Leu Arg Gln Lys Leu Ala Asp
    130                 135                 140
```

```
Ser Thr Glu Lys Ala Asp Ile Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Tyr Arg Gly His Phe Leu Phe Glu Gly Glu Leu Asp Thr
                165                 170                 175

Glu Asn Thr Ser Val Glu Glu Thr Phe Lys Glu Phe Ile Asp Ile Tyr
            180                 185                 190

Asn Glu Gln Phe Glu Glu Gly Ile Ile Phe Tyr Lys Asp Ile Pro Leu
        195                 200                 205

Ile Leu Thr Asp Lys Leu Ser Lys Ser Lys Lys Val Glu Lys Ile Leu
    210                 215                 220

Gln Tyr Tyr Pro Lys Glu Lys Thr Thr Gly Cys Leu Ala Gln Phe Leu
225                 230                 235                 240

Lys Leu Ile Val Gly Asn Gln Gly Asn Phe Lys Gln Ala Phe His Leu
                245                 250                 255

Asp Glu Glu Val Lys Ile Gln Ile Ser Lys Glu Thr Tyr Glu Glu Asp
            260                 265                 270

Leu Glu Lys Leu Leu Arg Lys Ser Asn Glu Glu Met Ile Asp Val Phe
        275                 280                 285

Leu Gln Val Lys Lys Val Tyr Asp Ala Ile Leu Leu Ser Asp Ile Leu
    290                 295                 300

Ser Thr Lys Met Lys Asp Thr Lys Ala Lys Leu Ser Ala Gly Met Ile
305                 310                 315                 320

Glu Arg Tyr Gln Asn His Lys Lys Asp Leu Glu Glu Leu Lys Gln Phe
                325                 330                 335

Val Arg Ala His Leu His Glu Lys Val Thr Val Phe Phe Lys Asp Ser
            340                 345                 350
```

```
Ser Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Thr Thr Gln Ala
        355                 360                 365

Asp Phe Tyr Lys Phe Leu Lys Lys Glu Leu Thr Gly Val Pro Gly Ser
    370                 375                 380

Glu Pro Met Leu Ala Lys Ile Asp Gln Glu Asn Phe Leu Leu Lys Gln
385                 390                 395                 400

Arg Thr Pro Thr Asn Gly Val Ile Pro His Gln Val His Leu Thr Glu
                405                 410                 415

Phe Lys Ala Ile Ile Asp Gln Gln Lys Gln Tyr Tyr Pro Phe Leu Glu
            420                 425                 430

Lys Ser Lys Glu Lys Met Ile Gln Leu Leu Thr Phe Arg Ile Pro Tyr
        435                 440                 445

Tyr Val Gly Pro Leu Ala Gln Asp Lys Glu Thr Ser Ser Phe Ala Trp
    450                 455                 460

Leu Glu Arg Lys Thr Thr Glu Lys Ile Lys Pro Trp Asn Ala Lys Asp
465                 470                 475                 480

Val Ile Asp Tyr Gly Ala Ser Ala Thr Lys Phe Ile Gln Arg Met Ile
                485                 490                 495

Asn Tyr Asp Thr Tyr Leu Pro Thr Glu Lys Val Leu Pro Lys Tyr Ser
            500                 505                 510

Met Leu Tyr Gln Lys Tyr Thr Ile Phe Asn Glu Leu Thr Lys Val Ala
        515                 520                 525

Tyr Lys Asp Asp Arg Gly Ile Lys His Gln Phe Ser Ser Glu Glu Lys
    530                 535                 540

Leu Arg Ile Phe Gln Glu Leu Phe Lys Lys Gln Arg Arg Val Thr Lys
545                 550                 555                 560
```

```
Lys Lys Leu Gln His Phe Leu Ser Ala Asn Tyr Asn Ile Glu Asp Ala
                565                 570                 575

Glu Ile Leu Gly Val Asp Lys Val Phe Asn Ser Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Phe Leu Glu Leu Ala Lys Pro Tyr Glu Leu Leu Glu Gln Pro
        595                 600                 605

Glu Met Glu Glu Met Phe Glu Asp Ile Val Lys Ile Ile Thr Ile Phe
    610                 615                 620

Glu Asp Arg Glu Met Val Arg Thr Gln Leu Lys Lys Tyr Gln Arg Ile
625                 630                 635                 640

Leu Gly Glu Glu Ile Phe Lys Lys Leu Val Lys Lys Lys Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Lys Arg Leu Ile Asn Gly Ile Arg Asp Gln Lys
            660                 665                 670

Thr Asn Lys Thr Ile Leu Asp Tyr Leu Ile Asp Asp Asp Phe Pro Tyr
        675                 680                 685

Asn Arg Asn Arg Asn Phe Met Gln Leu Ile Asn Asp Asp His Leu Ser
    690                 695                 700

Phe Lys Glu Glu Ile Ala Lys Glu Leu Thr Leu Ser Asp Lys Gln Ser
705                 710                 715                 720

Leu Leu Glu Val Val Glu Ala Ile Pro Gly Ser Pro Ala Ile Lys Lys
                725                 730                 735

Gly Ile Trp Gln Thr Leu Lys Ile Val Glu Glu Leu Ile Ala Ile Ile
            740                 745                 750

Gly Tyr Lys Pro Lys Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln
        755                 760                 765
```

```
Thr Thr Thr Gly Gly Lys Asn Arg Ser Lys Pro Arg Leu Lys Ser Leu
    770                 775                 780

Glu Glu Ala Leu Lys Asn Phe Asp Ser Gln Leu Leu Lys Glu Arg Pro
785                 790                 795                 800

Val Asp Asn Gln Ser Leu Gln Lys Asp Arg Leu Tyr Leu Tyr Tyr Leu
                805                 810                 815

Gln Asn Gly Lys Asp Met Tyr Thr Gly Glu Ser Leu Asp Ile Asp Arg
            820                 825                 830

Leu Ser Glu Tyr Asp Ile Asp His Ile Ile Pro Arg Ser Phe Ile Val
        835                 840                 845

Asp His Ser Leu Asp Asn Lys Val Leu Val Ser Ser Lys Glu Asn Arg
    850                 855                 860

Leu Lys Lys Asp Asp Val Pro Asp Ser Lys Val Val Lys Arg Met Lys
865                 870                 875                 880

Ala Tyr Trp Glu Lys Leu Leu Arg Ala Asn Leu Ile Ser Glu Arg Lys
                885                 890                 895

Phe Ser Tyr Leu Thr Lys Leu Glu Leu Thr Asp Asp Asp Lys Ala Arg
            900                 905                 910

Phe Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His Val
        915                 920                 925

Ala Ala Ile Leu His Gln Tyr Phe Asn Gln Thr Gln Glu Leu Glu Lys
    930                 935                 940

Glu Lys Asp Ile Arg Ile Ile Thr Leu Lys Ser Ser Leu Val Ser Gln
945                 950                 955                 960

Phe Arg Gln Val Phe Gly Ile His Lys Val Arg Glu Ile Asn His His
                965                 970                 975
```

```
His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala Leu Ala Leu
            980                 985                 990


Leu Lys Lys Tyr Pro Arg Leu Ala  Pro Glu Phe Val Tyr  Gly Ser Phe
        995                 1000                1005


Ala Lys  Phe His Leu Val Lys  Glu Asn Lys Ala Thr  Ala Lys Lys
    1010                1015                1020


Glu Phe  Tyr Ser Asn Ile Leu  Lys Phe Phe Glu Lys  Glu Glu Gln
    1025                1030                1035


Phe Cys  Asp Glu Asn Gly Glu  Ile Phe Trp Asp Lys  Arg Lys His
    1040                1045                1050


Ile Gln  Gln Ile Lys Lys Val  Ile Ser Ser His Gln  Val Asn Ile
    1055                1060                1065


Val Lys  Lys Val Glu Val Gln  Thr Gly Ser Phe Tyr  Lys Glu Thr
    1070                1075                1080


Val Asn  Thr Lys Glu Lys Pro  Asp Lys Leu Ile Lys  Arg Lys Asn
    1085                1090                1095


Asn Trp  Asp Val Thr Lys Tyr  Gly Gly Phe Gly Ser  Pro Val Val
    1100                1105                1110


Ala Tyr  Ala Val Val Phe Thr  Tyr Glu Lys Gly Lys  Asn His Lys
    1115                1120                1125


Lys Ala  Lys Ala Ile Glu Gly  Ile Thr Ile Met Glu  Gln Ala Leu
    1130                1135                1140


Phe Glu  Lys Asp Pro Ile Ser  Phe Leu Ile Glu Lys  Gly Tyr Ser
    1145                1150                1155


Asn Val  Asn Gln Phe Ile Lys  Leu Pro Lys Tyr Thr  Leu Phe Glu
    1160                1165                1170
```

```
Leu Ala  Asn Gly Gln Arg Arg  Met Leu Ala Ser Gln  Glu Leu Gln
    1175                1180                1185


Lys Ala  Asn Ser Phe Ile Leu  Pro Glu Lys Leu Val  Thr Leu Leu
    1190                1195                1200


Tyr His  Ala Asn His Tyr Asp  Glu Ile Ala Tyr Lys  Asp Ser Tyr
    1205                1210                1215


Asp Tyr  Val Asn Glu His Phe  Ser Asn Phe Gln Asp  Ile Leu Asp
    1220                1225                1230


Lys Val  Ile Ile Phe Ala Glu  Lys Tyr Thr Ser Ala  Pro Gln Lys
    1235                1240                1245


Leu Asn  Gln Ile Ile Ala Thr  Tyr Glu Lys Asn Gln  Glu Ala Asp
    1250                1255                1260


Arg Lys  Ile Met Ala His Ser  Phe Val Asn Leu Met  Gln Phe Asn
    1265                1270                1275


Ala Leu  Gly Ala Pro Ala Asp  Phe Lys Phe Phe Asp  Thr Thr Ile
    1280                1285                1290


Thr Arg  Lys Arg Tyr Thr Ser  Leu Thr Glu Ile Trp  Gln Ser Thr
    1295                1300                1305


Ile Ile  Tyr Gln Ser Val Thr  Gly Leu Tyr Glu Thr  Arg Arg Arg
    1310                1315                1320


Met Ala  Asp Leu Trp Asp Gly  Val Gln
    1325                1330


<210>  325
<211>  1359
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide
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<400> 325

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Ala Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30

Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
```

195 200 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
210 215 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225 230 235 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
245 250 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
260 265 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
275 280 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
290 295 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305 310 315 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
325 330 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
340 345 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
355 360 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
370 375 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385 390 395 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly

405 410 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
420 425 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
435 440 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
450 455 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465 470 475 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
485 490 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
500 505 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
515 520 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
530 535 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545 550 555 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
565 570 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
580 585 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
595 600 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu

610 615 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625 630 635 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
645 650 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
660 665 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
675 680 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
690 695 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705 710 715 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
725 730 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
740 745 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
755 760 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
770 775 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785 790 795 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
805 810 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser

```
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
```

```
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
```

1220 1225 1230

Glu Lys Leu Lys Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu
1235 1240 1245

Phe Val Glu Gln His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln
1250 1255 1260

Ile Ser Glu Phe Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu
1265 1270 1275

Asp Lys Val Leu Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile
1280 1285 1290

Arg Glu Gln Ala Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn
1295 1300 1305

Leu Gly Ala Pro Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp
1310 1315 1320

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp
1355

<210> 326
<211> 1300
<212> PRT
<213> Kandleria vitulina

<400> 326

Asn Asn Lys Ile Tyr Asn Ile Gly Leu Asp Ile Gly Asp Ala Ser Val
1 5 10 15

Gly Trp Ala Val Val Asp Glu His Tyr Asn Leu Leu Lys Arg His Gly
20 25 30

```
Lys His Met Trp Gly Ser Arg Leu Phe Thr Gln Ala Asn Thr Ala Val
        35                  40                  45

Glu Arg Arg Ser Ser Arg Ser Thr Arg Arg Arg Tyr Asn Lys Arg Arg
    50                  55                  60

Glu Arg Ile Arg Leu Leu Arg Gly Ile Met Glu Asp Met Val Leu Asp
65                  70                  75                  80

Val Asp Pro Thr Phe Phe Ile Arg Leu Ala Asn Val Ser Phe Leu Asp
                85                  90                  95

Gln Glu Asp Lys Lys Asp Tyr Leu Lys Ser Asn Tyr Asn Leu Phe Ile
            100                 105                 110

Asp Lys Asp Phe Asn Asp Lys Thr Tyr Tyr Asp Lys Tyr Pro Thr Ile
        115                 120                 125

Tyr His Leu Arg Lys His Leu Cys Glu Ser Lys Glu Lys Glu Asp Pro
    130                 135                 140

Arg Leu Ile Tyr Leu Ala Leu His His Ile Val Lys Tyr Arg Gly Asn
145                 150                 155                 160

Phe Leu Tyr Glu Gly Gln Lys Phe Ser Met Asp Val Ser Asn Ile Glu
                165                 170                 175

Asp Lys Met Ile Asp Val Leu Arg Gln Phe Asn Glu Ile Asn Leu Phe
            180                 185                 190

Glu Tyr Val Glu Asp Lys Lys Ile Asp Glu Val Leu Asn Val Leu Lys
        195                 200                 205

Glu Pro Leu Ser Lys Lys His Lys Ala Asp Lys Ala Phe Ala Leu Phe
    210                 215                 220

Asp Thr Thr Lys Asp Asn Lys Ala Ala Tyr Lys Glu Leu Cys Ala Ala
225                 230                 235                 240
```

```
Leu Ala Gly Asn Lys Phe Asn Val Thr Lys Met Leu Lys Glu Ala Glu
                245                 250                 255

Leu His Asp Glu Asp Glu Lys Asp Ile Ser Phe Lys Phe Ser Asp Ala
            260                 265                 270

Thr Phe Asp Asp Ala Phe Val Glu Lys Gln Pro Leu Leu Gly Asp Cys
        275                 280                 285

Val Glu Phe Ile Asp Leu Leu His Asp Ile Tyr Ser Trp Val Glu Leu
    290                 295                 300

Gln Asn Ile Leu Gly Ser Ala His Thr Ser Glu Pro Ser Ile Ser Ala
305                 310                 315                 320

Ala Met Ile Gln Arg Tyr Glu Asp His Lys Asn Asp Leu Lys Leu Leu
                325                 330                 335

Lys Asp Val Ile Arg Lys Tyr Leu Pro Lys Lys Tyr Phe Glu Val Phe
            340                 345                 350

Arg Asp Glu Lys Ser Lys Lys Asn Asn Tyr Cys Asn Tyr Ile Asn His
        355                 360                 365

Lys Thr Pro Val Asp Glu Phe Tyr Lys Tyr Ile Lys Lys Leu Ile Glu
    370                 375                 380

Lys Ile Asp Asp Pro Asp Val Lys Thr Ile Leu Asn Lys Ile Glu Leu
385                 390                 395                 400

Glu Ser Phe Met Leu Lys Gln Asn Ser Arg Thr Asn Gly Ala Val Pro
                405                 410                 415

Tyr Gln Met Gln Leu Asp Glu Leu Asn Lys Ile Leu Glu Asn Gln Ser
            420                 425                 430

Val Tyr Tyr Ser Asp Leu Lys Asp Asn Glu Asp Lys Ile Arg Ser Ile
        435                 440                 445
```

```
Leu Thr Phe Arg Ile Pro Tyr Tyr Phe Gly Pro Leu Ile Thr Lys Asp
    450                 455                 460

Arg Gln Phe Asp Trp Ile Ile Lys Lys Glu Gly Lys Glu Asn Glu Arg
465                 470                 475                 480

Ile Leu Pro Trp Asn Ala Asn Glu Ile Val Asp Val Asp Lys Thr Ala
                485                 490                 495

Asp Glu Phe Ile Lys Arg Met Arg Asn Phe Cys Thr Tyr Phe Pro Asp
            500                 505                 510

Glu Pro Val Leu Ala Lys Asn Ser Leu Thr Val Ser Lys Tyr Glu Val
        515                 520                 525

Leu Asn Glu Ile Asn Lys Leu Arg Ile Asn Asp His Leu Ile Lys Arg
    530                 535                 540

Asp Ile Lys Asp Lys Met Leu His Thr Leu Phe Met Asp His Lys Ser
545                 550                 555                 560

Ile Ser Ala Asn Ala Met Lys Lys Trp Leu Val Lys Asn Gln Tyr Phe
                565                 570                 575

Ser Asn Thr Asp Asp Ile Lys Ile Glu Gly Phe Gln Lys Glu Asn Ala
            580                 585                 590

Cys Ser Thr Ser Leu Thr Pro Trp Ile Asp Phe Thr Lys Ile Phe Gly
        595                 600                 605

Glu Ile Asn Asn Ser Asn Tyr Glu Leu Ile Glu Lys Ile Ile Tyr Asp
    610                 615                 620

Val Thr Val Phe Glu Asp Lys Lys Ile Leu Arg Arg Arg Leu Lys Lys
625                 630                 635                 640

Glu Tyr Asp Leu Asp Glu Glu Lys Ile Lys Lys Ile Leu Lys Leu Lys
                645                 650                 655
```

```
Tyr Ser Gly Trp Ser Arg Leu Ser Lys Lys Leu Leu Ser Gly Ile Lys
            660                 665                 670

Thr Lys Arg Thr Pro Glu Thr Val Leu Glu Val Met Glu Thr Asn Met
        675                 680                 685

Asn Leu Met Gln Val Ile Asn Asp Glu Lys Leu Gly Phe Lys Lys Thr
    690                 695                 700

Ile Asp Asp Ala Asn Ser Thr Ser Val Ser Gly Lys Phe Ser Tyr Ala
705                 710                 715                 720

Glu Val Gln Glu Leu Ala Gly Ser Pro Ala Ile Lys Arg Gly Ile Trp
                725                 730                 735

Gln Ala Leu Leu Ile Val Asp Glu Ile Lys Lys Ile Met Lys His Glu
            740                 745                 750

Pro Ala His Val Tyr Ile Glu Phe Ala Arg Asn Glu Asp Lys Glu Arg
        755                 760                 765

Lys Asp Ser Phe Val Asn Gln Met Leu Lys Leu Tyr Lys Asp Phe Glu
    770                 775                 780

Asp Glu Ala Asn Lys His Leu Lys Gly Glu Asp Ala Lys Ser Lys Ile
785                 790                 795                 800

Arg Ser Glu Arg Leu Lys Leu Tyr Tyr Thr Gln Met Gly Lys Cys Met
                805                 810                 815

Tyr Thr Gly Lys Ser Leu Asp Ile Asp Arg Leu Asp Thr Tyr Gln Val
            820                 825                 830

Asp His Ile Val Pro Gln Ser Leu Leu Lys Asp Asp Ser Ile Asp Asn
        835                 840                 845

Lys Val Leu Val Leu Ser Ser Glu Asn Gln Arg Lys Leu Asp Asp Leu
    850                 855                 860
```

```
Val Ile Pro Glu Met Ile Arg Asn Lys Met Phe Gly Phe Trp Asn Lys
865                 870                 875                 880

Leu Tyr Glu Asn Lys Ile Ile Ser Pro Lys Lys Phe Tyr Ser Leu Ile
                885                 890                 895

Lys Ser Glu Tyr Ser Asp Lys Asp Lys Glu Arg Phe Ile Asn Arg Gln
            900                 905                 910

Ile Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln Ile Ile Ser
        915                 920                 925

Asn His Tyr Glu Thr Thr Lys Val Val Thr Val Arg Ala Asp Leu Ser
    930                 935                 940

His Ala Phe Arg Glu Arg Tyr His Ile Tyr Lys Asn Arg Asp Ile Asn
945                 950                 955                 960

Asp Phe His His Ala His Asp Ala Tyr Ile Ala Thr Ile Leu Gly Thr
                965                 970                 975

Tyr Ile Gly His Arg Phe Glu Ser Leu Asp Ala Lys Tyr Ile Tyr Gly
            980                 985                 990

Glu Tyr Gln Lys Ile Phe Arg Asn  Lys Asn Lys Asp Lys  Lys Asp Gly
        995                 1000                1005

Phe Ile  Leu Asn Ser Met Arg  Asn Leu Tyr Ala Asp  Lys Asp Thr
    1010                1015                1020

Gly Glu  Val Val Trp Asp Pro  Glu Trp Ile Ser Arg  Ile Lys Lys
    1025                1030                1035

Cys Phe  Tyr Tyr Lys Asp Cys  Phe Val Thr Lys Lys  Leu Glu Glu
    1040                1045                1050

Asn Asn  Gly Ser Phe Phe Asn  Thr Val Arg Pro Asn  Asp Glu His
    1055                1060                1065
```

```
Ser Glu  Lys Gly Ala Lys Val  Pro Val Asn Lys Leu  Arg Ser Asn
    1070                1075                1080

Val His  Lys Tyr Gly Gly Phe  Glu Gly Leu Lys Tyr  Ser Ile Val
    1085                1090                1095

Ala Ile  Lys Gly Lys Lys Lys  Lys Gly Lys Lys Ile  Ile Asp Val
    1100                1105                1110

Asn Lys  Leu Val Gly Ile Pro  Leu Met Tyr Lys Asn  Val Asp Asp
    1115                1120                1125

Glu Thr  Lys Ile Asn Tyr Ile  Lys Glu Ser Glu Gly  Leu Glu Glu
    1130                1135                1140

Val Lys  Ile Ile Lys Glu Ile  Leu Lys Asn Gln Leu  Ile Glu Ile
    1145                1150                1155

Asn Gly  Gly Leu Phe Tyr Val  Thr Ser Glu Ile Val  Asn Ala Arg
    1160                1165                1170

Gln Leu  Ile Leu Asp Phe Asn  Cys Thr Arg Ile Ile  Asp Gly Ile
    1175                1180                1185

Tyr Lys  Ala Met Lys Tyr Lys  Asn Tyr Ser Glu Leu  Ser Gln Glu
    1190                1195                1200

Glu Ile  Met Asn Val Tyr Asp  Ile Phe Val Glu Lys  Leu Lys Leu
    1205                1210                1215

Tyr Tyr  Pro Thr Tyr Lys Asn  Ile Ala Thr Asn Phe  Glu Asn Phe
    1220                1225                1230

Glu Asn  Ile Ser Asp Glu Glu  Lys Cys Glu Val Ile  Gln Met Leu
    1235                1240                1245

Val Val  Met His Ala Gly Pro  Gln Asn Gly Asn Ile  Thr Phe Asp
    1250                1255                1260
```

```
Asp Phe  Lys Leu Ser Asn Arg  Leu Gly Arg Leu Asn  Cys Lys Thr
    1265                 1270                 1275


Ile Ser  Leu Thr Thr Val Phe  Ile Ala Asp Ser Pro  Thr Gly Met
    1280                 1285                 1290


Tyr Ser  Lys Lys Tyr Lys Leu
    1295                 1300
```

<210> 327
<211> 1301
<212> PRT
<213> Kandleria vitulina

<400> 327

```
Asn Asn Lys Ile Tyr Asn Ile Gly Leu Asp Ile Gly Asp Ala Ser Val
1               5                   10                  15


Gly Trp Ala Val Val Asp Glu His Tyr Asn Leu Leu Lys Arg His Gly
            20                  25                  30


Lys His Met Trp Gly Ser Arg Leu Phe Thr Gln Ala Asn Thr Ala Val
        35                  40                  45


Glu Arg Arg Ser Ser Arg Ser Thr Arg Arg Arg Tyr Asn Lys Arg Arg
    50                  55                  60


Glu Arg Ile Arg Leu Leu Arg Glu Ile Met Glu Asp Met Val Leu Asp
65                  70                  75                  80


Val Asp Pro Thr Phe Phe Ile Arg Leu Ala Asn Val Ser Phe Leu Asp
                85                  90                  95


Gln Glu Asp Lys Lys Asp Tyr Leu Lys Ser Asn Tyr Asn Leu Phe Ile
            100                 105                 110


Asp Lys Asp Phe Asn Asp Lys Thr Tyr Tyr Asp Lys Tyr Pro Thr Ile
        115                 120                 125
```

```
Tyr His Leu Arg Lys His Leu Cys Glu Ser Lys Glu Lys Glu Asp Pro
    130                 135                 140

Arg Leu Ile Tyr Leu Ala Leu His His Ile Val Lys Tyr Arg Gly Asn
145                 150                 155                 160

Phe Leu Tyr Glu Gly Gln Lys Phe Ser Met Asp Val Ser Asn Ile Glu
                165                 170                 175

Asp Lys Met Ile Asp Val Leu Arg Gln Phe Asn Glu Ile Asn Leu Phe
            180                 185                 190

Glu Tyr Val Glu Asp Lys Lys Ile Asp Glu Val Leu Asn Val Leu Lys
        195                 200                 205

Glu Pro Leu Ser Lys Lys His Lys Ala Glu Lys Ala Phe Ala Leu Phe
    210                 215                 220

Asp Thr Thr Lys Asp Asn Lys Ala Ala Tyr Lys Glu Leu Cys Ala Ala
225                 230                 235                 240

Leu Ala Gly Asn Lys Phe Asn Val Thr Lys Met Leu Lys Glu Ala Glu
                245                 250                 255

Leu His Asp Glu Asp Glu Lys Asp Ile Ser Phe Lys Phe Ser Asp Ala
            260                 265                 270

Thr Phe Asp Asp Ala Phe Val Glu Lys Gln Pro Leu Leu Gly Asp Cys
        275                 280                 285

Val Glu Phe Ile Asp Leu Leu His Asp Ile Tyr Ser Trp Val Glu Leu
    290                 295                 300

Gln Asn Ile Leu Gly Ser Ala His Thr Ser Glu Pro Ser Ile Ser Ala
305                 310                 315                 320

Ala Met Ile Gln Arg Tyr Glu Asp His Lys Asn Asp Leu Lys Leu Leu
                325                 330                 335
```

```
Lys Asp Val Ile Arg Lys Tyr Leu Pro Lys Lys Tyr Phe Glu Val Phe
            340                 345                 350

Arg Asp Glu Lys Ser Lys Lys Asn Asn Tyr Cys Asn Tyr Ile Asn His
        355                 360                 365

Lys Thr Pro Val Asp Glu Phe Tyr Lys Tyr Ile Lys Lys Leu Ile Glu
    370                 375                 380

Lys Ile Asp Asp Pro Asp Val Lys Thr Ile Leu Asn Lys Ile Glu Leu
385                 390                 395                 400

Glu Ser Phe Met Leu Lys Gln Asn Ser Arg Thr Asn Gly Ala Val Pro
                405                 410                 415

Tyr Gln Met Gln Leu Asp Glu Leu Asn Lys Ile Leu Glu Asn Gln Ser
            420                 425                 430

Val Tyr Tyr Ser Asp Leu Lys Asp Asn Glu Asp Lys Ile Arg Ser Ile
        435                 440                 445

Leu Thr Phe Arg Ile Pro Tyr Tyr Phe Gly Pro Leu Ile Thr Lys Asp
    450                 455                 460

Arg Gln Phe Asp Trp Ile Ile Lys Lys Glu Gly Lys Glu Asn Glu Arg
465                 470                 475                 480

Ile Leu Pro Trp Asn Ala Asn Glu Ile Val Asp Val Asp Lys Thr Ala
                485                 490                 495

Asp Glu Phe Ile Lys Arg Met Arg Asn Phe Cys Thr Tyr Phe Pro Asp
            500                 505                 510

Glu Pro Val Met Ala Lys Asn Ser Leu Thr Val Ser Lys Tyr Glu Val
        515                 520                 525

Leu Asn Glu Ile Asn Lys Leu Arg Ile Asn Asp His Leu Ile Lys Arg
    530                 535                 540
```

```
Asp Met Lys Asp Lys Met Leu His Thr Leu Phe Met Asp His Lys Ser
545                 550                 555                 560

Ile Ser Ala Asn Ala Met Lys Lys Trp Leu Val Lys Asn Gln Tyr Phe
                565                 570                 575

Ser Asn Thr Asp Asp Ile Lys Ile Glu Gly Phe Gln Lys Glu Asn Ala
            580                 585                 590

Cys Ser Thr Ser Leu Thr Pro Trp Ile Asp Phe Thr Lys Ile Phe Gly
        595                 600                 605

Lys Ile Asn Glu Ser Asn Tyr Asp Phe Ile Glu Lys Ile Ile Tyr Asp
    610                 615                 620

Val Thr Val Phe Glu Asp Lys Lys Ile Leu Arg Arg Arg Leu Lys Lys
625                 630                 635                 640

Glu Tyr Asp Leu Asp Glu Glu Lys Ile Lys Lys Ile Leu Lys Leu Lys
                645                 650                 655

Tyr Ser Gly Trp Ser Arg Leu Ser Lys Lys Leu Leu Ser Gly Ile Lys
            660                 665                 670

Thr Lys Arg Thr Pro Glu Thr Val Leu Glu Val Met Glu Thr Asn Met
        675                 680                 685

Asn Leu Met Gln Val Ile Asn Asp Glu Lys Leu Gly Phe Lys Lys Thr
    690                 695                 700

Ile Asp Asp Ala Asn Ser Thr Ser Val Ser Gly Lys Phe Ser Tyr Ala
705                 710                 715                 720

Glu Val Gln Glu Leu Ala Gly Ser Pro Ala Ile Lys Arg Gly Ile Trp
                725                 730                 735

Gln Ala Leu Leu Ile Val Asp Glu Ile Lys Lys Ile Met Lys His Glu
            740                 745                 750
```

```
Pro Ala His Val Tyr Ile Glu Phe Ala Arg Asn Glu Asp Lys Glu Arg
        755                 760                 765

Lys Asp Ser Phe Val Asn Gln Met Leu Lys Leu Tyr Lys Asp Phe Glu
    770                 775                 780

Asp Glu Ala Asn Lys His Leu Lys Gly Glu Asp Ala Lys Ser Lys Ile
785                 790                 795                 800

Arg Ser Glu Arg Leu Lys Leu Tyr Tyr Thr Gln Met Gly Lys Cys Met
                805                 810                 815

Tyr Thr Gly Lys Ser Leu Asp Ile Asp Arg Leu Asp Thr Tyr Gln Val
            820                 825                 830

Asp His Ile Val Pro Gln Ser Leu Leu Lys Asp Asp Ser Ile Asp Asn
        835                 840                 845

Lys Val Leu Val Leu Ser Ser Glu Asn Gln Arg Lys Leu Asp Asp Leu
    850                 855                 860

Val Ile Pro Ser Ser Ile Arg Asn Lys Met Tyr Gly Phe Trp Glu Lys
865                 870                 875                 880

Leu Phe Asn Asn Lys Ile Ile Ser Pro Lys Lys Phe Tyr Ser Leu Ile
                885                 890                 895

Lys Thr Glu Phe Asn Glu Lys Asp Gln Glu Arg Phe Ile Asn Arg Gln
            900                 905                 910

Ile Val Glu Thr Arg Gln Ile Thr Lys His Val Ala Gln Ile Ile Asp
        915                 920                 925

Asn His Tyr Glu Asn Thr Lys Val Val Thr Val Arg Ala Asp Leu Ser
    930                 935                 940

His Gln Phe Arg Glu Arg Tyr His Ile Tyr Lys Asn Arg Asp Ile Asn
945                 950                 955                 960
```

```
Asp Phe His His Ala His Asp Ala Tyr Ile Ala Thr Ile Leu Gly Thr
               965                 970                 975

Tyr Ile Gly His Arg Phe Glu Ser Leu Asp Ala Lys Tyr Ile Tyr Gly
           980                 985                 990

Glu Tyr Lys Arg Ile Phe Arg Gln  Lys Asn Lys Gly Lys  Asn Asp Gly
        995                1000                1005

Phe Ile  Leu Asn Ser Met Arg  Asn Ile Tyr Ala Asp  Lys Asp Thr
    1010                1015                1020

Gly Glu  Ile Val Trp Asp Pro  Asn Tyr Ile Asp Arg  Ile Lys Lys
    1025                1030                1035

Cys Phe  Tyr Tyr Lys Asp Cys  Phe Val Thr Lys Lys  Leu Glu Glu
    1040                1045                1050

Asn Asn  Gly Thr Phe Phe Asn  Thr Val Leu Pro Asn  Asp Thr Asn
    1055                1060                1065

Ser Asp  Lys Asp Ala Thr Val  Pro Val Asn Lys Tyr  Arg Ser Asn
    1070                1075                1080

Val Asn  Lys Tyr Gly Gly Phe  Ser Gly Val Asn Ser  Phe Ile Val
    1085                1090                1095

Ala Ile  Lys Gly Lys Lys Lys  Lys Gly Lys Lys Val  Ile Glu Val
    1100                1105                1110

Asn Lys  Leu Thr Gly Ile Pro  Leu Met Tyr Lys Asn  Ala Asp Glu
    1115                1120                1125

Glu Ile  Lys Ile Asn Tyr Leu  Lys Gln Ala Glu Asp  Leu Glu Glu
    1130                1135                1140

Val Gln  Ile Gly Lys Glu Ile  Leu Lys Asn Gln Leu  Ile Glu Lys
    1145                1150                1155
```

```
Asp Gly  Gly Leu Tyr Tyr Ile  Val Ala Glu Ile Ile  Asn Ala Lys
    1160                1165                1170


Gln Leu  Ile Leu Asn Glu Ser  Gln Thr Lys Leu Val  Cys Glu Ile
    1175                1180                1185


Tyr Lys  Ala Met Lys Tyr Lys  Asn Tyr Asp Asn Leu  Asp Ser Glu
    1190                1195                1200


Lys Ile  Ile Asp Leu Tyr Arg  Leu Leu Ile Asn Lys  Met Glu Leu
    1205                1210                1215


Tyr Tyr  Pro Glu Tyr Arg Lys  Gln Leu Val Lys Lys  Phe Glu Asp
    1220                1225                1230


Leu Lys  Val Ile Ser Ile Glu  Glu Lys Cys Asn Ile  Ile Gln Ile
    1235                1240                1245


Leu Ala  Thr Leu His Cys Asn  Ser Ser Ile Gly Lys  Ile Met Tyr
    1250                1255                1260


Ser Asp  Phe Lys Ile Ser Thr  Thr Ile Gly Arg Leu  Asn Gly Arg
    1265                1270                1275


Thr Ile  Ser Leu Asp Ile Ser  Phe Ile Ala Glu Ser  Pro Thr Gly
    1280                1285                1290


Met Tyr  Ser Lys Lys Tyr Lys  Leu
    1295                1300


<210>  328
<211>  1304
<212>  PRT
<213>  Lactobacillus animalis

<400>  328

Leu Lys Lys Asp Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15
```

```
Gly His Ala Val Val Thr Asp Asp Tyr Lys Val Pro Thr Lys Lys Met
            20                  25                  30

Lys Val Phe Gly Asp Thr Ser Lys Lys Thr Ile Lys Lys Asn Met Leu
        35                  40                  45

Gly Val Leu Leu Phe Asn Glu Gly Gln Thr Ala Ala Asp Thr Arg Leu
    50                  55                  60

Lys Arg Gly Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Leu Arg
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Pro Ala Leu Ala Lys Val Asp Pro Asn
                85                  90                  95

Phe Phe Tyr Arg Leu Glu Glu Ser Ser Leu Val Ala Glu Asp Lys Lys
            100                 105                 110

Tyr Asp Val Tyr Pro Ile Phe Gly Lys Arg Glu Glu Glu Leu Leu Tyr
        115                 120                 125

His Asp Thr His Lys Thr Ile Tyr His Leu Arg Ser Glu Leu Ala Asn
    130                 135                 140

Asn Asp Arg Pro Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Leu Glu Gly Glu Ile Asp Leu
                165                 170                 175

Arg Thr Thr Asp Ile Asn Lys Val Phe Ala Glu Phe Ser Glu Thr Leu
            180                 185                 190

Asn Glu Asn Ser Asp Glu Asn Leu Gly Lys Leu Asp Val Ala Asp Ile
        195                 200                 205

Phe Lys Asp Asn Thr Phe Ser Lys Thr Lys Lys Ser Glu Glu Leu Leu
    210                 215                 220
```

```
Lys Leu Ser Gly Lys Lys Asn Gln Leu Ala His Gln Leu Phe Lys Met
225                 230                 235                 240


Met Val Gly Asn Met Gly Ser Phe Lys Lys Val Leu Gly Thr Asp Glu
                245                 250                 255


Glu His Lys Leu Ser Phe Gly Lys Asp Thr Tyr Glu Asp Asp Leu Asn
            260                 265                 270


Asp Leu Leu Ala Glu Ala Gly Asp Gln Tyr Leu Asp Ile Phe Val Ala
        275                 280                 285


Ala Lys Lys Val Tyr Asp Ala Ala Ile Leu Ala Ser Ile Leu Asp Val
    290                 295                 300


Lys Asp Thr Gln Thr Lys Thr Val Phe Ser Gln Ala Met Ile Glu Arg
305                 310                 315                 320


Tyr Glu Glu His Gln Lys Asp Leu Ile Glu Leu Lys Arg Val Phe Lys
                325                 330                 335


Lys Tyr Leu Pro Glu Lys Cys His Asp Phe Phe Ser Glu Pro Lys Ile
            340                 345                 350


Ser Gly Tyr Ala Gly Tyr Ile Asp Gly Lys Val Ser Glu Glu Asp Phe
        355                 360                 365


Tyr Lys Tyr Thr Lys Lys Thr Leu Lys Gly Ile Pro Glu Thr Glu Glu
    370                 375                 380


Ile Leu Gln Lys Ile Asp Ala Asn Asn Tyr Leu Arg Lys Gln Arg Thr
385                 390                 395                 400


Phe Asp Asn Gly Ala Ile Pro His Gln Val His Leu Lys Glu Leu Val
                405                 410                 415


Ala Ile Val Glu Asn Gln Gly Lys Tyr Tyr Pro Phe Leu Arg Glu Asn
            420                 425                 430
```

```
Lys Asp Lys Phe Glu Lys Ile Leu Asn Phe Arg Ile Pro Tyr Tyr Val
        435                 440                 445

Gly Pro Leu Ala Arg Gly Asn Ser Lys Phe Ala Trp Leu Thr Arg Ala
    450                 455                 460

Gly Glu Gly Lys Ile Thr Pro Tyr Asn Phe Asp Glu Met Ile Asp Lys
465                 470                 475                 480

Glu Thr Ser Ala Glu Asp Phe Ile Lys Arg Met Thr Ile Asn Asp Leu
                485                 490                 495

Tyr Leu Pro Thr Glu Pro Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            500                 505                 510

Arg Tyr Thr Ile Phe Asn Glu Leu Ala Gly Val Arg Tyr Val Thr Glu
        515                 520                 525

Asn Gly Glu Ala Lys Tyr Phe Asp Ala Gln Thr Lys Arg Ser Ile Phe
    530                 535                 540

Glu Leu Phe Lys Leu Asp Arg Lys Val Ser Glu Lys Met Val Ile Lys
545                 550                 555                 560

His Leu Lys Val Val Met Pro Ala Ile Arg Ile Gln Ala Leu Lys Gly
                565                 570                 575

Leu Asp Asn Gly Lys Phe Asn Ala Ser Tyr Gly Thr Tyr Lys Asp Leu
            580                 585                 590

Val Asp Met Gly Val Ala Pro Glu Leu Leu Asn Asp Glu Val Asn Ser
        595                 600                 605

Glu Lys Trp Glu Asp Ile Ile Lys Thr Leu Thr Ile Phe Glu Gly Arg
    610                 615                 620

Lys Leu Ile Lys Arg Arg Leu Glu Asn Tyr Arg Asp Phe Leu Gly Glu
625                 630                 635                 640
```

```
Asp Ile Leu Arg Lys Leu Ser Arg Lys Lys Tyr Thr Gly Trp Gly Arg
                645                 650                 655

Leu Ser Ala Lys Leu Leu Asp Gly Ile Tyr Asp Lys Lys Thr His Lys
            660                 665                 670

Thr Ile Leu Asp Cys Leu Met Glu Asp Tyr Ser Gln Asn Phe Met Gln
        675                 680                 685

Leu Ile Asn Asp Asp Thr Tyr Ser Phe Lys Glu Thr Ile Lys Asn Ala
    690                 695                 700

Gln Val Ile Glu Lys Glu Glu Thr Leu Ala Lys Thr Val Gln Glu Leu
705                 710                 715                 720

Pro Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln Ser Leu Glu Ile
                725                 730                 735

Val Asp Glu Ile Ile Lys Val Met Gly Tyr Lys Pro Lys Ser Ile Val
            740                 745                 750

Val Glu Met Ala Arg Glu Thr Gln Thr His Gly Thr Arg Lys Arg Glu
        755                 760                 765

Asp Arg Val Gln Gln Ile Val Lys Asn Leu Lys Glu Leu Pro Lys Pro
    770                 775                 780

Ser Asn Ala Glu Leu Ser Asp Glu Arg Lys Tyr Leu Tyr Cys Leu Gln
785                 790                 795                 800

Asn Gly Arg Asp Met Tyr Thr Gly Ala Pro Leu Asp Tyr Asp His Leu
                805                 810                 815

Gln Phe Tyr Asp Val Asp His Ile Ile Pro Gln Ser Phe Leu Lys Asp
            820                 825                 830

Asp Ser Ile Glu Asn Lys Val Leu Thr Ile Lys Lys Glu Asn Val Arg
        835                 840                 845
```

```
Lys Thr Asn Gly Leu Pro Ser Glu Ala Val Ile Gln Lys Met Gly Ser
    850                 855                 860

Phe Trp Lys Lys Leu Leu Asp Ala Gly Ala Met Thr Asn Lys Lys Tyr
865                 870                 875                 880

Asp Asn Leu Arg Arg Asn Leu His Gly Gly Leu Asn Glu Lys Leu Lys
                885                 890                 895

Glu Arg Phe Ile Glu Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys
            900                 905                 910

Tyr Val Ala Gln Leu Leu Asp Gln Arg Leu Asn Tyr Asp Gly Asn Gly
        915                 920                 925

Val Glu Leu Asp Glu Lys Ile Ala Ile Val Thr Leu Lys Ala Gln Leu
    930                 935                 940

Ala Ser Gln Phe Arg Ser Glu Phe Lys Leu Arg Lys Val Arg Ala Leu
945                 950                 955                 960

Asn Asn Leu His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Ala
                965                 970                 975

Asn Leu Ile Met Ala Lys Tyr Pro Glu Leu Glu Pro Glu Phe Val Tyr
            980                 985                 990

Gly Lys Tyr Arg Lys Thr Lys Phe  Lys Gly Leu Gly Lys  Ala Thr Ala
        995                 1000                1005

Lys Asn  Thr Leu Tyr Ala Asn  Val Leu Tyr Phe Leu  Lys Glu Asn
    1010                1015                1020

Glu Val  Tyr Pro Phe Trp Asp  Lys Ala Arg Asp Leu  Pro Thr Ile
    1025                1030                1035

Lys Arg  Tyr Leu Tyr Arg Ala  Gln Val Asn Lys Val  Arg Lys Ala
    1040                1045                1050
```

```
Glu Arg  Gln Thr Gly Gly Phe  Ser Asp Glu Met Leu  Val Pro Lys
    1055                1060                1065

Ser Asp  Ser Gly Lys Leu Leu  Pro Arg Lys Glu Gly  Leu Asp Pro
    1070                1075                1080

Val Lys  Tyr Gly Gly Tyr Ala  Lys Ala Val Glu Ser  Tyr Ala Val
    1085                1090                1095

Leu Ile  Thr Ala Asp Glu Val  Lys Lys Gly Lys Thr  Lys Lys Val
    1100                1105                1110

Lys Thr  Leu Val Asn Ile Pro  Ile Ile Asp Ser Lys  Lys Tyr Glu
    1115                1120                1125

Ala Asp  Pro Thr Ala Tyr Leu  Ala Ser Arg Gly Tyr  Thr Asn Val
    1130                1135                1140

Thr Asn  Ser Phe Ile Leu Pro  Lys Tyr Ser Leu Leu  Glu Asp Pro
    1145                1150                1155

Glu Gly  Arg Arg Arg Tyr Leu  Ala Ser Lys Glu Phe  Gln Lys Ala
    1160                1165                1170

Asn Glu  Leu Ile Leu Pro Gln  His Leu Val Glu Leu  Leu Tyr Trp
    1175                1180                1185

Val Asn  Ala Lys Asp Gly Glu  Gln Lys Leu Glu Asp  His Lys Ala
    1190                1195                1200

Glu Phe  Lys Glu Leu Phe Asp  Lys Ile Met Glu Phe  Ala Asp Lys
    1205                1210                1215

Tyr Val  Val Ala Pro Lys Asn  Ser Glu Lys Ile Arg  Arg Leu Tyr
    1220                1225                1230

Glu Glu  Asn Gln Asp Ala Thr  Pro Met Glu Leu Gly  Lys Asn Phe
    1235                1240                1245
```

```
Val Glu  Leu Leu Arg Tyr Thr  Ala Asp Gly Ala Ala  Ser Asp Phe
    1250                1255                1260


Lys Phe  Phe Gly Glu Asn Ile  Pro Arg Lys Arg Tyr  Asn Ser Ala
    1265                1270                1275


Gly Ser  Leu Leu Asn Gly Thr  Leu Ile Tyr Gln Ser  Lys Thr Gly
    1280                1285                1290


Leu Tyr  Glu Thr Arg Ile Asp  Leu Gly Lys Leu
    1295                1300
```

<210> 329
<211> 1292
<212> PRT
<213> Lactobacillus curvatus

<400> 329

```
Met Ser Arg Pro Tyr Asn Ile Gly Leu Asp Ile Gly Thr Ser Ser Ile
1               5                   10                  15


Gly Trp Ser Val Val Asp Asp Gln Ser Lys Leu Val Ser Val Arg Gly
            20                  25                  30


Lys Tyr Gly Tyr Gly Val Arg Leu Tyr Asp Glu Gly Gln Thr Ala Ala
        35                  40                  45


Glu Arg Arg Ser Phe Arg Thr Thr Arg Arg Arg Leu Lys Arg Arg Lys
    50                  55                  60


Trp Arg Leu Gly Leu Leu Arg Glu Ile Phe Glu Pro Tyr Ile Thr Pro
65                  70                  75                  80


Val Asp Asp Thr Phe Phe Leu Arg Lys Lys Gln Ser Asn Leu Ser Pro
                85                  90                  95


Lys Asp Gln Arg Lys Gln Thr Ser Leu Phe Asn Asp Arg Thr Asp Arg
            100                 105                 110


Ala Phe Tyr Asp Asp Tyr Pro Thr Ile Tyr His Leu Arg Tyr Lys Leu
```

115 120 125

Met Thr Glu Lys Arg Gln Phe Asp Ile Arg Glu Ile Tyr Leu Ala Met
130 135 140

His His Ile Val Lys Tyr Arg Gly His Phe Leu Asn Glu Ala Pro Val
145 150 155 160

Ser Ser Phe Lys Ser Ser Glu Ile Asn Leu Val Ala His Phe Asp Arg
165 170 175

Leu Asn Thr Ile Phe Ala Asp Leu Phe Ser Glu Ser Gly Phe Thr Asp
180 185 190

Lys Leu Ala Glu Val Lys Ala Leu Leu Leu Asp Asn His Gln Ser Ala
195 200 205

Ser Asn Arg Gln Arg Gln Ala Leu Leu Leu Ile Tyr Thr Pro Ser Lys
210 215 220

Gln Asn Lys Ala Ile Ala Thr Glu Leu Leu Lys Ala Ile Leu Gly Leu
225 230 235 240

Lys Ala Lys Phe Asn Val Leu Thr Gly Ile Glu Ala Glu Asp Val Lys
245 250 255

Thr Trp Thr Leu Thr Phe Asn Ala Glu Asn Phe Asp Glu Glu Met Val
260 265 270

Lys Leu Glu Ser Ser Leu Asp Asp Asn Ala His Gln Ile Ile Glu Ser
275 280 285

Leu Gln Glu Leu Tyr Ser Gly Val Leu Leu Ala Gly Ile Val Pro Glu
290 295 300

Asn Gln Ser Leu Ser Gln Ala Met Ile Thr Lys Tyr Asp Asp His Gln
305 310 315 320

Lys His Leu Lys Met Leu Lys Ala Val Arg Glu Ala Leu Ala Pro Glu

```
                325                 330                 335

Asp Arg Gln Arg Leu Lys Gln Ala Tyr Asp Gln Tyr Val Asp Gly Lys
            340                 345                 350

Ser Lys Glu Asp Phe Tyr Gly Asp Ile Thr Lys Ala Leu Lys Asn Asn
        355                 360                 365

Pro Asp His Pro Ile Val Ser Glu Ile Lys Lys Leu Ile Glu Leu Asp
    370                 375                 380

Gln Phe Met Pro Lys Gln Arg Thr Lys Asp Asn Gly Ala Ile Pro His
385                 390                 395                 400

Gln Leu His Gln Gln Glu Leu Asp Arg Ile Ile Glu Asn Gln Gln Gln
                405                 410                 415

Tyr Tyr Pro Trp Leu Ala Glu Leu Asn Pro Asn Lys Leu Asp Glu Leu
            420                 425                 430

Val Ala Phe Arg Val Pro Tyr Tyr Val Gly Pro Leu Gln Gln Gln Ser
        435                 440                 445

Ser Asp Ala Lys Phe Ala Trp Met Ile Arg Lys Ala Glu Gly Gln Ile
    450                 455                 460

Thr Pro Trp Asn Phe Asp Asp Lys Val Asp Arg Gln Ala Ser Ala Asn
465                 470                 475                 480

Glu Phe Ile Lys Arg Met Thr Thr Thr Asp Thr Tyr Leu Leu Ala Glu
                485                 490                 495

Asp Val Leu Pro Lys Gln Ser Leu Ile Tyr Gln Arg Phe Glu Val Leu
            500                 505                 510

Asn Glu Leu Asn Gly Leu Lys Ile Asp Asp Gln Pro Ile Thr Thr Glu
        515                 520                 525

Leu Lys Gln Ala Ile Phe Thr Asp Leu Phe Met Gln Lys Thr Ser Val
```

530 535 540

Thr Val Lys Asn Ile Gln Asp Tyr Leu Val Ser Glu Lys Arg Tyr Ala
545 550 555 560

Ser Arg Pro Ala Ile Thr Gly Leu Ser Asp Glu Asn Lys Phe Asn Ser
565 570 575

Arg Leu Ser Thr Tyr His Asp Leu Lys Thr Ile Val Gly Asp Ala Val
580 585 590

Asp Asp Val Asp Lys Gln Ala Asp Leu Glu Lys Cys Ile Glu Trp Ser
595 600 605

Thr Ile Phe Glu Asp Gly Lys Ile Tyr Ser Ala Lys Leu Asn Glu Ile
610 615 620

Asp Trp Leu Thr Asp Gln Gln Arg Val Gln Leu Ala Ala Lys Arg Tyr
625 630 635 640

Arg Gly Trp Gly Arg Leu Ser Ala Lys Leu Leu Thr Gln Ile Val Asn
645 650 655

Ala Asn Gly Gln Arg Ile Met Asp Leu Leu Trp Thr Thr Asp Asn Phe
660 665 670

Met Arg Ile Val His Ser Glu Asp Phe Asp Lys Leu Ile Thr Glu Ala
675 680 685

Asn Gln Met Met Leu Ala Glu Asn Asp Val Gln Asp Val Ile Asn Asp
690 695 700

Leu Tyr Thr Ser Pro Gln Asn Lys Lys Ala Leu Arg Gln Ile Leu Leu
705 710 715 720

Val Val Asn Asp Ile Gln Lys Ala Met Lys Gly Gln Ala Pro Glu Arg
725 730 735

Ile Leu Ile Glu Phe Ala Arg Glu Asp Glu Val Asn Pro Arg Leu Ser

740 745 750

Val Gln Arg Lys Arg Gln Val Glu Gln Val Tyr Gln Asn Ile Ser Glu
755 760 765

Leu Glu Ile Arg Asn Glu Leu Lys Asp Leu Ser Asn Ser Ala Leu Ser
770 775 780

Asn Thr Arg Leu Phe Leu Tyr Phe Met Gln Gly Gly Arg Asp Met Tyr
785 790 795 800

Thr Gly Asp Ser Leu Asn Ile Asp Arg Leu Ser Thr Tyr Asp Ile Asp
805 810 815

His Ile Leu Pro Gln Ser Phe Ile Lys Asp Asn Ser Leu Asp Asn Arg
820 825 830

Val Leu Val Ser Gln Arg Met Asn Arg Ser Lys Ala Asp Gln Val Pro
835 840 845

Ser Val Glu Leu Gly Gln Lys Met Gln Ile Gln Trp Glu Gln Met Leu
850 855 860

Arg Ala Gly Leu Ile Thr Lys Lys Lys Tyr Asp Asn Leu Thr Leu Asn
865 870 875 880

Pro Asp Met Lys Gly Phe Ile Asn Arg Gln Leu Val Glu Thr Arg Gln
885 890 895

Val Ile Lys Leu Ala Thr Asn Leu Leu Met Glu Gln Tyr Gly Glu Asp
900 905 910

Asn Ile Glu Leu Ile Thr Val Lys Ser Gly Leu Thr His Gln Met Arg
915 920 925

Thr Glu Phe Asp Phe Pro Lys Asn Arg Asn Leu Asn Asn His His His
930 935 940

Ala Phe Asp Ala Tyr Leu Thr Ala Phe Val Gly Leu Tyr Leu Leu Lys

945 950 955 960

Arg Tyr Pro Lys Leu Lys Pro Tyr Phe Val Tyr Gly Glu Tyr Gln Lys
965 970 975

Ala Ser Gln Gln Asp Lys Arg Asn Phe Asn Phe Leu Asn Gly Leu Lys
980 985 990

Lys Asp Glu Leu Val Asp Glu Asn Thr Glu Ala Val Ile Trp Asn Lys
995 1000 1005

Glu Ser Gly Leu Ala Tyr Leu Asn Lys Ile Tyr Gln Phe Lys Lys
1010 1015 1020

Ile Leu Val Thr Arg Glu Val His Glu Asn Ser Gly Ala Leu Phe
1025 1030 1035

Asn Gln Thr Leu Tyr Ala Ala Lys Asp Asp Lys Ala Ser Gly Gln
1040 1045 1050

Leu Ile Pro Ala Lys Gln Asp Arg Pro Thr Ala Leu Tyr Gly Gly
1055 1060 1065

Tyr Ser Gly Lys Thr Val Ala Tyr Met Cys Ile Val Arg Ile Lys
1070 1075 1080

Asn Lys Lys Gly Asp Leu Tyr Lys Val Cys Gly Val Glu Thr Ser
1085 1090 1095

Trp Leu Ala Gln Leu Lys Gln Lys Lys Ala Phe Leu Lys Gln Lys
1100 1105 1110

Ile Ser Pro Gln Phe Thr Lys Val Lys Lys Gln Lys Gly Thr Ile
1115 1120 1125

Val Lys Val Val Glu Asp Phe Glu Val Ile Ala Pro His Ile Leu
1130 1135 1140

Ile Asn Gln Arg Phe Phe Asp Asn Gly Gln Glu Leu Thr Leu Gly

1145 1150 1155

Ser His Asn Glu Gln Glu Leu Ile Leu Asp Lys Thr Ala Val Lys
1160 1165 1170

Leu Leu Asn Gly Ala Leu Pro Leu Thr Gln Ser Glu Glu Leu Ala
1175 1180 1185

Glu Gln Val Tyr Asp Glu Ile Leu Asp Gln Val Met His Tyr Phe
1190 1195 1200

Pro Leu Tyr Asp Thr Asn Gln Phe Arg Ala Lys Leu Ser Ala Gly
1205 1210 1215

Lys Ala Ala Asp Gly Asn Lys Met Val Gln Val Gly Gln Gln Val
1220 1225 1230

Ile Leu Asp Arg Val Leu Ile Gly Leu His Ala Asn Ala Ala Val
1235 1240 1245

Ser Asp Leu Gly Val Leu Lys Ile Ser Thr Pro Leu Gly Lys Met
1250 1255 1260

Gln Gln Pro Ser Gly Ile Ser Asp Thr Gln Ile Ile Tyr Gln Ser
1265 1270 1275

Pro Thr Gly Leu Phe Glu Arg Arg Val Ala Leu Arg Asp Leu
1280 1285 1290

<210> 330
<211> 1291
<212> PRT
<213> Lactobacillus farciminis

<400> 330

Lys Glu Gln Pro Tyr Asn Ile Gly Leu Asp Ile Gly Thr Gly Ser Val
1 5 10 15

Gly Trp Ala Val Thr Asn Asp Asn Tyr Asp Leu Leu Asn Ile Lys Lys
20 25 30

```
Lys Asn Leu Trp Gly Val Arg Leu Phe Glu Gly Ala Gln Thr Ala Lys
        35                  40                  45

Glu Thr Arg Leu Asn Arg Ser Thr Arg Arg Arg Tyr Arg Arg Arg Lys
    50                  55                  60

Asn Arg Ile Asn Trp Leu Asn Glu Ile Phe Ser Glu Glu Leu Ala Asn
65                  70                  75                  80

Thr Asp Pro Ser Phe Leu Ile Arg Leu Gln Asn Ser Trp Val Ser Lys
                85                  90                  95

Lys Asp Pro Asp Arg Lys Arg Asp Lys Tyr Asn Leu Phe Ile Asp Asn
            100                 105                 110

Pro Tyr Thr Asp Lys Glu Tyr Tyr Arg Glu Phe Pro Thr Ile Phe His
        115                 120                 125

Leu Arg Lys Glu Leu Ile Ile Asn Lys Asn Lys Ala Asp Ile Arg Leu
    130                 135                 140

Val Tyr Leu Ala Leu His Asn Ile Leu Lys Tyr Arg Gly Asn Phe Thr
145                 150                 155                 160

Tyr Glu His Gln Lys Phe Asn Ile Ser Thr Leu Asn Ser Asn Leu Ser
                165                 170                 175

Lys Glu Leu Ile Glu Leu Asn Gln Gln Leu Ile Lys Tyr Asp Ile Ser
            180                 185                 190

Phe Pro Asp Asn Cys Asp Trp Asn His Ile Ser Asp Ile Leu Ile Gly
        195                 200                 205

Arg Gly Asn Ala Thr Gln Lys Ser Ser Asn Ile Leu Asn Asn Phe Thr
    210                 215                 220

Lys Glu Thr Lys Lys Leu Leu Lys Glu Val Ile Asn Leu Ile Leu Gly
225                 230                 235                 240
```

```
Asn Val Ala His Leu Asn Thr Ile Phe Lys Thr Ser Leu Thr Lys Asp
                245                 250                 255

Glu Glu Lys Leu Ser Phe Ser Gly Lys Asp Ile Glu Ser Lys Leu Asp
            260                 265                 270

Asp Leu Asp Ser Ile Leu Asp Asp Asp Gln Phe Thr Val Leu Asp Thr
        275                 280                 285

Ala Asn Arg Ile Tyr Ser Thr Ile Thr Leu Asn Glu Ile Leu Asn Gly
    290                 295                 300

Glu Ser Tyr Phe Ser Met Ala Lys Val Asn Gln Tyr Glu Asn His Ala
305                 310                 315                 320

Ile Asp Leu Cys Lys Leu Arg Asp Met Trp His Thr Thr Lys Asn Glu
                325                 330                 335

Lys Ala Val Gly Leu Ser Arg Gln Ala Tyr Asp Asp Tyr Ile Asn Lys
            340                 345                 350

Lys Lys Glu Leu Tyr Thr Ser Leu Lys Lys Phe Leu Lys Val Ala Leu
        355                 360                 365

Pro Thr Asn Leu Ala Lys Glu Ala Glu Glu Lys Ile Ser Lys Gly Thr
    370                 375                 380

Tyr Leu Val Lys Pro Arg Asn Ser Glu Asn Gly Val Val Pro Tyr Gln
385                 390                 395                 400

Leu Asn Lys Ile Glu Met Glu Lys Ile Ile Asp Asn Gln Ser Gln Tyr
                405                 410                 415

Tyr Pro Phe Leu Lys Glu Asn Lys Glu Lys Leu Leu Ser Ile Leu Ser
            420                 425                 430

Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Gln Ser Ser Glu Lys Asn
        435                 440                 445
```

```
Pro Phe Ala Trp Met Glu Arg Lys Ser Asn Gly His Ala Arg Pro Trp
    450                 455                 460

Asn Phe Asp Glu Ile Val Asp Arg Glu Lys Ser Ser Asn Lys Phe Ile
465                 470                 475                 480

Arg Arg Met Thr Val Thr Asp Ser Tyr Leu Val Gly Glu Pro Val Leu
                485                 490                 495

Pro Lys Asn Ser Leu Ile Tyr Gln Arg Tyr Glu Val Leu Asn Glu Leu
            500                 505                 510

Asn Asn Ile Arg Ile Thr Glu Asn Leu Lys Thr Asn Pro Thr Gly Ser
        515                 520                 525

Arg Leu Thr Val Glu Thr Lys Gln His Ile Tyr Asn Glu Leu Phe Lys
    530                 535                 540

Asn Tyr Lys Lys Ile Thr Val Lys Lys Leu Thr Lys Trp Leu Ile Ala
545                 550                 555                 560

Gln Gly Tyr Tyr Lys Asn Pro Ile Leu Ile Gly Leu Ser Gln Lys Asp
                565                 570                 575

Glu Phe Asn Ser Thr Leu Thr Thr Tyr Leu Asp Met Lys Lys Ile Phe
            580                 585                 590

Gly Ser Ser Phe Met Glu Asn Asn Lys Asn Tyr Asn Gln Ile Glu Glu
        595                 600                 605

Leu Ile Glu Trp Leu Thr Ile Phe Glu Asp Lys Gln Ile Leu Asn Glu
    610                 615                 620

Lys Leu His Ser Ser Asn Tyr Ser Tyr Thr Ser Asp Gln Ile Lys Lys
625                 630                 635                 640

Ile Ser Asn Met Arg Tyr Lys Gly Trp Gly Arg Leu Ser Lys Lys Ile
                645                 650                 655
```

```
Leu Thr Cys Ile Thr Thr Glu Thr Asn Thr Pro Lys Ser Leu Gln Leu
            660                 665                 670

Ser Asn Asp Leu Met Trp Thr Thr Asn Asn Asn Phe Ile Ser Ile Ile
        675                 680                 685

Ser Asn Asp Lys Tyr Asp Phe Lys Asn Tyr Ile Glu Asn His Asn Leu
    690                 695                 700

Asn Lys Asn Glu Asp Gln Asn Ile Ser Asn Leu Val Asn Asp Ile His
705                 710                 715                 720

Val Ser Pro Ala Leu Lys Arg Gly Ile Thr Gln Ser Ile Lys Ile Val
                725                 730                 735

Gln Glu Ile Val Lys Phe Met Gly His Ala Pro Lys Tyr Ile Phe Ile
            740                 745                 750

Glu Val Thr Arg Glu Thr Lys Thr Thr Ser Arg Gly Lys Arg Ile Gln
        755                 760                 765

Arg Leu Gln Ser Lys Leu Leu Asn Lys Ala Asn Gly Leu Val Pro Glu
    770                 775                 780

Glu Leu Lys Lys His Lys Asn Asp Leu Ser Ser Glu Arg Ile Met Leu
785                 790                 795                 800

Tyr Phe Leu Gln Asn Gly Lys Ser Leu Tyr Ser Glu Glu Ser Leu Asn
                805                 810                 815

Ile Asn Lys Leu Ser Asp Tyr Gln Val Asp His Ile Leu Pro Arg Thr
            820                 825                 830

Tyr Ile Pro Asp Asp Ser Leu Glu Asn Lys Ala Leu Val Leu Ala Lys
        835                 840                 845

Glu Asn Gln Arg Lys Ala Asp Asp Leu Leu Leu Asn Ser Asn Val Ile
    850                 855                 860
```

```
Asp Lys Asn Leu Glu Arg Trp Thr Tyr Met Leu Asn Asn Asn Met Met
865                 870                 875                 880

Gly Leu Lys Lys Phe Lys Asn Leu Thr Arg Arg Val Ile Thr Asp Lys
                885                 890                 895

Asp Lys Leu Gly Phe Ile His Arg Gln Leu Val Gln Thr Ser Gln Met
            900                 905                 910

Val Lys Gly Val Ala Asn Ile Leu Asn Ser Met Tyr Lys Asn Gln Gly
        915                 920                 925

Thr Thr Cys Ile Gln Ala Arg Ala Asn Leu Ser Thr Ala Phe Arg Lys
    930                 935                 940

Ala Leu Glu Leu Val Lys Asn Arg Asn Ile Asn Asp Phe His His Ala
945                 950                 955                 960

Gln Asp Ala Tyr Leu Ala Ser Phe Leu Gly Thr Tyr Arg Leu Arg Arg
                965                 970                 975

Phe Pro Thr Asp Glu Met Leu Leu Met Asn Gly Glu Tyr Asn Lys Phe
            980                 985                 990

Tyr Gly Lys Glu Leu Tyr Ser Lys  Lys Ser Arg Lys Asn  Gly Phe Ile
        995                 1000                1005

Ile Ser  Pro Leu Val Asn Gly  Thr Thr Gln Asp Arg  Asn Thr Gly
    1010                1015                1020

Glu Ile  Ile Trp Asn Val Gly  Phe Arg Asp Lys Ile  Leu Lys Ile
    1025                1030                1035

Phe Asn  Tyr His Gln Cys Asn  Val Thr Arg Lys Thr  Glu Ile Lys
    1040                1045                1050

Thr Gly  Gln Phe Tyr Asp Gln  Thr Ile Tyr Ser Pro  Lys Asn Pro
    1055                1060                1065
```

```
Lys Lys  Leu Ile Ala Gln Lys  Lys Asp Met Asp Pro  Asn Ile Tyr
    1070                1075                1080

Gly Gly  Phe Ser Gly Asp Asn  Lys Ser Ser Ile Thr  Ile Val Lys
    1085                1090                1095

Ile Asp  Asn Asn Lys Ile Lys  Pro Val Ala Ile Pro  Ile Arg Leu
    1100                1105                1110

Ile Asn  Asp Lys Lys Thr Leu  Gln Asn Trp Leu Glu  Glu Asn Val
    1115                1120                1125

Lys His  Lys Lys Ser Ile Gln  Ile Ile Lys Asn Asn  Val Pro Ile
    1130                1135                1140

Gly Gln  Ile Ile Tyr Ser Lys  Lys Val Gly Leu Leu  Ser Arg Glu
    1145                1150                1155

Ile Ala  Asn Arg Gln Gln Leu  Ile Leu Pro Pro Glu  His Ser Ala
    1160                1165                1170

Leu Leu  Arg Ile Leu Gln Ile  Pro Asp Glu Asp Pro  Asp Gln Ile
    1175                1180                1185

Leu Ala  Phe Tyr Asp Lys Asn  Ile Leu Val Glu Ile  Leu Gln Glu
    1190                1195                1200

Leu Ile  Thr Lys Met Lys Lys  Phe Tyr Pro Phe Tyr  Lys Asn Glu
    1205                1210                1215

Gln Glu  Phe Leu Ala Ser Phe  Asn Gln Ala Thr Thr  Ser Glu Lys
    1220                1225                1230

Ile Asn  Ser Leu Glu Glu Leu  Ile Thr Leu Leu His  Ala Asn Ser
    1235                1240                1245

Thr Ser  Ala His Leu Ile Phe  Asn Asn Ile Glu Lys  Lys Ala Phe
    1250                1255                1260
```

Gly Arg Lys Thr His Gly Leu Thr Asp Thr Asp Phe Ile Tyr Gln
    1265   1270   1275

Ser Val Thr Gly Leu Tyr Glu Thr Arg Ile His Ile Glu
    1280   1285   1290

<210> 331
<211> 1327
<212> PRT
<213> Listeria innocua

<400> 331

Met Lys Lys Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20   25   30

Lys Ile Ala Gly Asp Ser Glu Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35   40   45

Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Ala Asp Arg Arg Met
    50   55   60

Ala Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65   70   75   80

Tyr Leu Gln Gly Ile Phe Ala Glu Glu Met Ser Lys Thr Asp Ala Asn
                85   90   95

Phe Phe Cys Arg Leu Ser Asp Ser Phe Tyr Val Asp Asn Glu Lys Arg
            100   105   110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Glu Tyr
        115   120   125

His Lys Asn Tyr Pro Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130   135   140

```
Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Gln Asn Thr Ser Val Asp Gly Ile Tyr Lys Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Ala Ser Gly Ile Glu Lys Leu Glu Asp Asn Lys Asp
        195                 200                 205

Val Ala Lys Ile Leu Val Glu Lys Val Thr Arg Lys Glu Lys Leu Glu
    210                 215                 220

Arg Ile Leu Lys Leu Tyr Pro Gly Glu Lys Ser Ala Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Pro
                245                 250                 255

Phe Asp Leu Ile Glu Lys Ser Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ser Leu Leu Ala Leu Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Ala Tyr Ser Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Ala Glu Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Thr His Glu Glu Asp Leu Gly Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys His Tyr Glu Glu Ile Phe
            340                 345                 350
```

```
Ser Asn Thr Glu Lys His Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Ala Asp Phe Tyr Lys Tyr Met Lys Met Thr Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Lys Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Leu Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525

Tyr Ile Asn Asp Gln Gly Lys Thr Ser Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Glu Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560
```

```
Lys Asp Leu Glu Leu Phe Leu Arg Asn Met Ser His Val Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ser Ser Tyr Ser Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Ile Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Val Asn Thr Glu Met Leu Glu Asn Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Met Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Thr Thr Ala Asp Lys Asp Ile Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765
```

```
Gly Lys Asn Asn Ser Arg Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Arg Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Asp Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Glu Lys Asp Asp His Gly Asn
    930                 935                 940

Thr Met Lys Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Asp Val Asn Asp
                965                 970                 975
```

```
Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990


Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Asp
        995                 1000                1005


Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020


Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Asp
    1025                1030                1035


Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050


Leu Asp  Thr Val Lys Lys Val  Met Ser Tyr Arg Gln  Met Asn Ile
    1055                1060                1065


Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Lys Ala Thr
    1070                1075                1080


Ile Lys  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Pro  Arg Lys Thr
    1085                1090                1095


Asn Trp  Asp Pro Met Lys Tyr  Gly Gly Leu Asp Ser  Pro Asn Met
    1100                1105                1110


Ala Tyr  Ala Val Val Ile Glu  Tyr Ala Lys Gly Lys  Asn Lys Leu
    1115                1120                1125


Val Phe  Glu Lys Lys Ile Ile  Arg Val Thr Ile Met  Glu Arg Lys
    1130                1135                1140


Ala Phe  Glu Lys Asp Glu Lys  Ala Phe Leu Glu Glu  Gln Gly Tyr
    1145                1150                1155


Arg Gln  Pro Lys Val Leu Ala  Lys Leu Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170
```

```
Glu Cys  Glu Glu Gly Arg Arg  Arg Met Leu Ala Ser  Ala Asn Glu
    1175                 1180                 1185


Ala Gln  Lys Gly Asn Gln Gln  Val Leu Pro Asn His  Leu Val Thr
    1190                 1195                 1200


Leu Leu  His His Ala Ala Asn  Cys Glu Val Ser Asp  Gly Lys Ser
    1205                 1210                 1215


Leu Asp  Tyr Ile Glu Ser Asn  Arg Glu Met Phe Ala  Glu Leu Leu
    1220                 1225                 1230


Ala His  Val Ser Glu Phe Ala  Lys Arg Tyr Thr Leu  Ala Glu Ala
    1235                 1240                 1245


Asn Leu  Asn Lys Ile Asn Gln  Leu Phe Glu Gln Asn  Lys Glu Gly
    1250                 1255                 1260


Asp Ile  Lys Ala Ile Ala Gln  Ser Phe Val Asp Leu  Met Ala Phe
    1265                 1270                 1275


Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Phe Phe  Glu Thr Thr
    1280                 1285                 1290


Ile Glu  Arg Lys Arg Tyr Asn  Asn Leu Lys Glu Leu  Leu Asn Ser
    1295                 1300                 1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                 1315                 1320


Arg Leu  Asp Asp
    1325
```

<210> 332
<211> 1327
<212> PRT
<213> Listeria innocua

<400> 332

```
Met Lys Lys Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30

Lys Ile Ala Gly Asp Ser Glu Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Ala Asp Arg Arg Met
    50                  55                  60

Ala Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65                  70                  75                  80

Tyr Leu Gln Gly Ile Phe Ala Glu Glu Met Ser Lys Thr Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Ser Asp Ser Phe Tyr Val Asp Asn Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Glu Tyr
        115                 120                 125

His Lys Asn Tyr Pro Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Gln Asn Thr Ser Val Asp Gly Ile Tyr Lys Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Ala Ser Gly Ile Glu Lys Leu Glu Asp Asn Lys Asp
        195                 200                 205
```

```
Val Ala Lys Ile Leu Val Glu Lys Val Thr Arg Lys Glu Lys Leu Glu
    210                 215                 220

Arg Ile Leu Lys Leu Tyr Pro Gly Glu Lys Ser Ala Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Pro
                245                 250                 255

Phe Asp Leu Ile Glu Lys Ser Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ser Leu Leu Ala Leu Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Ala Tyr Ser Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Ala Glu Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Thr His Glu Glu Asp Leu Gly Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys His Tyr Glu Glu Ile Phe
            340                 345                 350

Ser Asn Thr Glu Lys His Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Ala Asp Phe Tyr Lys Tyr Met Lys Met Thr Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Lys Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415
```

```
Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asn Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Leu Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525

Tyr Ile Asn Asp Gln Gly Lys Thr Ser Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Glu Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Met Ser His Val Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ser Ser Tyr Ser Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Ile Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Val Asn Thr Glu Met Leu Glu Asn Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620
```

```
Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640


Leu Asp Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655


Trp Gly Arg Leu Ser Ala Lys Leu Leu Met Gly Ile Arg Asp Lys Gln
            660                 665                 670


Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685


Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700


Ile Glu Lys Glu Gln Val Thr Thr Ala Asp Lys Asp Ile Gln Ser Ile
705                 710                 715                 720


Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735


Ser Leu Lys Ile Val Asp Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750


Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765


Gly Lys Asn Asn Ser Arg Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780


Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800


Glu Leu Arg Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815


Asp Met Tyr Thr Gly Gln Asp Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830
```

```
Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Glu Lys Asp Asp His Gly Asn
    930                 935                 940

Thr Met Lys Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Asp Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Asp
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Asp
    1025                1030                1035
```

```
Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Asp  Thr Val Lys Lys Val  Met Ser Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Lys Ala Thr
    1070                1075                1080

Ile Lys  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Ser  Arg Lys Thr
    1085                1090                1095

Asn Trp  Asp Pro Met Lys Tyr  Gly Gly Leu Asp Ser  Pro Asn Met
    1100                1105                1110

Ala Tyr  Ala Val Val Ile Glu  Tyr Ala Lys Gly Lys  Asn Lys Leu
    1115                1120                1125

Val Phe  Glu Lys Lys Ile Ile  Arg Val Thr Ile Met  Glu Arg Lys
    1130                1135                1140

Ala Phe  Glu Lys Asp Glu Lys  Ala Phe Leu Glu Glu  Gln Gly Tyr
    1145                1150                1155

Arg Gln  Pro Lys Val Leu Ala  Lys Leu Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Glu Gly Arg Arg  Arg Met Leu Ala Ser  Ala Asn Glu
    1175                1180                1185

Ala Gln  Lys Gly Asn Gln Gln  Val Leu Pro Asn His  Leu Val Thr
    1190                1195                1200

Leu Leu  His His Val Ala Asn  Cys Glu Val Ser Asp  Gly Lys Ser
    1205                1210                1215

Leu Asp  Tyr Ile Glu Ser Asn  Arg Glu Met Phe Ala  Glu Leu Leu
    1220                1225                1230
```

```
Ala His  Val Ser Glu Phe Ala  Lys Arg Tyr Thr Leu  Ala Glu Ala
    1235                1240                1245


Asn Leu  Asn Lys Ile Asn Gln  Leu Phe Glu Gln Asn  Lys Glu Gly
    1250                1255                1260


Asp Ile  Lys Ala Ile Ala Gln  Ser Phe Val Asp Leu  Met Ala Phe
    1265                1270                1275


Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Phe Phe  Glu Thr Thr
    1280                1285                1290


Ile Glu  Arg Lys Arg Tyr Asn  Asn Leu Lys Glu Leu  Leu Asn Ser
    1295                1300                1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                1315                1320


Arg Leu  Asp Asp
    1325
```

<210> 333
<211> 1327
<212> PRT
<213> Listeria innocua

<400> 333

```
Met Lys Lys Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30


Lys Ile Ala Gly Asp Ser Glu Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Asp Glu Gly Gln Thr Ala Ala Asp Arg Arg Met
    50                  55                  60


Ala Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
```

65 70 75 80

Tyr Leu Gln Gly Ile Phe Ala Glu Glu Met Ser Lys Thr Asp Ala Asn
85 90 95

Phe Phe Cys Arg Leu Ser Asp Ser Phe Tyr Val Asp Asn Glu Lys Arg
100 105 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Glu Tyr
115 120 125

His Lys Asn Tyr Pro Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
130 135 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145 150 155 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
165 170 175

Gln Asn Thr Ser Val Asp Gly Ile Tyr Lys Gln Phe Ile Gln Thr Tyr
180 185 190

Asn Gln Val Phe Ala Ser Gly Ile Glu Lys Leu Glu Asp Asn Lys Asp
195 200 205

Val Ala Lys Ile Leu Val Glu Lys Val Thr Arg Lys Glu Lys Leu Glu
210 215 220

Arg Ile Leu Lys Leu Tyr Pro Gly Glu Lys Ser Ala Gly Met Phe Ala
225 230 235 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Pro
245 250 255

Phe Asp Leu Ile Glu Lys Ser Asp Ile Glu Cys Ala Lys Asp Ser Tyr
260 265 270

Glu Glu Asp Leu Glu Ser Leu Leu Ala Leu Ile Gly Asp Glu Tyr Ala

275 280 285

Glu Leu Phe Val Ala Ala Lys Asn Ala Tyr Ser Ala Val Val Leu Ser
290 295 300

Ser Ile Ile Thr Val Ala Glu Thr Glu Thr Asn Ala Lys Leu Ser Ala
305 310 315 320

Ser Met Ile Glu Arg Phe Asp Thr His Glu Glu Asp Leu Gly Glu Leu
325 330 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys His Tyr Glu Glu Ile Phe
340 345 350

Ser Asn Thr Glu Lys His Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
355 360 365

Gln Ala Asp Phe Tyr Lys Tyr Met Lys Met Thr Leu Glu Asn Ile Glu
370 375 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Lys Glu Asn Phe Leu Arg
385 390 395 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
405 410 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
420 425 430

Leu Lys Glu Asn Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
435 440 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp
450 455 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465 470 475 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr

485 490 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
500 505 510

Leu Cys Tyr Gln Lys Tyr Leu Val Tyr Asn Glu Leu Thr Lys Val Arg
515 520 525

Tyr Ile Asn Asp Gln Gly Lys Thr Ser Tyr Phe Ser Gly Gln Glu Lys
530 535 540

Glu Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545 550 555 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Met Ser His Val Glu Ser Pro
565 570 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ser Ser Tyr Ser Thr Tyr
580 585 590

His Asp Leu Leu Lys Val Gly Ile Lys Gln Glu Ile Leu Asp Asn Pro
595 600 605

Val Asn Thr Glu Met Leu Glu Asn Ile Val Lys Ile Leu Thr Val Phe
610 615 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625 630 635 640

Leu Asp Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
645 650 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Met Gly Ile Arg Asp Lys Gln
660 665 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
675 680 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile

```
    690                 695                 700

Ile Glu Lys Glu Gln Val Thr Thr Ala Asp Lys Asp Ile Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765

Gly Lys Asn Asn Ser Arg Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Arg Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Asp Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
```

900 905 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
915 920 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Glu Lys Asp Asp His Gly Asn
930 935 940

Thr Met Lys Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945 950 955 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Asp Val Asn Asp
965 970 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
980 985 990

Leu Leu Lys Val Tyr Pro Gln Leu Glu Pro Glu Phe Val Tyr Gly Asp
995 1000 1005

Tyr His Gln Phe Asp Trp Phe Lys Ala Asn Lys Ala Thr Ala Lys
1010 1015 1020

Lys Gln Phe Tyr Thr Asn Ile Met Leu Phe Phe Ala Gln Lys Asp
1025 1030 1035

Arg Ile Ile Asp Glu Asn Gly Glu Ile Leu Trp Asp Lys Lys Tyr
1040 1045 1050

Leu Asp Thr Val Lys Lys Val Met Ser Tyr Arg Gln Met Asn Ile
1055 1060 1065

Val Lys Lys Thr Glu Ile Gln Lys Gly Glu Phe Ser Lys Ala Thr
1070 1075 1080

Ile Lys Pro Lys Gly Asn Ser Ser Lys Leu Ile Ser Arg Lys Thr
1085 1090 1095

Asn Trp Asp Pro Met Lys Tyr Gly Gly Leu Asp Ser Pro Asn Met

1100 1105 1110

Ala Tyr Ala Val Val Ile Glu Tyr Ala Lys Gly Lys Asn Lys Leu
1115 1120 1125

Val Phe Glu Lys Lys Ile Ile Arg Val Thr Ile Met Glu Arg Lys
1130 1135 1140

Ala Phe Glu Lys Asp Glu Lys Ala Phe Leu Glu Glu Gln Gly Tyr
1145 1150 1155

Arg Gln Pro Lys Val Leu Ala Lys Leu Pro Lys Tyr Thr Leu Tyr
1160 1165 1170

Glu Cys Glu Glu Gly Arg Arg Arg Met Leu Ala Ser Ala Asn Glu
1175 1180 1185

Ala Gln Lys Gly Asn Gln Gln Val Leu Pro Asn His Leu Val Thr
1190 1195 1200

Leu Leu His His Val Ala Asn Cys Glu Val Ser Asp Gly Lys Ser
1205 1210 1215

Leu Asp Tyr Ile Glu Ser Asn Arg Glu Met Phe Ala Glu Leu Leu
1220 1225 1230

Ala His Val Ser Glu Phe Ala Lys Arg Tyr Thr Leu Ala Glu Ala
1235 1240 1245

Asn Leu Asn Lys Ile Asn Gln Leu Phe Glu Gln Asn Lys Glu Gly
1250 1255 1260

Asp Ile Lys Ala Ile Ala Gln Ser Phe Val Asp Leu Met Ala Phe
1265 1270 1275

Asn Ala Met Gly Ala Pro Ala Ser Phe Lys Phe Phe Glu Thr Thr
1280 1285 1290

Ile Glu Arg Lys Arg Tyr Asn Asn Leu Lys Glu Leu Leu Asn Ser

1295 1300 1305

Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr Glu Ser Arg Lys
1310 1315 1320

Arg Leu Asp Asp
1325

<210> 334
<211> 1101
<212> PRT
<213> Listeria innocua

<400> 334

Leu Lys Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala Gln Phe
1 5 10 15

Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Pro Phe Asp
20 25 30

Leu Ile Glu Lys Ser Asp Ile Glu Cys Ala Lys Asp Ser Tyr Glu Glu
35 40 45

Asp Leu Glu Ser Leu Leu Ala Leu Ile Gly Asp Glu Tyr Ala Glu Leu
50 55 60

Phe Val Ala Ala Lys Asn Ala Tyr Ser Ala Val Val Leu Ser Ser Ile
65 70 75 80

Ile Thr Val Ala Glu Thr Glu Thr Asn Ala Lys Leu Ser Ala Ser Met
85 90 95

Ile Glu Arg Phe Asp Thr His Glu Glu Asp Leu Gly Glu Leu Lys Ala
100 105 110

Phe Ile Lys Leu His Leu Pro Lys His Tyr Glu Glu Ile Phe Ser Asn
115 120 125

Thr Glu Lys His Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys Gln Ala
130 135 140

```
Asp Phe Tyr Lys Tyr Met Lys Thr Thr Leu Glu Asn Ile Glu Gly Ala
145                 150                 155                 160

Asp Tyr Phe Ile Ala Lys Ile Glu Lys Glu Asn Phe Leu Arg Lys Gln
                165                 170                 175

Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu Glu Glu
            180                 185                 190

Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe Leu Lys
        195                 200                 205

Glu Asn Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile Pro Tyr
    210                 215                 220

Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp Leu Thr
225                 230                 235                 240

Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu Lys Val
                245                 250                 255

Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr Asn Lys
            260                 265                 270

Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser Leu Cys
        275                 280                 285

Tyr Gln Lys Tyr Leu Val Tyr Asn Glu Leu Thr Lys Val Arg Tyr Ile
    290                 295                 300

Asn Asp Gln Gly Lys Thr Ser Tyr Phe Ser Gly Gln Glu Lys Glu Gln
305                 310                 315                 320

Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys Lys Asp
                325                 330                 335

Leu Glu Leu Phe Leu Arg Asn Met Ser His Val Glu Ser Pro Thr Ile
            340                 345                 350
```

```
Glu Gly Leu Glu Asp Ser Phe Asn Ser Ser Tyr Ser Thr Tyr His Asp
        355                 360                 365

Leu Leu Lys Val Gly Ile Lys Gln Glu Ile Leu Asp Asn Pro Val Asn
    370                 375                 380

Thr Glu Met Leu Glu Asn Ile Val Lys Ile Leu Thr Val Phe Glu Asp
385                 390                 395                 400

Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val Leu Asp
                405                 410                 415

Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly Trp Gly
            420                 425                 430

Arg Leu Ser Ala Lys Leu Leu Met Gly Ile Arg Asp Lys Gln Ser His
        435                 440                 445

Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg Asn Leu
    450                 455                 460

Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile Ile Glu
465                 470                 475                 480

Lys Glu Gln Val Thr Thr Ala Asp Lys Asp Ile Gln Ser Ile Val Ala
                485                 490                 495

Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln Ser Leu
            500                 505                 510

Lys Ile Val Asp Glu Leu Val Ser Val Met Gly Tyr Pro Pro Gln Thr
        515                 520                 525

Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys Gly Lys
    530                 535                 540

Asn Asn Ser Arg Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile Lys Glu
545                 550                 555                 560
```

```
Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln Glu Leu
                565                 570                 575

Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys Asp Met
            580                 585                 590

Tyr Thr Gly Gln Asp Leu Asp Ile His Asn Leu Ser Asn Tyr Asp Ile
        595                 600                 605

Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile Asp Asn
    610                 615                 620

Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asn Asp Val
625                 630                 635                 640

Pro Pro Leu Glu Ile Val Gln Lys Arg Lys Val Phe Trp Glu Lys Leu
                645                 650                 655

Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu Thr Lys
            660                 665                 670

Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe Ile His
        675                 680                 685

Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala Asn Ile
    690                 695                 700

Leu His Gln Arg Phe Asn Tyr Gly Lys Asp Asp His Gly Asn Thr Met
705                 710                 715                 720

Lys Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser Gln Phe
                725                 730                 735

Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Gly Val Asn Asp Tyr His
            740                 745                 750

His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr Leu Leu
        755                 760                 765
```

```
Lys Val Tyr Pro Gln Leu Glu Pro Glu Phe Val Tyr Gly Asp Tyr His
    770                 775                 780

Gln Phe Asp Trp Phe Lys Ala Asn Lys Ala Thr Ala Lys Lys Gln Phe
785                 790                 795                 800

Tyr Thr Asn Ile Met Leu Phe Phe Ala Gln Lys Asp Arg Ile Ile Asp
                805                 810                 815

Glu Asn Gly Glu Ile Leu Trp Asp Lys Lys Tyr Leu Asp Thr Val Lys
            820                 825                 830

Lys Val Met Ser Tyr Arg Gln Met Asn Ile Val Lys Lys Thr Glu Ile
        835                 840                 845

Gln Lys Gly Glu Phe Ser Lys Ala Thr Ile Lys Pro Lys Gly Asn Ser
    850                 855                 860

Ser Lys Leu Ile Pro Arg Lys Thr Asn Trp Asp Pro Met Lys Tyr Gly
865                 870                 875                 880

Gly Leu Asp Ser Pro Asn Met Ala Tyr Ala Val Val Ile Glu Tyr Ala
                885                 890                 895

Lys Gly Lys Asn Lys Leu Val Phe Glu Lys Lys Ile Ile Arg Val Thr
            900                 905                 910

Ile Met Glu Arg Lys Ala Phe Glu Lys Asp Glu Lys Ala Phe Leu Glu
        915                 920                 925

Glu Gln Gly Tyr Arg Gln Pro Lys Val Leu Ala Lys Leu Pro Lys Tyr
    930                 935                 940

Thr Leu Tyr Glu Cys Glu Glu Gly Arg Arg Arg Met Leu Ala Ser Ala
945                 950                 955                 960

Asn Glu Ala Gln Lys Gly Asn Gln Gln Val Leu Pro Asn His Leu Val
                965                 970                 975
```

```
Thr Leu Leu His His Ala Ala Asn Cys Glu Val Ser Asp Gly Lys Ser
            980                 985                 990


Leu Asp Tyr Ile Glu Ser Asn Arg  Glu Met Phe Ala Glu  Leu Leu Ala
        995                 1000                1005


His Val  Ser Glu Phe Ala Lys  Arg Tyr Thr Leu Ala  Glu Ala Asn
    1010                1015                1020


Leu Asn  Lys Ile Asn Gln Leu  Phe Glu Gln Asn Lys  Glu Gly Asp
    1025                1030                1035


Ile Lys  Ala Ile Ala Gln Ser  Phe Val Asp Leu Met  Ala Phe Asn
    1040                1045                1050


Ala Met  Gly Ala Pro Ala Ser  Phe Lys Phe Phe Glu  Thr Thr Ile
    1055                1060                1065


Glu Arg  Lys Arg Tyr Asn Asn  Leu Lys Glu Leu Leu  Asn Ser Thr
    1070                1075                1080


Ile Ile  Tyr Gln Ser Ile Thr  Gly Leu Tyr Glu Ser  Arg Lys Arg
    1085                1090                1095


Leu Asp  Asp
    1100


<210>  335
<211>  1327
<212>  PRT
<213>  Listeria ivanovii

<400>  335

Met Arg Lys Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Leu Thr Asp Gln Tyr Asn Leu Val Lys Arg Lys Met
            20                  25                  30
```

```
Lys Val Ala Gly Ser Ala Glu Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Glu Gly Glu Val Ala Ala Gly Arg Arg Met
    50                  55                  60

Asn Arg Thr Thr Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ala
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Ala Glu Met Ala Glu Val Asp Ala Asn
                85                  90                  95

Phe Phe Tyr Arg Leu Glu Asp Ser Phe Tyr Ile Glu Ser Glu Lys Arg
            100                 105                 110

His Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Glu Glu Tyr Lys Thr Ile Tyr His Leu Arg Glu Lys Leu Val Asn
    130                 135                 140

Ser Ser Asp Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Met Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Glu Val Phe Lys Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Ile Phe Ala Ser Asp Ile Glu Arg Leu Glu Glu Asn Lys Glu
        195                 200                 205

Val Ala Glu Ile Leu Ser Glu Lys Leu Thr Arg Arg Glu Lys Leu Asp
    210                 215                 220

Lys Ile Leu Lys Leu Tyr Thr Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240
```

```
Arg Phe Ile Asn Leu Ile Ile Gly Ser Lys Gly Asp Phe Lys Lys Val
                245                 250                 255

Phe Asp Leu Asp Glu Lys Ala Glu Ile Glu Cys Ala Lys Asp Thr Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ala Leu Leu Ala Lys Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Ile Phe Val Ala Ala Lys Ser Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Asn Ile Ile Thr Val Thr Asp Thr Glu Thr Lys Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Lys His Ala Lys Asp Leu Lys Arg Leu
                325                 330                 335

Lys Ala Phe Phe Lys Met Gln Leu Pro Glu Lys Phe Asn Glu Val Phe
            340                 345                 350

Asn Asp Ile Glu Lys Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Thr
        355                 360                 365

Gln Glu Lys Phe Tyr Lys Tyr Met Lys Lys Met Leu Ala Asn Ile Asp
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Asp Gln Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Thr Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Lys Asp Tyr Glu Lys Ile Arg Ser Leu Val Thr Phe Arg Ile
        435                 440                 445
```

```
Pro Tyr Phe Ile Gly Pro Leu Ala Asn Gly Gln Ser Asp Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Ile Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr His His Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Gly Leu Phe Lys Gln Gln Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Arg Phe Leu Tyr Thr Ile Asn His Ile Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Val Glu Asp Ala Phe Asn Ser Ser Phe Ala Thr Tyr
            580                 585                 590

His Asp Leu Gln Lys Gly Gly Val Thr Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Ala Asp Met Leu Glu Glu Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Ser Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Thr Ile Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655
```

```
Trp Gly Arg Leu Ser Ala Lys Leu Leu Thr Gly Ile Arg Asp Lys His
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Ala Asp Lys Gly Ile Gln Ser Ile
705                 710                 715                 720

Val Ala Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Gly Ile Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Phe Ile Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Cys Leu Lys Asn Asp Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Lys Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Ile Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Arg Val Leu Val Ser Ser Thr Ala Asn Arg Glu Lys Gly Asp
    850                 855                 860
```

```
Asn Val Pro Leu Leu Glu Val Val Arg Lys Arg Lys Ala Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Ala Lys Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Asn Phe
            900                 905                 910

Ile Gln Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu Tyr Gln Arg Phe Asn Cys Lys Gln Asp Glu Asn Gly Asn
    930                 935                 940

Glu Val Glu Gln Val Arg Ile Val Thr Leu Lys Ser Thr Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Asp
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Arg Phe Phe Ala  Lys Glu Asn
    1025                1030                1035

Gln Ile  Ile Asp Lys Asn Gly  Glu Ile Leu Trp Asp  Asn Arg Tyr
    1040                1045                1050

Leu Asp  Thr Ile Lys Lys Val  Leu Ser Tyr Arg Gln  Met Asn Ile
    1055                1060                1065
```

```
Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Asn Ala Thr
    1070                1075                1080

Val Asn  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Ser  Arg Lys Ala
    1085                1090                1095

Asp Trp  Asn Pro Ile Lys Tyr  Gly Gly Phe Asp Gly  Ser Asn Met
    1100                1105                1110

Ala Tyr  Ser Ile Val Ile Glu  Tyr Glu Lys Arg Lys  Lys Lys Thr
    1115                1120                1125

Val Ile  Lys Lys Glu Leu Ile  Gln Ile Asn Ile Met  Glu Arg Val
    1130                1135                1140

Ala Phe  Glu Lys Asp Gln Lys  Ala Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

Tyr Ser  Pro Lys Val Leu Thr  Lys Ile Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Asn Gly Arg Arg  Arg Met Leu Gly Ser  Ala Asn Glu
    1175                1180                1185

Ala Gln  Lys Gly Asn Gln Met  Val Leu Pro Asn His  Leu Met Thr
    1190                1195                1200

Leu Leu  Tyr His Ala Lys Asn  Cys Glu Ala Asn Asp  Gly Glu Ser
    1205                1210                1215

Leu Ala  Tyr Ile Glu Met His  Arg Glu Met Phe Ala  Glu Leu Leu
    1220                1225                1230

Ala Tyr  Ile Ser Glu Phe Ala  Lys Arg Tyr Thr Leu  Ala Asn Asp
    1235                1240                1245

Arg Leu  Glu Lys Ile Asn Met  Phe Phe Glu Gln Asn  Lys Lys Gly
    1250                1255                1260
```

```
Asp Ile  Lys Val Ile Ala Lys  Ser Phe Asp Lys Leu  Lys Val Phe
    1265                 1270                 1275


Asn Ala  Phe Gly Ala Pro Arg  Asp Phe Glu Phe Phe  Glu Thr Thr
    1280                 1285                 1290


Ile Lys  Arg Lys Arg Tyr Tyr  Asn Ile Lys Glu Leu  Leu Asn Ala
    1295                 1300                 1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ala Arg Lys
    1310                 1315                 1320


Arg Leu  Glu Asp
    1325


<210>  336
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<212>  PRT
<213>  Listeria ivanovii

<400>  336

Met Lys Lys Met Leu Ala Asn Ile Asp Gly Ala Asp Tyr Phe Ile Asp
1               5                  10                  15


Gln Ile Glu Glu Glu Asn Phe Leu Arg Lys Gln Arg Thr Phe Asp Asn
            20                  25                  30


Gly Thr Ile Pro His Gln Leu His Leu Glu Glu Leu Glu Ala Ile Leu
        35                  40                  45


His Gln Gln Ala Lys Tyr Tyr Pro Phe Leu Arg Lys Asp Tyr Glu Lys
    50                  55                  60


Ile Arg Ser Leu Val Thr Phe Arg Ile Pro Tyr Phe Ile Gly Pro Leu
65                  70                  75                  80


Ala Asn Gly Gln Ser Asp Phe Ala Trp Leu Thr Arg Lys Ala Asp Gly
                85                  90                  95
```

```
Glu Ile Arg Pro Trp Asn Ile Glu Glu Lys Val Asp Phe Gly Lys Ser
            100                 105                 110

Ala Ile Asp Phe Ile Glu Lys Met Thr Asn Lys Asp Thr Tyr Leu Pro
        115                 120                 125

Lys Glu Asn Val Leu Pro Lys His Ser Leu Cys Tyr Gln Lys Tyr Met
    130                 135                 140

Val Tyr Asn Glu Leu Thr Lys Ile Arg Tyr Ile Asp Asp Gln Gly Lys
145                 150                 155                 160

Thr His His Phe Ser Gly Gln Glu Lys Gln Gln Ile Phe Asn Gly Leu
                165                 170                 175

Phe Lys Gln Gln Arg Lys Val Lys Lys Lys Asp Leu Glu Arg Phe Leu
            180                 185                 190

Tyr Thr Ile Asn His Ile Glu Ser Pro Thr Ile Glu Gly Val Glu Asp
        195                 200                 205

Ala Phe Asn Ser Ser Phe Ala Thr Tyr His Asp Leu Gln Lys Gly Gly
    210                 215                 220

Val Thr Gln Glu Ile Leu Asp Asn Pro Leu Asn Ala Asp Met Leu Glu
225                 230                 235                 240

Glu Ile Val Lys Ile Leu Thr Val Phe Glu Asp Lys Arg Met Ile Lys
                245                 250                 255

Glu Gln Leu Gln Ser Phe Ser Asp Val Leu Asp Gly Thr Ile Leu Lys
            260                 265                 270

Lys Leu Glu Arg Arg His Tyr Thr Gly Trp Gly Arg Leu Ser Ala Lys
        275                 280                 285

Leu Leu Thr Gly Ile Arg Asp Lys His Ser His Leu Thr Ile Leu Asp
    290                 295                 300
```

```
Tyr Leu Met Asp Asp Gly Leu Asn Arg Asn Leu Met Gln Leu Ile Asn
305                 310                 315                 320

Asp Ser Asn Leu Ser Phe Lys Ser Ile Ile Glu Lys Glu Gln Val Ser
                325                 330                 335

Thr Ala Asp Lys Gly Ile Gln Ser Ile Val Ala Glu Leu Ala Gly Ser
            340                 345                 350

Pro Ala Ile Lys Lys Gly Ile Leu Gln Ser Leu Lys Ile Val Asp Glu
        355                 360                 365

Leu Val Gly Ile Met Gly Tyr Pro Pro Gln Thr Ile Val Val Glu Met
    370                 375                 380

Ala Arg Glu Asn Gln Thr Thr Gly Lys Gly Lys Asn Asn Ser Lys Pro
385                 390                 395                 400

Arg Phe Ile Ser Leu Glu Lys Ala Ile Lys Glu Phe Gly Ser Gln Ile
                405                 410                 415

Leu Lys Glu His Pro Thr Asp Asn Gln Cys Leu Lys Asn Asp Arg Leu
            420                 425                 430

Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys Asp Met Tyr Thr Gly Lys Glu
        435                 440                 445

Leu Asp Ile His Asn Leu Ser Asn Tyr Asp Ile Asp His Ile Ile Pro
    450                 455                 460

Gln Ser Phe Ile Thr Asp Asn Ser Ile Asp Asn Arg Val Leu Val Ser
465                 470                 475                 480

Ser Thr Ala Asn Arg Glu Lys Gly Asp Asn Val Pro Leu Leu Glu Val
                485                 490                 495

Val Arg Lys Arg Lys Ala Phe Trp Glu Lys Leu Tyr Gln Ala Lys Leu
            500                 505                 510
```

```
Met Ser Lys Arg Lys Phe Asp Tyr Leu Thr Lys Ala Glu Arg Gly Gly
        515                 520                 525

Leu Thr Glu Ala Asp Lys Ala Asn Phe Ile Gln Arg Gln Leu Val Glu
    530                 535                 540

Thr Arg Gln Ile Thr Lys Asn Val Ala Asn Ile Leu Tyr Gln Arg Phe
545                 550                 555                 560

Asn Cys Lys Gln Asp Glu Asn Gly Asn Glu Val Glu Gln Val Arg Ile
                565                 570                 575

Val Thr Leu Lys Ser Thr Leu Val Ser Gln Phe Arg Lys Gln Phe Gln
            580                 585                 590

Leu Tyr Lys Val Arg Glu Val Asn Asp Tyr His His Ala His Asp Ala
        595                 600                 605

Tyr Leu Asn Gly Val Val Ala Asn Thr Leu Leu Lys Val Tyr Pro Gln
    610                 615                 620

Leu Glu Pro Glu Phe Val Tyr Gly Asp Tyr His Gln Phe Asp Trp Phe
625                 630                 635                 640

Lys Ala Asn Lys Ala Thr Ala Lys Lys Gln Phe Tyr Thr Asn Ile Met
                645                 650                 655

Arg Phe Phe Ala Lys Glu Asn Gln Ile Ile Asp Lys Asn Gly Glu Ile
            660                 665                 670

Leu Trp Asp Asn Arg Tyr Leu Asp Thr Ile Lys Lys Val Leu Ser Tyr
        675                 680                 685

Arg Gln Met Asn Ile Val Lys Lys Thr Glu Ile Gln Lys Gly Glu Phe
    690                 695                 700

Ser Asn Ala Thr Val Asn Pro Lys Gly Asn Ser Ser Lys Leu Ile Ser
705                 710                 715                 720
```

```
Arg Lys Ala Asp Trp Asn Pro Ile Lys Tyr Gly Gly Phe Asp Gly Ser
                725                 730                 735

Asn Met Ala Tyr Ser Ile Val Ile Glu Tyr Glu Lys Arg Lys Lys Lys
            740                 745                 750

Thr Val Ile Lys Lys Glu Leu Ile Gln Ile Asn Ile Met Glu Arg Val
        755                 760                 765

Ala Phe Glu Lys Asp Gln Lys Ala Phe Leu Glu Glu Lys Gly Tyr Tyr
    770                 775                 780

Ser Pro Lys Val Leu Thr Lys Ile Pro Lys Tyr Thr Leu Tyr Glu Cys
785                 790                 795                 800

Glu Asn Gly Arg Arg Arg Met Leu Gly Ser Ala Asn Glu Ala Gln Lys
                805                 810                 815

Gly Asn Gln Met Val Leu Pro Asn His Leu Met Thr Leu Leu Tyr His
            820                 825                 830

Ala Lys Asn Cys Glu Ala Asn Asp Gly Glu Ser Leu Ala Tyr Ile Glu
        835                 840                 845

Met His Arg Glu Met Phe Ala Glu Leu Leu Ala Tyr Ile Ser Glu Phe
    850                 855                 860

Ala Lys Arg Tyr Thr Leu Ala Asn Asp Arg Leu Glu Lys Ile Asn Met
865                 870                 875                 880

Phe Phe Glu Gln Asn Lys Lys Gly Asp Ile Lys Val Ile Ala Lys Ser
                885                 890                 895

Phe Asp Lys Leu Lys Val Phe Asn Ala Phe Gly Ala Pro Arg Asp Phe
            900                 905                 910

Glu Phe Phe Glu Thr Thr Ile Lys Arg Lys Arg Tyr Tyr Asn Ile Lys
        915                 920                 925
```

Glu Leu Leu Asn Ala Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr
930 935 940

Glu Ala Arg Lys Arg Leu Glu Asp
945 950

<210> 337
<211> 1327
<212> PRT
<213> Listeria monocytogenes

<400> 337

Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Leu Thr Asn Gln Tyr Asp Leu Val Lys Arg Lys Met
20 25 30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
50 55 60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
85 90 95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
100 105 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
115 120 125

His Asp Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Lys Leu Val Asn
130 135 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His

145 150 155 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
165 170 175

Lys Asn Thr Ser Val Asp Glu Val Tyr Lys Gln Phe Ile Glu Thr Tyr
180 185 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Ile Glu
195 200 205

Val Ala Asn Ile Leu Ala Gly Lys Phe Thr Arg Arg Glu Lys Phe Glu
210 215 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225 230 235 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
245 250 255

Phe Asp Leu Ile Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
260 265 270

Glu Glu Asp Leu Glu Thr Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
275 280 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
290 295 300

Ser Ile Ile Thr Val Thr Asp Thr Glu Thr Asn Ala Lys Leu Ser Ala
305 310 315 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Val Glu Leu
325 330 335

Lys Ala Phe Ile Lys Leu Asn Leu Pro Lys Gln Tyr Glu Glu Ile Phe
340 345 350

Ser Asn Ala Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys

```
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Ile Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ser Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Ile His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Glu Asp Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Arg Glu Lys
    530                 535                 540

Gln Gln Val Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Ile Glu Ser Pro
```

565 570 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
580 585 590

His Asp Leu Leu Lys Val Gly Met Lys Gln Glu Ile Leu Asp Asn Pro
595 600 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
610 615 620

Glu Asp Lys Pro Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625 630 635 640

Leu Asp Gly Gly Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
645 650 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Glu Lys Gln
660 665 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
675 680 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
690 695 700

Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705 710 715 720

Val Ala Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
725 730 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro
740 745 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
755 760 765

Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile

```
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Gly
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu Tyr Gln Arg Phe Asn Lys Glu Thr Asp Asn His Gly Asn
    930                 935                 940

Thr Met Glu Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Gly
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
```

980 985 990

Leu Leu Lys Val Tyr Pro Gln Leu Glu Pro Glu Phe Val Tyr Gly Glu
995 1000 1005

Tyr His Gln Phe Asp Trp Phe Lys Ala Asn Lys Ala Thr Ala Lys
1010 1015 1020

Lys Gln Phe Tyr Thr Asn Ile Met Leu Phe Phe Ala Gln Lys Glu
1025 1030 1035

Arg Ile Ile Asp Glu Asn Gly Glu Ile Leu Trp Asp Lys Lys Tyr
1040 1045 1050

Leu Glu Thr Ile Lys Lys Val Leu Asp Tyr Arg Gln Met Asn Ile
1055 1060 1065

Val Lys Lys Thr Glu Ile Gln Lys Gly Glu Phe Ser Lys Ala Thr
1070 1075 1080

Ile Lys Pro Lys Gly Asn Ser Ser Lys Leu Ile Pro Arg Lys Glu
1085 1090 1095

Asn Trp Asp Pro Met Lys Tyr Gly Gly Leu Asp Ser Pro Asn Met
1100 1105 1110

Ala Tyr Ala Val Ile Ile Glu His Ala Lys Gly Lys Lys Lys Ile
1115 1120 1125

Val Ile Glu Lys Lys Leu Ile Gln Ile Asn Ile Met Glu Arg Lys
1130 1135 1140

Met Phe Glu Lys Asp Glu Glu Ala Phe Leu Glu Glu Lys Gly Tyr
1145 1150 1155

Arg His Pro Lys Val Leu Thr Lys Leu Pro Lys Tyr Thr Leu Tyr
1160 1165 1170

Glu Cys Glu Lys Gly Arg Arg Arg Met Leu Ala Ser Ala Asn Glu

1175 1180 1185

Ala Gln Lys Gly Asn Gln Leu Val Leu Ser Asn His Leu Val Ser
1190 1195 1200

Leu Leu Tyr His Ala Lys Asn Cys Glu Ala Ser Asp Gly Lys Ser
1205 1210 1215

Leu Lys Tyr Ile Glu Ala His Arg Glu Thr Phe Ser Glu Leu Leu
1220 1225 1230

Ala Gln Val Ser Glu Phe Ala Thr Arg Tyr Thr Leu Ala Asp Ala
1235 1240 1245

Asn Leu Ser Lys Ile Asn Asn Leu Phe Glu Gln Asn Lys Glu Gly
1250 1255 1260

Asp Ile Lys Ala Ile Ala Gln Ser Phe Val Asp Leu Met Ala Phe
1265 1270 1275

Asn Ala Met Gly Ala Pro Ala Ser Phe Lys Phe Phe Glu Ala Thr
1280 1285 1290

Ile Asp Arg Lys Arg Tyr Thr Asn Leu Lys Glu Leu Leu Ser Ser
1295 1300 1305

Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr Glu Ser Arg Lys
1310 1315 1320

Arg Leu Asp Asp
1325

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<213> Listeria monocytogenes

<400> 338

Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

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Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
    50                  55                  60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Glu Val Tyr Lys Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Thr Glu
        195                 200                 205

Val Ala Ser Ile Leu Ala Gly Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220
```

```
Arg Ile Leu Arg Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Asn Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asn Leu Val Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ala Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Ala Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Glu Leu Gly Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys Gln Tyr Gln Glu Ile Phe
            340                 345                 350

Asn Asn Ala Glu Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Thr Leu Glu Asn Val Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Thr Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430
```

```
Leu Arg Glu Gly Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Asp Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Arg Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Ile Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Leu Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Ile Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Glu Gln Phe Ser Asp Val
625                 630                 635                 640
```

```
Leu Asp Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Asp Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Ile Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845
```

```
Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Gly
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Lys Glu Thr Asp Asn His Gly Asn
    930                 935                 940

Thr Met Glu Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Glu
    1025                1030                1035

Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050
```

```
Leu Glu  Thr Ile Lys Lys Val  Leu Asp Tyr Arg Gln  Ile Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Lys Ala Thr
    1070                1075                1080

Ile Lys  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Pro  Arg Lys Glu
    1085                1090                1095

Asn Trp  Asp Pro Met Lys Tyr  Gly Gly Leu Asp Ser  Pro Asn Met
    1100                1105                1110

Ala Tyr  Ala Val Ile Ile Glu  His Ala Lys Gly Lys  Lys Lys Ile
    1115                1120                1125

Val Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Lys
    1130                1135                1140

Met Phe  Glu Lys Asp Glu Glu  Ala Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

His Gln  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Lys Gly Arg Arg  Arg Met Leu Ser Ser  Ala Asn Glu
    1175                1180                1185

Ala Gln  Lys Gly Asn Gln Leu  Val Leu Ser Asn His  Leu Val Ser
    1190                1195                1200

Leu Leu  Tyr His Ala Lys Asn  Cys Glu Ala Ser Asp  Gly Lys Ser
    1205                1210                1215

Leu Lys  Tyr Ile Glu Ala His  Arg Glu Thr Phe Ser  Glu Leu Leu
    1220                1225                1230

Ala Gln  Val Ser Glu Phe Ala  Thr Lys Tyr Thr Leu  Ala Asp Ala
    1235                1240                1245
```

```
Asn Leu  Ser Lys Ile Asn Asn  Leu Phe Glu Gln Asn  Lys Glu Gly
    1250                1255                1260


Asp Ile  Lys Ala Ile Ala Gln  Ser Phe Val Asp Leu  Met Ala Phe
    1265                1270                1275


Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Phe Phe  Glu Ala Thr
    1280                1285                1290


Ile Asp  Arg Lys Arg Tyr Thr  Asn Leu Lys Glu Leu  Leu Ser Ser
    1295                1300                1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                1315                1320


Arg Leu  Asp Asp
    1325
```

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<213> Listeria monocytogenes

<400> 339

```
Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30


Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
    50                  55                  60


Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65                  70                  75                  80
```

```
Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Glu Val Tyr Lys Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Thr Glu
        195                 200                 205

Val Ala Ser Ile Leu Ala Gly Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220

Arg Ile Leu Arg Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Asn Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asn Leu Val Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ala Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285
```

```
Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Ala Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Glu Leu Gly Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys Gln Tyr Gln Glu Ile Phe
            340                 345                 350

Asn Asn Ala Glu Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Thr Leu Glu Asn Val Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Thr Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Gly Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Asp Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495
```

```
Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Arg Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Ile Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Leu Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Ile Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Glu Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700
```

```
Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Asp Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Ile Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Gly
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910
```

```
Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Lys Glu Thr Asp Asn His Gly Asn
    930                 935                 940

Thr Met Glu Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Glu
    1025                1030                1035

Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Glu  Thr Ile Lys Lys Val  Leu Asp Tyr Arg Gln  Ile Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Lys Ala Thr
    1070                1075                1080

Ile Lys  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Pro  Arg Lys Glu
    1085                1090                1095

Asn Trp  Asp Pro Val Lys Tyr  Gly Gly Leu Asp Ser  Pro Asn Met
    1100                1105                1110
```

```
Ala Tyr  Ala Val Ile Ile Glu  His Ala Lys Gly Lys  Lys Lys Ile
    1115                1120                1125

Val Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Lys
    1130                1135                1140

Met Phe  Glu Lys Asp Glu Glu  Ala Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

His Gln  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Lys Gly Arg Arg  Arg Met Leu Ser Ser  Ala Asn Glu
    1175                1180                1185

Ala Gln  Lys Gly Asn Gln Leu  Val Leu Ser Asn His  Leu Val Ser
    1190                1195                1200

Leu Leu  Tyr His Ala Lys Asn  Cys Glu Ala Ser Asp  Gly Lys Ser
    1205                1210                1215

Leu Lys  Tyr Ile Glu Ala His  Arg Glu Thr Phe Ser  Glu Leu Leu
    1220                1225                1230

Ala Gln  Val Ser Glu Phe Ala  Thr Lys Tyr Thr Leu  Ala Asp Ala
    1235                1240                1245

Asn Leu  Ser Lys Ile Asn Asn  Leu Phe Glu Gln Asn  Lys Glu Gly
    1250                1255                1260

Asp Ile  Lys Ala Ile Ala Gln  Ser Phe Val Asp Leu  Met Ala Phe
    1265                1270                1275

Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Phe Phe  Glu Ala Thr
    1280                1285                1290

Ile Asp  Arg Lys Arg Tyr Thr  Asn Leu Lys Glu Leu  Leu Ser Ser
    1295                1300                1305
```

Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr Glu Ser Arg Lys
    1310   1315   1320

Arg Leu Asp Asp
    1325

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<212> PRT
<213> Listeria monocytogenes

<400> 340

Met Lys Lys Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20   25   30

Lys Ile Ser Gly Asp Ser Glu Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35   40   45

Gly Val Arg Leu Phe Glu Lys Gly Glu Thr Ala Ala Lys Arg Arg Met
    50   55   60

Ser Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65   70   75   80

Tyr Leu Gln Glu Ile Phe Ala Ile Gln Met Asn Glu Val Asp Asp Asn
                85   90   95

Phe Phe Asn Arg Leu Lys Glu Ser Phe Tyr Ala Glu Ser Asp Lys Lys
            100   105   110

Tyr Asn Arg His Pro Phe Phe Gly Thr Val Glu Glu Glu Val Ala Tyr
        115   120   125

Tyr Lys Asp Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ile Asp
    130   135   140

```
Ser Gln Lys Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160


Ile Ile Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175


Lys Asn Thr Ser Ile Asp Glu Met Phe Lys Gln Phe Leu Gln Ile Tyr
            180                 185                 190


Asn Gln Val Phe Ala Asn Asp Ile Glu Lys Thr Glu Lys Asn Gln Glu
        195                 200                 205


Val Ala Gln Ile Leu Ala Glu Lys Phe Thr Arg Lys Asp Lys Leu Asp
    210                 215                 220


Lys Ile Leu Ser Leu Tyr Pro Gly Glu Lys Thr Thr Gly Val Phe Ala
225                 230                 235                 240


Gln Phe Val Asn Ile Ile Val Gly Ser Thr Gly Lys Phe Lys Lys His
                245                 250                 255


Phe Asn Leu His Glu Lys Lys Asp Ile Asn Cys Ala Glu Asp Thr Tyr
            260                 265                 270


Asp Thr Asp Leu Glu Ser Leu Leu Ala Ile Ile Gly Asp Glu Phe Ala
        275                 280                 285


Glu Val Phe Val Ala Ala Lys Asn Ala Tyr Asn Ala Val Val Leu Ser
    290                 295                 300


Asn Ile Ile Thr Val Thr Asp Ser Thr Thr Arg Ala Lys Leu Ser Ala
305                 310                 315                 320


Ser Leu Ile Glu Arg Phe Glu Asn His Lys Glu Asp Leu Lys Lys Met
                325                 330                 335


Lys Arg Phe Val Arg Thr Tyr Leu Pro Glu Lys Tyr Asp Glu Ile Phe
            340                 345                 350
```

```
Asp Asp Thr Glu Lys His Gly Tyr Ala Gly Tyr Ile Ser Gly Thr Lys
        355                 360                 365

Gln Ala Asp Phe Tyr Lys Tyr Met Lys Ala Thr Leu Glu Lys Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Lys Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560
```

```
Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn Gln Ile Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Met Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Thr Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Asn Lys
        755                 760                 765
```

```
Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Val
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asn Val Pro Pro Leu Glu Ile Val Gln Lys Arg Lys Ile Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Lys Thr Asp Gly Asn Lys Asp
    930                 935                 940

Thr Met Glu Thr Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Phe Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975
```

```
Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Gly Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Asp
    1025                1030                1035

Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Arg Tyr
    1040                1045                1050

Leu Glu  Thr Val Lys Lys Val  Leu Gly Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Asn Val Thr
    1070                1075                1080

Pro Asn  Pro Lys Gly Lys Ser  Asn Lys Leu Ile Pro  Arg Lys Lys
    1085                1090                1095

Asp Trp  Asp Pro Ile Lys Tyr  Gly Gly Phe Asp Gly  Ser Lys Met
    1100                1105                1110

Ala Tyr  Ala Ile Ile Ile Glu  Tyr Glu Lys Gln Lys  Arg Lys Val
    1115                1120                1125

Arg Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Glu
    1130                1135                1140

Ala Phe  Glu Lys Asp Glu Lys  Thr Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

His Gln  Pro Lys Val Leu Ile  Lys Val Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170
```

```
Glu Cys  Lys Asn Gly Arg Arg  Arg Met Leu Gly Ser  Ala Asn Glu
    1175                 1180                 1185


Ala His  Lys Gly Asn Gln Met  Leu Leu Pro Asn His  Leu Met Ala
    1190                 1195                 1200


Leu Leu  Tyr His Ala Glu Lys  Tyr Glu Ala Ile Asp  Gly Glu Ser
    1205                 1210                 1215


Leu Ala  Tyr Ile Glu Val His  Arg Ala Leu Phe Asp  Glu Leu Leu
    1220                 1225                 1230


Ala Tyr  Ile Ser Glu Phe Ala  Arg Lys Tyr Thr Leu  Ser Asn Asp
    1235                 1240                 1245


Arg Leu  Asp Glu Ile Asn Met  Leu Tyr Glu Arg Asn  Lys Asp Gly
    1250                 1255                 1260


Asp Val  Lys Ser Ile Ala Glu  Ser Phe Val Ser Leu  Lys Lys Phe
    1265                 1270                 1275


Asn Ala  Phe Gly Val His Gln  Asp Phe Ser Phe Phe  Gly Thr Lys
    1280                 1285                 1290


Ile Glu  Arg Lys Arg Asp Arg  Lys Leu Asn Glu Leu  Leu Asn Ser
    1295                 1300                 1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                 1315                 1320


Arg Leu  Asp Asn
    1325


<210>  341
<211>  1327
<212>  PRT
<213>  Listeria monocytogenes

<400>  341

Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
```

```
1               5                   10                  15

Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Glu Gly Glu Thr Ala Ala Asp Arg Arg Met
    50                  55                  60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Leu Glu Met Ala Asn Ile Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Gly Val Tyr Lys Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Ile Ser Asn Ile Glu Lys Met Glu Glu Asn Thr Thr
        195                 200                 205

Val Ala Asp Ile Leu Ala Gly Lys Phe Thr Arg Lys Glu Lys Leu Glu
```

```
    210                 215                 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asp Leu Val Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ala Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Asp Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Ser Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys Gln Tyr Glu Glu Ile Phe
            340                 345                 350

Ser Asn Val Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Leu Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
```

420 425 430

Leu Lys Glu Ala Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
435 440 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Asp Phe Ala Trp
450 455 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465 470 475 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
485 490 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
500 505 510

Leu Tyr Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Val Arg
515 520 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
530 535 540

Gln Gln Ile Phe Asn Asp Tyr Phe Lys Gln Lys Arg Lys Val Ser Lys
545 550 555 560

Lys Asp Leu Glu Gln Phe Leu Arg Asn Met Ser His Ile Glu Ser Pro
565 570 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ser Ser Tyr Ala Thr Tyr
580 585 590

His Asp Leu Leu Lys Val Gly Ile Lys Gln Glu Val Leu Glu Asn Pro
595 600 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
610 615 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val

625 630 635 640

Leu Asp Gly Ala Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
645 650 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
660 665 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
675 680 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
690 695 700

Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705 710 715 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
725 730 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro
740 745 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Val Lys
755 760 765

Gly Lys Asn Asn Ser Arg Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
770 775 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785 790 795 800

Glu Leu Arg Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
805 810 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
820 825 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile

835 840 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
850 855 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865 870 875 880

Lys Leu Phe Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
885 890 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Thr Phe
900 905 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
915 920 925

Asn Ile Leu His Gln Arg Phe Asn Asn Glu Thr Asp Asn His Gly Asn
930 935 940

Asn Met Glu Gln Val Arg Ile Val Met Leu Lys Ser Ala Leu Val Ser
945 950 955 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
965 970 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
980 985 990

Leu Leu Lys Val Tyr Pro Gln Leu Glu Pro Glu Phe Val Tyr Gly Glu
995 1000 1005

Tyr His Gln Phe Asp Trp Phe Lys Ala Asn Lys Ala Thr Ala Lys
1010 1015 1020

Lys Gln Phe Tyr Thr Asn Ile Met Leu Phe Phe Ala Gln Lys Glu
1025 1030 1035

Arg Ile Ile Asp Glu Asn Gly Glu Ile Leu Trp Asp Lys Lys Tyr

1040 1045 1050

Leu Glu Thr Ile Lys Lys Val Leu Asp Tyr Arg Gln Met Asn Ile
1055 1060 1065

Val Lys Lys Thr Glu Ile Gln Lys Gly Glu Phe Ser Lys Ala Thr
1070 1075 1080

Ile Lys Pro Lys Gly Asn Ser Ser Lys Leu Ile Pro Arg Lys Glu
1085 1090 1095

Asn Trp Asp Pro Met Lys Tyr Gly Gly Leu Asp Ser Pro Asn Met
1100 1105 1110

Ala Tyr Ala Val Ile Ile Glu His Ala Lys Gly Lys Lys Lys Val
1115 1120 1125

Val Phe Glu Lys Lys Ile Ile Arg Ile Thr Ile Met Glu Arg Lys
1130 1135 1140

Ala Phe Glu Lys Asp Glu Lys Ser Phe Leu Glu Lys Gln Gly Tyr
1145 1150 1155

Arg Gln Pro Lys Val Leu Thr Lys Leu Pro Lys Tyr Thr Leu Tyr
1160 1165 1170

Glu Cys Glu Asn Gly Arg Arg Arg Met Leu Ala Ser Ala Asn Glu
1175 1180 1185

Ala Gln Lys Gly Asn Gln Gln Val Leu Lys Gly Gln Leu Ile Thr
1190 1195 1200

Leu Leu His His Ala Lys Asn Cys Glu Ala Ser Asp Gly Lys Ser
1205 1210 1215

Leu Asp Tyr Ile Glu Ser Asn Arg Glu Met Phe Gly Glu Leu Leu
1220 1225 1230

Ala His Val Ser Glu Phe Ala Lys Arg Tyr Thr Leu Ala Asp Ala

1235 1240 1245

Asn Leu Ser Lys Ile Asn Gln Leu Phe Glu Gln Asn Lys Asp Asn
1250 1255 1260

Asp Ile Lys Val Ile Ala Gln Ser Phe Val Asn Leu Met Ala Phe
1265 1270 1275

Asn Ala Met Gly Ala Pro Ala Ser Phe Lys Phe Phe Glu Ala Thr
1280 1285 1290

Ile Glu Arg Lys Arg Tyr Thr Asn Leu Lys Glu Leu Leu Ser Ala
1295 1300 1305

Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr Glu Ala Arg Lys
1310 1315 1320

Arg Leu Asp Gly
1325

<210> 342
<211> 1327
<212> PRT
<213> Listeria monocytogenes

<400> 342

Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Leu Thr Asn Gln Tyr Asp Leu Val Lys Arg Lys Met
20 25 30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
50 55 60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65 70 75 80

```
Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Gly Val Tyr Glu Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Ile Glu
        195                 200                 205

Val Ala Asn Ile Leu Ala Gly Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asp Leu Ile Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ala Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285
```

```
Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Ala Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Gly Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys Gln Tyr Gln Glu Ile Phe
            340                 345                 350

Asn Asn Ala Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Ile Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Ile His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Lys Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495
```

```
Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Ile Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Met Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Pro Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Gly Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Glu Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700
```

```
Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Lys Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Gly
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Ala Asp Lys Ala Arg Phe
            900                 905                 910
```

```
Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Asn Glu Thr Asp Asn His Gly Asn
    930                 935                 940

Thr Met Glu Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Gly  Gln Lys Glu
    1025                1030                1035

Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Glu  Thr Ile Lys Lys Val  Leu Asp Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Lys Ala Thr
    1070                1075                1080

Ile Lys  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Pro  Arg Lys Glu
    1085                1090                1095

Asn Trp  Asp Pro Met Lys Tyr  Gly Gly Leu Asp Ser  Pro Asn Met
    1100                1105                1110
```

```
Ala Tyr  Ala Val Ile Ile Glu  His Ala Lys Gly Lys  Lys Lys Leu
    1115                1120                1125

Ile Phe  Glu Lys Lys Ile Ile  Arg Ile Thr Ile Met  Glu Arg Lys
    1130                1135                1140

Met Phe  Glu Lys Asp Glu Glu  Ala Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

Arg His  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Lys Gly Arg Arg  Arg Met Leu Ala Ser  Ala Asn Glu
    1175                1180                1185

Ala Gln  Lys Gly Asn Gln Leu  Val Leu Ser Asn His  Leu Val Ser
    1190                1195                1200

Leu Leu  Tyr His Ala Lys Asn  Cys Glu Ala Ser Asp  Gly Lys Ser
    1205                1210                1215

Leu Lys  Tyr Ile Glu Ala His  Arg Glu Thr Phe Ser  Glu Leu Leu
    1220                1225                1230

Ala Gln  Val Ser Glu Phe Ala  Thr Arg Tyr Thr Leu  Ala Asp Ala
    1235                1240                1245

Asn Leu  Ser Lys Ile Asn Asn  Leu Phe Glu Gln Asn  Lys Glu Gly
    1250                1255                1260

Asp Ile  Gln Ala Ile Ala Gln  Ser Phe Val Asp Leu  Met Ala Phe
    1265                1270                1275

Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Phe Phe  Glu Ala Thr
    1280                1285                1290

Ile Asp  Arg Lys Arg Tyr Thr  Asn Leu Lys Glu Leu  Leu Ser Ser
    1295                1300                1305
```

Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr Glu Ser Arg Lys
    1310   1315   1320

Arg Leu Asp Asp
    1325

<210> 343
<211> 1327
<212> PRT
<213> Listeria monocytogenes

<400> 343

Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1   5   10   15

Gly Trp Ala Val Leu Thr Asn Gln Tyr Asp Leu Val Lys Arg Lys Met
            20   25   30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35   40   45

Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
    50   55   60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65   70   75   80

Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
                85   90   95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100   105   110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115   120   125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130   135   140

```
Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Gly Val Tyr Glu Gln Phe Ile Leu Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Ile Glu
        195                 200                 205

Val Ala Asn Ile Leu Ala Gly Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asp Leu Ile Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Thr Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Asp Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Val Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu Asn Leu Pro Lys Gln Tyr Glu Glu Ile Phe
            340                 345                 350
```

```
Ser Asn Ala Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Thr Leu Glu Asn Val Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Thr Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Lys Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560
```

```
Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Val Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Met Lys Val Gly Ile Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Thr Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Ala Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Val Val Glu Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Asn Lys
        755                 760                 765
```

```
Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asn Val Pro Pro Leu Glu Ile Val Gln Lys Arg Lys Ile Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Lys Thr Asp Asp Asn Glu Asp
    930                 935                 940

Thr Met Glu Pro Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975
```

```
Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990


Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005


Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020


Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Glu
    1025                1030                1035


Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050


Leu Glu  Thr Ile Lys Lys Val  Leu Asn Tyr Arg Gln  Met Asn Ile
    1055                1060                1065


Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Asn Gln Asn
    1070                1075                1080


Pro Lys  Pro Arg Gly Asp Ser  Ser Lys Leu Ile Pro  Lys Lys Thr
    1085                1090                1095


Asn Leu  Asn Pro Ile Lys Tyr  Gly Gly Phe Glu Gly  Ser Asn Met
    1100                1105                1110


Ala Tyr  Ala Ile Ile Ile Glu  His Glu Lys Arg Lys  Lys Lys Val
    1115                1120                1125


Thr Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Lys
    1130                1135                1140


Ala Phe  Glu Lys Asp Glu Lys  Val Phe Leu Glu Gly  Lys Gly Tyr
    1145                1150                1155


His Gln  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Ala Leu Tyr
    1160                1165                1170
```

```
Glu Cys  Glu Asn Gly Arg Arg  Arg Met Leu Gly Ser  Ala Asn Glu
    1175                 1180                 1185


Val His  Lys Gly Asn Gln Met  Leu Leu Pro Asn His  Leu Met Thr
    1190                 1195                 1200


Leu Leu  Tyr His Ala Glu Lys  Arg Glu Ala Ile Asp  Gly Glu Ser
    1205                 1210                 1215


Leu Ala  Tyr Ile Glu Ala His  Lys Ala Val Phe Gly  Glu Leu Leu
    1220                 1225                 1230


Ala His  Ile Ser Glu Phe Ala  Arg Lys Tyr Thr Leu  Ala Asn Asp
    1235                 1240                 1245


Lys Leu  Asp Glu Ile Asn Met  Leu Tyr Glu Arg Asn  Lys Asp Gly
    1250                 1255                 1260


Asp Val  Lys Ser Ile Ala Glu  Ser Phe Val Ser Leu  Lys Lys Phe
    1265                 1270                 1275


Asn Ala  Phe Gly Val His Lys  Asp Phe Asn Phe Phe  Gly Thr Thr
    1280                 1285                 1290


Ile Lys  Arg Lys Arg Asp Arg  Lys Leu Lys Glu Leu  Leu Asn Ser
    1295                 1300                 1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                 1315                 1320


Arg Leu  Asp Ser
    1325


<210>  344
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<212>  PRT
<213>  Listeria monocytogenes

<400>  344
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```
Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
    50                  55                  60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Gly Val Tyr Glu Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Ile Glu
        195                 200                 205
```

```
Val Ala Asn Ile Leu Ala Gly Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asp Leu Ile Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Thr Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Asn Asp Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Val Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu Asn Leu Pro Lys Gln Tyr Glu Glu Ile Phe
            340                 345                 350

Ser Asn Ala Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Ile Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ser Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415
```

```
Glu Glu Leu Glu Ala Ile Ile His Gln Gln Ala Lys Tyr Tyr Thr Phe
            420                 425                 430

Leu Lys Glu Asp Tyr Asp Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn Gln Ile Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Met Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620
```

```
Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640


Leu Asp Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655


Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
            660                 665                 670


Ser His Leu Thr Ile Leu Glu Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685


Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700


Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720


Val Ala Glu Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735


Ser Leu Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro
            740                 745                 750


Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765


Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780


Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800


Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815


Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830
```

```
Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Gly
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Lys Glu Thr Asp Asn His Gly Asn
    930                 935                 940

Thr Met Glu Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Glu
    1025                1030                1035
```

```
Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Glu  Thr Ile Lys Lys Val  Leu Asp Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Lys Ala Thr
    1070                1075                1080

Ile Lys  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Pro  Arg Lys Glu
    1085                1090                1095

Asn Trp  Asp Pro Met Lys Tyr  Gly Gly Leu Asp Ser  Pro Asn Met
    1100                1105                1110

Ala Tyr  Ala Val Ile Ile Glu  His Ala Lys Gly Lys  Lys Arg Ile
    1115                1120                1125

Val Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Lys
    1130                1135                1140

Met Phe  Glu Lys Asp Glu Glu  Ala Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

Arg His  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Lys Gly Arg Arg  Arg Met Leu Ala Ser  Ala Asn Glu
    1175                1180                1185

Ala Gln  Lys Gly Asn Gln Leu  Val Leu Ser Asn His  Leu Val Ser
    1190                1195                1200

Leu Leu  Tyr His Ala Lys Asn  Cys Glu Ala Ser Asp  Gly Lys Ser
    1205                1210                1215

Leu Lys  Tyr Ile Glu Ala His  Arg Glu Thr Phe Ser  Glu Leu Leu
    1220                1225                1230
```

```
Ala Gln  Val Ser Glu Phe Ala  Thr Arg Tyr Thr Leu  Ala Asp Ala
    1235                 1240                 1245


Asn Leu  Ser Lys Ile Asn Asn  Leu Phe Glu Gln Asn  Lys Glu Gly
    1250                 1255                 1260


Asp Ile  Lys Ala Ile Ala Gln  Ser Phe Val Asp Leu  Met Ala Phe
    1265                 1270                 1275


Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Phe Phe  Glu Ala Thr
    1280                 1285                 1290


Ile Asp  Arg Lys Arg Tyr Thr  Asn Leu Lys Glu Leu  Leu Ser Ser
    1295                 1300                 1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                 1315                 1320


Arg Leu  Asp Asp
    1325
```

<210> 345
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<212> PRT
<213> Listeria monocytogenes

<400> 345

```
Met Lys Lys Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30


Lys Ile Ser Gly Asp Ser Glu Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Glu Lys Gly Glu Thr Ala Ala Lys Arg Arg Met
    50                  55                  60


Ser Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
```

```
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Ile Gln Met Asn Glu Val Asp Asp Asn
                85                  90                  95

Phe Phe Asn Arg Leu Lys Glu Ser Phe Tyr Ala Glu Ser Asp Lys Lys
            100                 105                 110

Tyr Asn Arg His Pro Phe Phe Gly Thr Val Glu Glu Glu Val Ala Tyr
        115                 120                 125

Tyr Lys Asp Phe Pro Thr Ile Tyr His Leu Arg Lys Glu Leu Ile Asp
    130                 135                 140

Ser Gln Lys Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly His Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Ile Asp Glu Met Phe Lys Gln Phe Leu Gln Ile Tyr
            180                 185                 190

Asn Gln Val Phe Ala Asn Asp Ile Glu Lys Thr Glu Lys Asn Gln Glu
        195                 200                 205

Val Ala Gln Ile Leu Ala Glu Lys Phe Thr Arg Lys Asp Lys Leu Asp
    210                 215                 220

Lys Ile Leu Ser Leu Tyr Pro Gly Glu Lys Thr Thr Gly Val Phe Ala
225                 230                 235                 240

Gln Phe Val Asn Ile Ile Val Gly Ser Thr Gly Lys Phe Lys Lys His
                245                 250                 255

Phe Asn Leu His Glu Lys Lys Asp Ile Asn Cys Ala Glu Asp Thr Tyr
            260                 265                 270

Asp Thr Asp Leu Glu Ser Leu Leu Ala Ile Ile Gly Asp Glu Phe Ala
```

```
        275                 280                 285

Glu Val Phe Val Ala Ala Lys Asn Ala Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Asn Ile Ile Thr Val Thr Asp Ser Thr Thr Arg Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Leu Ile Glu Arg Phe Glu Asn His Lys Glu Asp Leu Lys Lys Met
                325                 330                 335

Lys Arg Phe Val Arg Thr Tyr Leu Pro Glu Lys Tyr Asp Glu Ile Phe
            340                 345                 350

Asp Asp Thr Glu Lys His Gly Tyr Ala Gly Tyr Ile Ser Gly Thr Lys
        355                 360                 365

Gln Ala Asp Phe Tyr Lys Tyr Met Lys Ala Thr Leu Glu Lys Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Val Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Lys Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
```

485 490 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
500 505 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Val Arg
515 520 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
530 535 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545 550 555 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn Gln Ile Glu Ser Pro
565 570 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
580 585 590

His Asp Leu Leu Lys Val Gly Met Lys Gln Glu Ile Leu Asp Asn Pro
595 600 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
610 615 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625 630 635 640

Leu Asp Gly Thr Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
645 650 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
660 665 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
675 680 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile

```
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Ala Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Asn Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Val
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asn Val Pro Pro Leu Glu Ile Val Gln Lys Arg Lys Ile Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
```

900 905 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
915 920 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Lys Thr Asp Gly Asn Lys Asp
930 935 940

Thr Met Glu Thr Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945 950 955 960

Gln Phe Arg Lys Gln Phe Gln Phe Tyr Lys Val Arg Glu Val Asn Asp
965 970 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
980 985 990

Leu Leu Lys Val Tyr Pro Gln Leu Glu Pro Glu Phe Val Tyr Gly Glu
995 1000 1005

Tyr His Gln Phe Asp Trp Phe Lys Ala Asn Lys Ala Thr Ala Lys
1010 1015 1020

Lys Gln Phe Tyr Thr Asn Ile Met Leu Phe Phe Ala Gln Lys Asp
1025 1030 1035

Arg Ile Ile Asp Glu Asn Gly Glu Ile Leu Trp Asp Lys Arg Tyr
1040 1045 1050

Leu Glu Thr Val Lys Lys Val Leu Gly Tyr Arg Gln Met Asn Ile
1055 1060 1065

Val Lys Lys Thr Glu Ile Gln Lys Gly Glu Phe Ser Asn Val Thr
1070 1075 1080

Pro Asn Pro Lys Gly Lys Ser Asn Lys Leu Ile Pro Arg Lys Lys
1085 1090 1095

Asp Trp Asp Pro Ile Lys Tyr Gly Gly Phe Asp Gly Ser Lys Met

```
    1100                1105                1110

Ala Tyr  Ala Ile Ile Ile Glu  Tyr Glu Lys Gln Lys  Arg Lys Val
    1115                1120                1125

Arg Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Glu
    1130                1135                1140

Ala Phe  Glu Lys Asp Glu Lys  Thr Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

His Gln  Pro Lys Val Leu Ile  Lys Val Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Asn Gly Arg Arg  Arg Met Leu Gly Ser  Ala Asn Glu
    1175                1180                1185

Ala His  Lys Gly Asn Gln Met  Leu Leu Pro Asn His  Leu Met Ala
    1190                1195                1200

Leu Leu  Tyr His Ala Glu Lys  Tyr Glu Ala Ile Asp  Gly Glu Ser
    1205                1210                1215

Leu Ala  Tyr Ile Glu Val His  Arg Ala Leu Phe Asp  Glu Leu Leu
    1220                1225                1230

Ala Tyr  Ile Ser Glu Phe Ala  Arg Lys Tyr Thr Leu  Ser Asn Asp
    1235                1240                1245

Arg Leu  Asp Glu Ile Asn Met  Leu Tyr Glu Arg Asn  Lys Asp Gly
    1250                1255                1260

Asp Val  Lys Ser Ile Ala Glu  Ser Phe Val Ser Leu  Lys Lys Phe
    1265                1270                1275

Asn Ala  Phe Gly Val His Gln  Asp Phe Ser Phe Phe  Gly Thr Lys
    1280                1285                1290

Ile Glu  Arg Lys Arg Asp Arg  Lys Leu Asn Glu Leu  Leu Asn Ser
```

1295 1300 1305

Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr Glu Ser Arg Lys
1310 1315 1320

Arg Leu Asp Asn
1325

<210> 346
<211> 1327
<212> PRT
<213> Listeria monocytogenes

<400> 346

Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Val Leu Thr Asn Gln Tyr Asp Leu Val Lys Arg Lys Met
20 25 30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
35 40 45

Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
50 55 60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65 70 75 80

Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
85 90 95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
100 105 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
115 120 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
130 135 140

```
Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Gly Val Tyr Glu Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Ile Glu
        195                 200                 205

Val Ala Asn Ile Leu Ala Arg Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asp Leu Ile Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Thr Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Asp Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Val Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu Asn Leu Pro Lys Gln Tyr Glu Glu Ile Phe
            340                 345                 350
```

```
Ser Asn Ala Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Ile Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Ile His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Lys Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560
```

```
Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Val Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Met Lys Val Gly Ile Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Thr Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Ala Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Val Val Glu Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Asn Lys
        755                 760                 765
```

```
Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asn Val Pro Pro Leu Glu Ile Val Gln Lys Arg Lys Ile Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Lys Thr Asp Asp Asn Glu Asp
    930                 935                 940

Thr Met Glu Pro Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975
```

```
Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Glu
    1025                1030                1035

Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Glu  Thr Ile Lys Lys Val  Leu Asn Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Asn Gln Asn
    1070                1075                1080

Pro Lys  Pro Arg Gly Asp Ser  Ser Lys Leu Ile Pro  Lys Lys Thr
    1085                1090                1095

Asn Leu  Asn Pro Ile Lys Tyr  Gly Gly Phe Glu Gly  Ser Asn Met
    1100                1105                1110

Ala Tyr  Ala Ile Ile Ile Glu  His Glu Lys Arg Lys  Lys Lys Val
    1115                1120                1125

Thr Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Lys
    1130                1135                1140

Ala Phe  Glu Lys Asp Glu Lys  Val Phe Leu Glu Gly  Lys Gly Tyr
    1145                1150                1155

His Gln  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Ala Leu Tyr
    1160                1165                1170
```

```
Glu Cys  Glu Asn Gly Arg Arg  Arg Met Leu Gly Ser  Ala Asn Glu
    1175                 1180                 1185

Val His  Lys Gly Asn Gln Met  Leu Leu Pro Asn His  Leu Met Thr
    1190                 1195                 1200

Leu Leu  Tyr His Ala Glu Lys  Arg Glu Ala Ile Asp  Gly Glu Ser
    1205                 1210                 1215

Leu Ala  Tyr Ile Glu Ala His  Lys Ala Val Phe Gly  Glu Leu Leu
    1220                 1225                 1230

Ala His  Ile Ser Glu Phe Ala  Arg Lys Tyr Thr Leu  Ala Asn Asp
    1235                 1240                 1245

Lys Leu  Asp Glu Ile Asn Met  Leu Tyr Glu Arg Asn  Lys Asp Gly
    1250                 1255                 1260

Asp Val  Lys Ser Ile Ala Glu  Ser Phe Val Ser Leu  Lys Lys Phe
    1265                 1270                 1275

Asn Ala  Phe Gly Val His Lys  Asp Phe Asn Phe Phe  Gly Thr Thr
    1280                 1285                 1290

Ile Lys  Arg Lys Arg Asp Arg  Lys Leu Lys Glu Leu  Leu Asn Ser
    1295                 1300                 1305

Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                 1315                 1320

Arg Leu  Asp Ser
    1325
```

<210> 347
<211> 1327
<212> PRT
<213> Listeria monocytogenes

<400> 347

```
Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15

Gly Trp Ala Val Leu Thr Asn Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30

Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45

Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
    50                  55                  60

Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Gly Val Tyr Glu Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Ile Glu
        195                 200                 205
```

```
Val Ala Asn Ile Leu Ala Gly Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asp Leu Ile Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Ala Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Ala Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Gly Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu His Leu Pro Lys Gln Tyr Gln Glu Ile Phe
            340                 345                 350

Asn Asn Ala Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Ile Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415
```

```
Glu Glu Leu Glu Ala Ile Ile His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Lys Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Val Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Ile Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Leu Lys Val Gly Met Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620
```

```
Glu Asp Lys Pro Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Gly Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Glu Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685

Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Lys Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830
```

```
Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Gly
    850                 855                 860

Asp Val Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Asp Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Asn Glu Thr Asp Asn His Gly Asn
    930                 935                 940

Thr Met Glu Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Gly  Gln Lys Glu
    1025                1030                1035
```

```
Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Glu  Thr Ile Lys Lys Val  Leu Asp Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Lys Ala Thr
    1070                1075                1080

Ile Lys  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Pro  Arg Lys Glu
    1085                1090                1095

Asn Trp  Asp Pro Met Lys Tyr  Gly Gly Leu Asp Ser  Pro Asn Met
    1100                1105                1110

Ala Tyr  Ala Val Ile Ile Glu  His Ala Lys Gly Lys  Lys Lys Leu
    1115                1120                1125

Ile Phe  Glu Lys Lys Ile Ile  Arg Ile Thr Ile Met  Glu Arg Lys
    1130                1135                1140

Met Phe  Glu Lys Asp Glu Glu  Ala Phe Leu Glu Glu  Lys Gly Tyr
    1145                1150                1155

Arg His  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Thr Leu Tyr
    1160                1165                1170

Glu Cys  Glu Lys Gly Arg Arg  Arg Met Leu Ala Ser  Ala Asn Glu
    1175                1180                1185

Ala Gln  Lys Gly Asn Gln Leu  Val Leu Ser Asn His  Leu Val Ser
    1190                1195                1200

Leu Leu  Tyr His Ala Lys Asn  Cys Glu Ala Ser Asp  Gly Lys Ser
    1205                1210                1215

Leu Lys  Tyr Ile Glu Ala His  Arg Glu Thr Phe Ser  Glu Leu Leu
    1220                1225                1230
```

```
Ala Gln  Val Ser Glu Phe Ala  Thr Arg Tyr Thr Leu  Ala Asp Ala
    1235                 1240                 1245


Asn Leu  Ser Lys Ile Asn Asn  Leu Phe Glu Gln Asn  Lys Glu Gly
    1250                 1255                 1260


Asp Ile  Gln Ala Ile Ala Gln  Ser Phe Val Asp Leu  Met Ala Phe
    1265                 1270                 1275


Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Phe Phe  Glu Ala Thr
    1280                 1285                 1290


Ile Asp  Arg Lys Arg Tyr Thr  Asn Leu Lys Glu Leu  Leu Ser Ser
    1295                 1300                 1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ser Arg Lys
    1310                 1315                 1320


Arg Leu  Asp Asp
    1325
```

<210> 348
<211> 1327
<212> PRT
<213> Listeria monocytogenes

<400> 348

```
Met Lys Asn Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Leu Thr Asn Gln Tyr Asp Leu Val Lys Arg Lys Met
            20                  25                  30


Lys Val Ala Gly Asn Ser Asp Lys Lys Gln Ile Lys Lys Asn Phe Trp
        35                  40                  45


Gly Val Arg Leu Phe Asp Asp Gly Gln Thr Ala Val Asp Arg Arg Met
    50                  55                  60
```

```
Asn Arg Thr Ala Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ala Val Glu Met Ala Asn Ile Asp Ala Asn
                85                  90                  95

Phe Phe Cys Arg Leu Asn Asp Ser Phe Tyr Val Asp Ser Glu Lys Arg
            100                 105                 110

Asn Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
        115                 120                 125

His Lys Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Glu Leu Val Asn
    130                 135                 140

Ser Ser Glu Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Ala Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Gly Val Tyr Glu Gln Phe Ile Gln Thr Tyr
            180                 185                 190

Asn Gln Val Phe Met Ser Asn Ile Glu Lys Val Glu Glu Asn Ile Glu
        195                 200                 205

Val Ala Asn Ile Leu Ala Arg Lys Phe Thr Arg Arg Glu Lys Phe Glu
    210                 215                 220

Arg Ile Leu Gln Leu Tyr Pro Gly Glu Lys Ser Thr Gly Met Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Val Gly Ser Lys Gly Asn Phe Gln Lys Val
                245                 250                 255

Phe Asp Leu Ile Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270
```

```
Glu Glu Asp Leu Glu Thr Leu Leu Ala Ile Ile Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Leu Phe Val Ala Ala Lys Asn Thr Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Thr Asp Thr Glu Thr Asn Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Ala His Glu Lys Asp Leu Val Glu Leu
                325                 330                 335

Lys Ala Phe Ile Lys Leu Asn Leu Pro Lys Gln Tyr Glu Glu Ile Phe
            340                 345                 350

Ser Asn Ala Ala Ile Asp Gly Tyr Ala Gly Tyr Ile Asp Gly Thr Lys
        355                 360                 365

Gln Val Asp Phe Tyr Lys Tyr Leu Lys Thr Ile Leu Glu Asn Ile Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Ala Lys Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Ile His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Arg Glu Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Lys Gly Gln Ser Glu Phe Ala Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480
```

```
Lys Val Asp Phe Gly Lys Ser Ala Val Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Leu Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Ile Asp Asp Gln Gly Lys Thr Asn Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540

Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560

Lys Asp Leu Glu Leu Phe Leu Arg Asn Ile Asn His Val Glu Ser Pro
                565                 570                 575

Thr Ile Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr
            580                 585                 590

His Asp Leu Met Lys Val Gly Ile Lys Gln Glu Ile Leu Asp Asn Pro
        595                 600                 605

Leu Asn Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe
    610                 615                 620

Glu Asp Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val
625                 630                 635                 640

Leu Asp Gly Thr Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655

Trp Gly Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln
            660                 665                 670

Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Gly Leu Asn Arg
        675                 680                 685
```

```
Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700

Ile Glu Lys Glu Gln Val Ser Thr Ala Asp Lys Asp Leu Gln Ser Ile
705                 710                 715                 720

Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735

Ser Leu Lys Val Val Glu Glu Leu Val Ser Val Met Gly Tyr Pro Pro
            740                 745                 750

Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Asn Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Glu Leu Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asn Val Pro Pro Leu Glu Ile Val Gln Lys Arg Lys Ile Phe Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895
```

```
Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Tyr Lys Thr Asp Asp Asn Glu Asp
    930                 935                 940

Thr Met Glu Pro Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser
945                 950                 955                 960

Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
                965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Glu
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Gln Lys Glu
    1025                1030                1035

Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Glu  Thr Ile Lys Lys Val  Leu Asn Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Asn Gln Asn
    1070                1075                1080

Pro Lys  Pro Arg Gly Asp Ser  Ser Lys Leu Ile Pro  Lys Lys Thr
    1085                1090                1095
```

```
Asn Leu  Asn Pro Ile Lys Tyr  Gly Gly Phe Glu Gly  Ser Asn Met
    1100                1105                1110

Ala Tyr  Ala Ile Ile Ile Glu  His Glu Lys Arg Lys  Lys Lys Val
    1115                1120                1125

Thr Ile  Glu Lys Lys Leu Ile  Gln Ile Asn Ile Met  Glu Arg Lys
    1130                1135                1140

Ala Phe  Glu Lys Asp Glu Lys  Val Phe Leu Glu Gly  Lys Gly Tyr
    1145                1150                1155

His Gln  Pro Lys Val Leu Thr  Lys Leu Pro Lys Tyr  Ala Leu Tyr
    1160                1165                1170

Glu Cys  Glu Asn Gly Arg Arg  Arg Met Leu Gly Ser  Ala Asn Glu
    1175                1180                1185

Val His  Lys Gly Asn Gln Met  Leu Leu Pro Asn His  Leu Met Thr
    1190                1195                1200

Leu Leu  Tyr His Ala Glu Lys  Arg Glu Ala Ile Asp  Gly Glu Ser
    1205                1210                1215

Leu Ala  Tyr Ile Glu Ala His  Lys Ala Val Phe Gly  Glu Leu Leu
    1220                1225                1230

Ala His  Ile Ser Glu Phe Ala  Arg Lys Tyr Thr Leu  Ala Asn Asp
    1235                1240                1245

Lys Leu  Asp Glu Ile Asn Met  Leu Tyr Glu Arg Asn  Lys Asp Gly
    1250                1255                1260

Asp Val  Lys Ser Ile Ala Glu  Ser Phe Val Ser Leu  Lys Lys Phe
    1265                1270                1275

Asn Ala  Phe Gly Val His Lys  Asp Phe Asn Phe Phe  Gly Thr Thr
    1280                1285                1290
```

Ile Lys Arg Lys Arg Asp Arg Lys Leu Lys Glu Leu Leu Asn Ser
1295 1300 1305

Thr Ile Ile Tyr Gln Ser Ile Thr Gly Leu Tyr Glu Ser Arg Lys
1310 1315 1320

Arg Leu Asp Ser
1325

<210> 349
<211> 781
<212> PRT
<213> Listeria monocytogenes

<220>
<221> misc_feature
<222> (721)..(721)
<223> Xaa can be any naturally occurring amino acid

<400> 349

Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys Lys Asp
1 5 10 15

Leu Glu Leu Phe Leu Arg Asn Ile Asn Gln Ile Glu Ser Pro Thr Ile
20 25 30

Glu Gly Leu Glu Asp Ser Phe Asn Ala Ser Tyr Ala Thr Tyr His Asp
35 40 45

Leu Leu Lys Val Gly Met Lys Gln Glu Ile Leu Asp Asn Pro Leu Asn
50 55 60

Thr Glu Met Leu Glu Asp Ile Val Lys Ile Leu Thr Val Phe Glu Asp
65 70 75 80

Lys Arg Met Ile Lys Glu Gln Leu Gln Gln Phe Ser Asp Val Leu Asp
85 90 95

Gly Val Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly Trp Gly
100 105 110

```
Arg Leu Ser Ala Lys Leu Leu Val Gly Ile Arg Asp Lys Gln Ser His
        115                 120                 125

Leu Thr Ile Leu Glu Tyr Leu Met Asp Asp Gly Leu Asn Arg Asn Leu
    130                 135                 140

Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile Ile Glu
145                 150                 155                 160

Lys Glu Gln Val Ser Thr Thr Asp Lys Asp Leu Gln Ser Ile Val Ala
                165                 170                 175

Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln Ser Leu
            180                 185                 190

Lys Ile Val Asp Glu Leu Val Ser Ile Met Gly Tyr Pro Pro Gln Thr
        195                 200                 205

Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Val Lys Gly Lys
    210                 215                 220

Asn Asn Ser Arg Pro Arg Tyr Lys Ser Leu Glu Lys Ala Ile Lys Glu
225                 230                 235                 240

Phe Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln Glu Leu
                245                 250                 255

Lys Asn Asn Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys Asp Ile
            260                 265                 270

Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr Asp Ile
        275                 280                 285

Asp His Ile Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile Asp Asn
    290                 295                 300

Leu Val Leu Thr Ser Ser Ala Gly Asn Arg Glu Lys Gly Asp Asp Val
305                 310                 315                 320
```

```
Pro Pro Leu Glu Ile Val Arg Lys Arg Lys Val Phe Trp Glu Lys Leu
                325                 330                 335

Tyr Gln Gly Asn Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu Thr Lys
            340                 345                 350

Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe Ile His
        355                 360                 365

Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala Asn Ile
    370                 375                 380

Leu His Gln Arg Phe Asn Asn Glu Thr Asp Asn His Gly Asn Thr Met
385                 390                 395                 400

Glu Gln Val Arg Ile Val Thr Leu Lys Ser Ala Leu Val Ser Gln Phe
                405                 410                 415

Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp Tyr His
            420                 425                 430

His Ala His Asp Ala Tyr Leu Asn Gly Val Val Ala Asn Thr Leu Leu
        435                 440                 445

Lys Val Tyr Pro Gln Leu Glu Pro Glu Phe Val Tyr Gly Glu Tyr His
    450                 455                 460

Gln Phe Asp Trp Phe Lys Ala Asn Lys Ala Thr Ala Lys Lys Gln Phe
465                 470                 475                 480

Tyr Thr Asn Ile Met Leu Phe Phe Ala Gln Lys Glu Arg Ile Ile Asp
                485                 490                 495

Glu Asn Gly Glu Ile Leu Trp Asp Lys Lys Tyr Leu Glu Thr Ile Lys
            500                 505                 510

Lys Val Leu Asp Tyr Arg Gln Met Asn Ile Val Lys Lys Thr Glu Ile
        515                 520                 525
```

```
Gln Lys Gly Glu Phe Ser Lys Ala Thr Ile Lys Pro Lys Gly Asn Ser
    530                 535                 540

Ser Lys Leu Ile Pro Arg Lys Glu Asn Trp Asp Pro Met Lys Tyr Gly
545                 550                 555                 560

Gly Leu Asp Ser Pro Asn Met Ala Tyr Ala Val Ile Ile Glu His Ala
                565                 570                 575

Lys Gly Lys Lys Lys Ile Val Ile Glu Lys Lys Leu Ile Gln Ile Asn
            580                 585                 590

Ile Met Glu Arg Lys Met Phe Glu Lys Asp Glu Glu Ala Phe Leu Glu
        595                 600                 605

Glu Lys Gly Tyr Arg His Pro Lys Val Leu Thr Lys Leu Pro Lys Tyr
    610                 615                 620

Thr Leu Tyr Glu Cys Glu Lys Gly Arg Arg Arg Met Leu Ala Ser Ala
625                 630                 635                 640

Asn Glu Ala Gln Lys Gly Asn Gln Leu Val Leu Ser Asn His Leu Val
                645                 650                 655

Ser Leu Leu Tyr His Ala Lys Asn Cys Glu Ala Ser Asp Gly Lys Ser
            660                 665                 670

Leu Lys Tyr Thr Glu Ala His Arg Glu Thr Phe Ser Glu Leu Leu Ala
        675                 680                 685

Gln Val Ser Glu Phe Ala Thr Arg Tyr Thr Leu Ala Asp Ala Asn Leu
    690                 695                 700

Ser Lys Ile Asn Asn Leu Phe Glu Gln Asn Lys Glu Gly Asp Ile Lys
705                 710                 715                 720

Xaa Ile Ala Gln Ser Phe Val Asp Leu Met Val Phe Asn Ala Met Gly
                725                 730                 735
```

Ala Pro Ala Ser Phe Lys Phe Phe Glu Ala Thr Ile Asp Arg Lys Arg
740 745 750

Tyr Thr Asn Leu Lys Glu Leu Leu Ser Ser Thr Ile Ile Tyr Gln Ser
755 760 765

Ile Thr Gly Leu Tyr Glu Ser Arg Lys Arg Leu Asp Asp
770 775 780

<210> 350
<211> 1327
<212> PRT
<213> Listeria seeligeri

<400> 350

Met Lys Lys Pro Tyr Thr Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1 5 10 15

Gly Trp Ala Ala Leu Thr Asp Gln Tyr Asp Leu Val Lys Arg Lys Met
20 25 30

Lys Val Ala Gly Asn Ser Glu Lys Lys Gln Ile Lys Lys Asn Leu Trp
35 40 45

Gly Val Arg Leu Val Asp Glu Gly Lys Thr Ala Ala His Arg Arg Val
50 55 60

Asn Arg Thr Thr Arg Arg Arg Ile Glu Arg Arg Arg Asn Arg Ile Ser
65 70 75 80

Tyr Leu Gln Glu Ile Phe Thr Ala Glu Met Phe Glu Val Asp Ala Asn
85 90 95

Phe Phe Tyr Arg Leu Glu Asp Ser Phe Tyr Ile Glu Ser Glu Lys Arg
100 105 110

Gln Ser Arg His Pro Phe Phe Ala Thr Ile Glu Glu Glu Val Ala Tyr
115 120 125

```
His Glu Asn Tyr Arg Thr Ile Tyr His Leu Arg Glu Lys Leu Val Asn
    130                 135                 140

Ser Ser Asp Lys Ala Asp Leu Arg Leu Val Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Ile Ile Lys Tyr Arg Gly Asn Phe Leu Ile Glu Gly Lys Leu Asp Thr
                165                 170                 175

Lys Asn Thr Ser Val Asp Glu Val Phe Lys Gln Phe Ile Lys Thr Tyr
            180                 185                 190

Asn Gln Val Phe Ala Ser Asp Ile Glu Arg Ile Glu Glu Asn Asn Glu
        195                 200                 205

Val Ala Lys Ile Phe Ser Glu Lys Leu Thr Lys Arg Glu Lys Leu Asp
    210                 215                 220

Lys Ile Leu Asn Leu Tyr Pro Asn Glu Lys Ser Thr Asp Leu Phe Ala
225                 230                 235                 240

Gln Phe Ile Ser Leu Ile Ile Gly Ser Lys Gly Asn Phe Lys Lys Phe
                245                 250                 255

Phe Asn Leu Thr Glu Lys Thr Asp Ile Glu Cys Ala Lys Asp Ser Tyr
            260                 265                 270

Glu Glu Asp Leu Glu Val Leu Leu Ala Arg Val Gly Asp Glu Tyr Ala
        275                 280                 285

Glu Ile Phe Val Ala Ala Lys Asn Ala Tyr Asn Ala Val Val Leu Ser
    290                 295                 300

Ser Ile Ile Thr Val Ser Asn Thr Glu Thr Lys Ala Lys Leu Ser Ala
305                 310                 315                 320

Ser Met Ile Glu Arg Phe Asp Lys His Asp Lys Asp Leu Lys Arg Met
                325                 330                 335
```

```
Lys Ala Phe Phe Lys Val Arg Leu Pro Glu Asn Phe Asn Glu Val Phe
            340                 345                 350

Asn Asp Val Glu Lys Asp Gly Tyr Ala Gly Tyr Ile Glu Gly Thr Lys
        355                 360                 365

Gln Glu Ala Phe Tyr Lys Tyr Met Lys Lys Met Leu Glu His Val Glu
    370                 375                 380

Gly Ala Asp Tyr Phe Ile Asn Gln Ile Glu Glu Glu Asn Phe Leu Arg
385                 390                 395                 400

Lys Gln Arg Thr Phe Asp Asn Gly Ala Ile Pro His Gln Leu His Leu
                405                 410                 415

Glu Glu Leu Glu Ala Ile Leu His Gln Gln Ala Lys Tyr Tyr Pro Phe
            420                 425                 430

Leu Lys Val Asp Tyr Glu Lys Ile Lys Ser Leu Val Thr Phe Arg Ile
        435                 440                 445

Pro Tyr Phe Val Gly Pro Leu Ala Asn Gly Gln Ser Glu Phe Ser Trp
    450                 455                 460

Leu Thr Arg Lys Ala Asp Gly Glu Ile Arg Pro Trp Asn Ile Glu Glu
465                 470                 475                 480

Lys Val Asp Phe Gly Lys Ser Ala Ile Asp Phe Ile Glu Lys Met Thr
                485                 490                 495

Asn Lys Asp Thr Tyr Leu Pro Lys Glu Asn Val Leu Pro Lys His Ser
            500                 505                 510

Met Cys Tyr Gln Lys Tyr Met Val Tyr Asn Glu Leu Thr Lys Ile Arg
        515                 520                 525

Tyr Thr Asp Asp Gln Gly Lys Thr His Tyr Phe Ser Gly Gln Glu Lys
    530                 535                 540
```

```
Gln Gln Ile Phe Asn Asp Leu Phe Lys Gln Lys Arg Lys Val Lys Lys
545                 550                 555                 560


Lys Asp Leu Glu Leu Phe Leu Tyr Asn Met Asn His Val Glu Ser Pro
                565                 570                 575


Thr Val Glu Gly Val Glu Asp Ala Phe Asn Ser Ser Phe Thr Thr Tyr
            580                 585                 590


His Asp Leu Gln Lys Val Gly Val Pro Gln Glu Ile Leu Asp Asp Pro
        595                 600                 605


Leu Asn Thr Glu Met Leu Glu Glu Ile Ile Lys Ile Leu Thr Val Phe
    610                 615                 620


Glu Asp Lys Arg Met Ile Asn Glu Arg Leu Gln Glu Phe Ser Asn Val
625                 630                 635                 640


Leu Asp Glu Ala Val Leu Lys Lys Leu Glu Arg Arg His Tyr Thr Gly
                645                 650                 655


Trp Gly Arg Leu Ser Ala Lys Leu Leu Ile Gly Ile Arg Asp Lys Glu
            660                 665                 670


Ser His Leu Thr Ile Leu Asp Tyr Leu Met Asp Asp Lys His Asn Arg
        675                 680                 685


Asn Leu Met Gln Leu Ile Asn Asp Ser Asn Leu Ser Phe Lys Ser Ile
    690                 695                 700


Ile Glu Lys Glu Gln Val Ser Thr Ala Asp Lys Asp Ile Gln Ser Ile
705                 710                 715                 720


Val Ala Asp Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu Gln
                725                 730                 735


Ser Leu Lys Ile Val Asp Glu Leu Val Gly Ile Met Gly Tyr Pro Pro
            740                 745                 750
```

```
Gln Thr Ile Val Val Glu Met Ala Arg Glu Asn Gln Thr Thr Gly Lys
        755                 760                 765

Gly Lys Asn Asn Ser Lys Pro Arg Phe Thr Ser Leu Glu Lys Ala Ile
    770                 775                 780

Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Thr Asp Asn Gln
785                 790                 795                 800

Gly Leu Lys Asn Asp Arg Leu Tyr Leu Tyr Tyr Leu Gln Asn Gly Lys
                805                 810                 815

Asp Met Tyr Thr Gly Gln Glu Leu Asp Ile His Asn Leu Ser Asn Tyr
            820                 825                 830

Asp Ile Asp His Val Val Pro Gln Ser Phe Ile Thr Asp Asn Ser Ile
        835                 840                 845

Asp Asn Arg Val Leu Ala Ser Ser Ala Ala Asn Arg Glu Lys Gly Asp
    850                 855                 860

Asn Val Pro Ser Leu Glu Val Val Arg Lys Arg Lys Val Tyr Trp Glu
865                 870                 875                 880

Lys Leu Tyr Gln Ala Lys Leu Met Ser Lys Arg Lys Phe Asp Tyr Leu
                885                 890                 895

Thr Lys Ala Glu Arg Gly Gly Leu Thr Glu Ala Asp Lys Ala Arg Phe
            900                 905                 910

Ile His Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys Asn Val Ala
        915                 920                 925

Asn Ile Leu His Gln Arg Phe Asn Cys Lys Lys Asp Glu Ser Gly Asn
    930                 935                 940

Val Ile Glu Gln Val Arg Ile Val Thr Leu Lys Ala Ala Leu Val Ser
945                 950                 955                 960
```

```
Gln Phe Arg Lys Gln Phe Gln Leu Tyr Lys Val Arg Glu Val Asn Asp
               965                 970                 975

Tyr His His Ala His Asp Ala Tyr Leu Asn Cys Val Val Ala Asn Thr
            980                 985                 990

Leu Leu Lys Val Tyr Pro Gln Leu  Glu Pro Glu Phe Val  Tyr Gly Asp
        995                 1000                1005

Tyr His  Gln Phe Asp Trp Phe  Lys Ala Asn Lys Ala  Thr Ala Lys
    1010                1015                1020

Lys Gln  Phe Tyr Thr Asn Ile  Met Leu Phe Phe Ala  Lys Lys Asp
    1025                1030                1035

Arg Ile  Ile Asp Glu Asn Gly  Glu Ile Leu Trp Asp  Lys Lys Tyr
    1040                1045                1050

Leu Asp  Thr Ile Lys Lys Val  Leu Asn Tyr Arg Gln  Met Asn Ile
    1055                1060                1065

Val Lys  Lys Thr Glu Ile Gln  Lys Gly Glu Phe Ser  Asn Ala Thr
    1070                1075                1080

Ala Asn  Pro Lys Gly Asn Ser  Ser Lys Leu Ile Pro  Arg Lys Ala
    1085                1090                1095

Asp Trp  Asp Pro Ile Lys Tyr  Gly Gly Phe Asp Gly  Ser Asn Met
    1100                1105                1110

Ala Tyr  Ala Ile Val Ile Glu  His Glu Lys Arg Lys  Lys Lys Thr
    1115                1120                1125

Val Ile  Lys Lys Glu Leu Ile  Gln Ile Asn Ile Met  Glu Arg Thr
    1130                1135                1140

Ala Phe  Glu Lys Asp Gln Lys  Glu Phe Leu Glu Gly  Lys Gly Tyr
    1145                1150                1155
```

```
Arg Asn  Pro Lys Val Ile Thr  Lys Ile Pro Lys Tyr  Thr Leu Tyr
    1160                 1165                 1170


Glu Cys  Glu Asn Gly Arg Arg  Arg Met Leu Gly Ser  Ala Asn Glu
    1175                 1180                 1185


Ala Gln  Lys Gly Asn Gln Met  Val Leu Pro Asn His  Leu Met Thr
    1190                 1195                 1200


Leu Leu  Tyr His Ala Lys Asn  Cys Glu Ala Ser Asp  Gly Lys Ser
    1205                 1210                 1215


Leu Ala  Tyr Ile Glu Ser His  Arg Glu Met Phe Ala  Glu Leu Leu
    1220                 1225                 1230


Asp Ser  Ile Ser Glu Phe Ala  Ser Arg Tyr Thr Leu  Ala Asp Ala
    1235                 1240                 1245


Asn Leu  Glu Lys Ile Asn Thr  Ile Phe Glu Gln Asn  Lys Ser Gly
    1250                 1255                 1260


Asp Val  Lys Val Ile Ala Gln  Ser Phe Val Asn Leu  Leu Glu Phe
    1265                 1270                 1275


Asn Ala  Met Gly Ala Pro Ala  Ser Phe Lys Tyr Phe  Glu Thr Asn
    1280                 1285                 1290


Ile Glu  Arg Lys Arg Tyr Asn  Asn Leu Lys Glu Leu  Leu Asn Ala
    1295                 1300                 1305


Thr Ile  Ile Tyr Gln Ser Ile  Thr Gly Leu Tyr Glu  Ala Arg Lys
    1310                 1315                 1320


Arg Leu  Asp Asp
    1325
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<210> 351
<211> 1359
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 351

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Ala Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95


Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110


His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125


His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140


Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160


Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175


Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190
```

```
Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400
```

```
Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605
```

```
Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815
```

```
Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020
```

```
Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215
```

```
Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230


Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245


Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260


Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355


<210>  352
<211>  1290
<212>  PRT
<213>  Roseburia hominis

<400>  352

Ile Val Asp Tyr Cys Ile Gly Leu Asp Leu Gly Thr Gly Ser Val Gly
1               5                  10                  15
```

```
Trp Ala Val Val Asp Met Asn His Arg Leu Met Lys Arg Asn Gly Lys
            20                  25                  30

His Leu Trp Gly Ser Arg Leu Phe Ser Asn Ala Glu Thr Ala Ala Thr
        35                  40                  45

Arg Arg Ser Ser Arg Ser Ile Arg Arg Arg Tyr Asn Lys Arg Arg Glu
    50                  55                  60

Arg Ile Arg Leu Leu Arg Ala Ile Leu Gln Asp Met Val Leu Glu Lys
65                  70                  75                  80

Asp Pro Thr Phe Phe Ile Arg Leu Glu His Thr Ser Phe Leu Asp Glu
                85                  90                  95

Glu Asp Lys Ala Lys Tyr Leu Gly Asp Asn Tyr Asn Leu Phe Ile Asp
            100                 105                 110

Glu Asp Phe Asn Asp Tyr Thr Tyr Tyr His Lys Tyr Pro Thr Ile Tyr
        115                 120                 125

His Leu Arg Lys Ala Leu Cys Glu Ser Thr Glu Lys Ala Asp Pro Arg
    130                 135                 140

Leu Ile Tyr Leu Ala Leu His His Ile Val Lys Tyr Arg Gly Asn Phe
145                 150                 155                 160

Leu Tyr Glu Gly Gln Lys Phe Asn Met Asp Ala Ser Asn Ile Glu Asp
                165                 170                 175

Lys Leu Ser Asp Val Phe Thr Gln Phe Ala Asp Phe Asn Asn Ile Pro
            180                 185                 190

Tyr Glu Asp Asp Lys Lys Asn Leu Glu Ile Leu Glu Ile Leu Lys Lys
        195                 200                 205

Pro Leu Ser Lys Lys Ala Lys Val Asp Glu Val Met Ala Leu Ile Ser
    210                 215                 220
```

```
Pro Glu Lys Glu Phe Lys Ser Ala Tyr Lys Glu Leu Val Thr Gly Ile
225                 230                 235                 240

Ala Gly Asn Lys Met Asn Val Thr Lys Met Ile Leu Cys Glu Ser Ile
                245                 250                 255

Lys Gln Gly Asp Ser Glu Ile Lys Leu Lys Phe Ser Asp Ser Asn Tyr
            260                 265                 270

Asp Asp Gln Phe Ser Glu Val Glu Asn Asp Leu Gly Glu Tyr Val Glu
        275                 280                 285

Phe Ile Asp Ser Leu His Asn Ile Tyr Ser Trp Val Glu Leu Gln Thr
    290                 295                 300

Ile Met Gly Ala Thr His Thr Asp Asn Ala Ser Ile Ser Glu Ala Met
305                 310                 315                 320

Val Ser Arg Tyr Asn Lys His His Glu Asp Leu Gln Leu Leu Lys Lys
                325                 330                 335

Cys Ile Lys Asp Asn Val Pro Lys Lys Tyr Phe Asp Met Phe Arg Asn
            340                 345                 350

Asp Ser Glu Lys Val Lys Gly Tyr Tyr Asn Tyr Ile Asn Arg Lys Ala
        355                 360                 365

Pro Val Asp Glu Phe Tyr Lys Phe Val Lys Lys Cys Ile Glu Lys Val
    370                 375                 380

Asp Thr Pro Glu Ala Lys Gln Ile Leu His Asp Ile Glu Leu Glu Asn
385                 390                 395                 400

Phe Leu Leu Lys Gln Asn Ser Arg Thr Asn Gly Ser Val Pro Tyr Gln
                405                 410                 415

Met Gln Leu Asp Glu Met Ile Lys Ile Ile Asp Asn Gln Ala Lys Tyr
            420                 425                 430
```

```
Tyr Pro Val Leu Lys Glu Lys Arg Glu Gln Leu Leu Ser Ile Leu Thr
        435                 440                 445

Phe Arg Ile Pro Tyr Tyr Phe Gly Pro Leu Glu Thr Ser Glu His Ala
    450                 455                 460

Trp Ile Lys Arg Leu Glu Gly Lys Glu Asn Gln Arg Ile Leu Pro Trp
465                 470                 475                 480

Asn Tyr Gln Asp Thr Val Asp Val Asp Ala Thr Ala Glu Gly Phe Ile
                485                 490                 495

Lys Arg Met Arg Ser Tyr Cys Thr Tyr Phe Pro Asp Glu Glu Val Leu
            500                 505                 510

Pro Lys Asn Ser Leu Ile Val Ser Lys Tyr Glu Val Tyr Asn Glu Leu
        515                 520                 525

Asn Lys Ile Arg Val Asp Asp Lys Leu Leu Glu Val Asp Val Lys Asn
    530                 535                 540

Asp Ile Tyr Asn Glu Leu Phe Met Lys Asn Lys Thr Val Thr Glu Lys
545                 550                 555                 560

Lys Leu Lys Asn Trp Leu Val Asn Asn Gln Cys Cys Arg Lys Asp Ala
                565                 570                 575

Glu Ile Lys Gly Phe Gln Lys Glu Asn Gln Phe Ser Thr Ser Leu Thr
            580                 585                 590

Pro Trp Ile Asp Phe Thr Asn Ile Phe Gly Lys Ile Asp Gln Ser Asn
        595                 600                 605

Phe Asp Leu Ile Glu Lys Ile Ile Tyr Asp Leu Thr Val Phe Glu Asp
    610                 615                 620

Lys Lys Ile Met Lys Arg Arg Leu Lys Lys Lys Tyr Ala Leu Pro Asp
625                 630                 635                 640
```

```
Asp Lys Ile Lys Gln Ile Leu Lys Leu Lys Tyr Lys Asp Trp Ser Arg
                645                 650                 655

Leu Ser Lys Lys Leu Leu Asp Gly Ile Val Ala Asp Ser Val Thr Val
            660                 665                 670

Leu Asp Val Leu Glu Ser Arg Leu Asn Leu Met Glu Ile Ile Asn Asp
        675                 680                 685

Lys Glu Leu Gly Tyr Ala Gln Met Ile Glu Glu Ala Ser Ser Cys Pro
    690                 695                 700

Lys Asp Gly Lys Phe Thr Tyr Glu Glu Val Ala Lys Leu Ala Gly Ser
705                 710                 715                 720

Pro Ala Leu Lys Arg Gly Ile Trp Gln Ser Leu Gln Ile Val Glu Glu
                725                 730                 735

Ile Thr Lys Val Met Lys Cys Arg Pro Lys Tyr Ile Tyr Ile Glu Phe
            740                 745                 750

Glu Arg Ser Glu Glu Lys Glu Arg Thr Glu Ser Lys Ile Lys Lys Leu
        755                 760                 765

Glu Asn Val Tyr Lys Asp Glu Gln Thr Ser Val Leu Glu Glu Leu Lys
    770                 775                 780

Gly Phe Asp Asn Thr Lys Lys Ile Ser Ser Asp Ser Leu Phe Leu Tyr
785                 790                 795                 800

Phe Thr Gln Leu Gly Lys Cys Met Tyr Ser Gly Lys Lys Leu Asp Ile
                805                 810                 815

Asp Ser Leu Asp Lys Tyr Gln Ile Asp His Ile Val Pro Gln Ser Leu
            820                 825                 830

Val Lys Asp Asp Ser Phe Asp Asn Arg Val Leu Val Leu Pro Ser Glu
        835                 840                 845
```

```
Asn Gln Arg Lys Leu Asp Asp Leu Val Val Pro Phe Asp Ile Arg Asp
    850                 855                 860

Lys Met Tyr Arg Phe Trp Lys Leu Leu Phe Asp His Glu Leu Ile Ser
865                 870                 875                 880

Pro Lys Lys Phe Tyr Ser Leu Ile Lys Thr Glu Tyr Thr Glu Arg Asp
                885                 890                 895

Glu Glu Arg Phe Ile Asn Arg Gln Leu Val Glu Thr Arg Gln Ile Thr
            900                 905                 910

Lys Asn Val Thr Gln Ile Ile Glu Asp His Tyr Ser Thr Thr Lys Val
        915                 920                 925

Ala Ala Ile Arg Ala Asn Leu Ser His Glu Phe Arg Val Lys Asn His
    930                 935                 940

Ile Tyr Lys Asn Arg Asp Ile Asn Asp Tyr His His Ala His Asp Ala
945                 950                 955                 960

Tyr Ile Val Ala Leu Ile Gly Gly Phe Met Arg Asp Arg Tyr Pro Asn
                965                 970                 975

Met His Asp Ser Lys Ala Val Tyr Ser Glu Tyr Met Lys Met Phe Arg
            980                 985                 990

Asn Lys Asn Asp Gln Lys Gly Phe  Val Ile Asn Ser Met  Asn Tyr Pro
        995                 1000                1005

Tyr Glu  Val Asp Gly Lys Leu  Ile Trp Asn Pro Asp  Leu Ile Asn
    1010                1015                1020

Glu Ile  Lys Lys Cys Phe Tyr  Tyr Lys Asp Cys Tyr  Cys Thr Thr
    1025                1030                1035

Lys Leu  Asp Gln Lys Ser Gly  Gln Met Phe Asn Thr  Val Leu Pro
    1040                1045                1050
```

```
Asn Asp  Ala His Ser Ala Lys  Gly Ala Val Ile Pro  Val Asn Lys
    1055                1060                1065

Asn Arg  Lys Asp Val Asn Lys  Tyr Gly Gly Phe Ser  Gly Leu Gln
    1070                1075                1080

Tyr Val  Ile Ala Ala Ile Glu  Gly Thr Lys Lys Lys  Gly Lys Lys
    1085                1090                1095

Leu Val  Lys Val Arg Lys Leu  Ser Gly Ile Pro Leu  Tyr Leu Lys
    1100                1105                1110

Gln Ala  Asp Ile Lys Glu Gln  Ile Glu Tyr Val Glu  Lys Glu Glu
    1115                1120                1125

Lys Leu  Ser Asp Val Lys Ile  Ile Lys Asn Asn Ile  Pro Leu Asn
    1130                1135                1140

Gln Leu  Ile Glu Ile Asp Gly  Arg Gln Tyr Leu Leu  Thr Ser Glu
    1145                1150                1155

Cys Val  Asn Ala Met Gln Leu  Val Leu Asn Glu Glu  Gln Cys Lys
    1160                1165                1170

Leu Ile  Ala Asp Ile Tyr Asn  Ala Ile Tyr Lys Gln  Asp Phe Asp
    1175                1180                1185

Gly Leu  Asp Asn Met Leu Met  Ile Gln Leu Tyr Leu  Gln Leu Ile
    1190                1195                1200

Asp Lys  Leu Lys Thr Leu Tyr  Pro Ile Tyr Met Gly  Ile Val Glu
    1205                1210                1215

Lys Phe  Glu Lys Phe Val Ser  Ile Ser Lys Glu Glu  Lys Ala Asn
    1220                1225                1230

Val Ile  Gln Met Leu Ile Ile  Met His Lys Gly Pro  Gln Asn Gly
    1235                1240                1245
```

```
Asn Ile  Ile Tyr Asp Asp Phe  Asn Val Gly Lys Arg  Ile Gly Arg
    1250                1255                1260


Leu Asn  Gly Arg Thr Phe Tyr  Leu Asn Ile Glu Phe  Ile Ser Gln
    1265                1270                1275


Ser Pro  Thr Gly Ile Tyr Thr  Lys Lys Tyr Lys Leu
    1280                1285                1290


<210>  353
<211>  1292
<212>  PRT
<213>  Sharpea azabuensis

<400>  353

Lys Asp Ile Arg Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Met Asp Glu His Tyr Glu Leu Leu Lys Lys Gly Asn
            20                  25                  30


His His Met Trp Gly Ser Arg Leu Phe Asp Ala Ala Glu Pro Ala Ala
        35                  40                  45


Thr Arg Arg Ala Ser Arg Ser Ile Arg Arg Arg Tyr Asn Lys Arg Arg
    50                  55                  60


Glu Arg Ile Arg Leu Leu Arg Asp Leu Leu Gly Asp Met Val Met Glu
65                  70                  75                  80


Val Asp Pro Thr Phe Phe Ile Arg Leu Leu Asn Val Ser Phe Leu Asp
                85                  90                  95


Glu Glu Asp Lys Gln Lys Asn Leu Gly Asp Asn Tyr Asn Leu Phe Ile
            100                 105                 110


Glu Lys Asp Phe Asn Asp Lys Thr Tyr Tyr Asp Lys Tyr Pro Thr Ile
        115                 120                 125
```

```
Tyr His Leu Arg Lys Glu Leu Cys Glu Asn Lys Glu Lys Ala Asp Pro
    130                 135                 140

Arg Leu Ile Tyr Leu Ala Leu His His Ile Val Lys Tyr Arg Gly Asn
145                 150                 155                 160

Phe Leu Tyr Glu Gly Gln Ser Phe Thr Met Asp Asn Ser Asp Ile Glu
                165                 170                 175

Glu Arg Leu Asn Ser Ala Ile Glu Lys Phe Met Ser Ile Asn Glu Phe
            180                 185                 190

Asp Asn Arg Ile Val Ser Asp Ile Asn Ser Met Ile Ala Val Leu Ser
        195                 200                 205

Lys Ile Tyr Gln Arg Ser Lys Lys Ala Asp Asp Leu Leu Lys Ile Met
    210                 215                 220

Asn Pro Thr Lys Glu Glu Lys Ala Ala Tyr Lys Glu Phe Thr Lys Ala
225                 230                 235                 240

Leu Val Gly Leu Lys Phe Asn Ile Ser Lys Met Ile Leu Ala Gln Glu
                245                 250                 255

Val Lys Lys Gly Asp Thr Asp Ile Val Leu Glu Phe Ser Asn Ala Asn
            260                 265                 270

Tyr Asp Ser Thr Ile Asp Glu Leu Gln Ser Glu Leu Gly Glu Tyr Ile
        275                 280                 285

Glu Phe Ile Glu Met Leu His Asn Ile Tyr Ser Trp Val Glu Leu Gln
    290                 295                 300

Ala Ile Leu Gly Ala Thr His Thr Asp Asn Pro Ser Ile Ser Ala Ala
305                 310                 315                 320

Met Val Glu Arg Tyr Glu Glu His Lys Lys Asp Leu Arg Val Leu Lys
                325                 330                 335
```

```
Lys Val Ile Arg Glu Glu Leu Pro Asp Lys Tyr Asn Glu Val Phe Arg
            340                 345                 350

Lys Asp Asn Arg Lys Leu His Asn Tyr Leu Gly Tyr Ile Lys Tyr Asp
        355                 360                 365

Thr Pro Val Glu Glu Phe Tyr Lys Tyr Ile Lys Gly Leu Leu Ala Lys
    370                 375                 380

Val Asp Thr Asp Glu Ala Arg Glu Ile Leu Glu Arg Ile Asp Leu Glu
385                 390                 395                 400

Lys Phe Met Leu Lys Gln Asn Ser Arg Thr Asn Gly Ser Ile Pro Tyr
                405                 410                 415

Gln Met Gln Lys Asp Glu Met Ile Gln Ile Ile Asp Asn Gln Ser Val
            420                 425                 430

Tyr Tyr Pro Gln Leu Lys Glu Asn Arg Asp Lys Leu Ile Ser Ile Leu
        435                 440                 445

Glu Phe Arg Ile Pro Tyr Tyr Phe Gly Pro Leu Ala His Ser Glu Phe
    450                 455                 460

Ala Trp Ile Lys Lys Phe Glu Asp Lys Gln Lys Glu Arg Ile Leu Pro
465                 470                 475                 480

Trp Asn Tyr Asp Gln Ile Val Asp Ile Asp Ala Thr Ala Glu Gly Phe
                485                 490                 495

Ile Glu Arg Met Lys Asn Thr Gly Thr Tyr Phe Pro Asp Glu Pro Val
            500                 505                 510

Met Ala Lys Asn Ser Leu Thr Val Ser Lys Phe Glu Val Leu Asn Glu
        515                 520                 525

Leu Asn Lys Ile Arg Ile Asn Gly Lys Leu Ile Ala Val Glu Thr Lys
    530                 535                 540
```

```
Lys Glu Leu Leu Ser Asp Leu Phe Met Lys Asn Lys Thr Ile Thr Asp
545                 550                 555                 560

Lys Lys Leu Lys Asp Trp Leu Val Thr His Gln Tyr Tyr Asp Ile Asn
                565                 570                 575

Glu Glu Leu Lys Ile Glu Gly Tyr Gln Lys Asp Leu Gln Phe Ser Thr
            580                 585                 590

Ser Leu Ala Pro Trp Ile Asp Phe Thr Lys Ile Phe Gly Glu Ile Asn
        595                 600                 605

Ala Ser Asn Tyr Gln Leu Ile Glu Lys Ile Ile Tyr Asp Ile Ser Ile
    610                 615                 620

Phe Glu Asp Lys Lys Ile Leu Lys Arg Arg Leu Lys Lys Val Tyr Gln
625                 630                 635                 640

Leu Asp Asp Leu Leu Val Asp Lys Ile Leu Lys Leu Asn Tyr Thr Gly
                645                 650                 655

Trp Ser Arg Leu Ser Glu Lys Leu Leu Thr Gly Met Thr Ala Asp Lys
            660                 665                 670

Ala Thr Val Leu Phe Val Leu Glu Ser Asn Lys Asn Leu Met Glu Ile
        675                 680                 685

Ile Asn Asp Glu Lys Leu Gly Tyr Lys Gln Ile Ile Glu Glu Ser Asn
    690                 695                 700

Met Gln Asp Ile Glu Gly Pro Phe Lys Tyr Asp Glu Val Lys Lys Leu
705                 710                 715                 720

Ala Gly Ser Pro Ala Ile Lys Arg Gly Ile Trp Gln Ala Leu Leu Val
                725                 730                 735

Val Arg Glu Ile Thr Lys Phe Met Lys His Glu Pro Ser His Ile Tyr
            740                 745                 750
```

```
Ile Glu Phe Ala Arg Glu Glu Gln Lys Val Arg Lys Glu Ser Lys Ile
        755                 760                 765

Ala Lys Leu Gln Lys Ile Tyr Glu Asn Leu Gln Thr Gln Val Tyr Glu
    770                 775                 780

Ser Leu Lys Lys Glu Asp Ala Lys Lys Arg Met Glu Thr Asp Ala Leu
785                 790                 795                 800

Tyr Leu Tyr Tyr Leu Gln Met Gly Lys Ser Met Tyr Ser Gly Lys Pro
                805                 810                 815

Leu Asp Ile Asp Lys Leu Ser Thr Tyr Gln Ile Asp His Ile Leu Pro
            820                 825                 830

Gln Ser Leu Ile Lys Asp Asp Ser Phe Asp Asn Arg Val Leu Val Leu
        835                 840                 845

Pro Glu Glu Asn Gln Trp Lys Leu Asp Ser Glu Thr Val Pro Phe Glu
    850                 855                 860

Ile Arg Asn Lys Met Ile Gly Phe Trp Gln Met Leu His Glu Asn Gly
865                 870                 875                 880

Leu Met Ser Asn Lys Lys Phe Phe Ser Leu Ile Arg Thr Asp Phe Ser
                885                 890                 895

Asp Lys Asp Lys Glu Arg Phe Ile Asn Arg Gln Leu Val Glu Thr Arg
            900                 905                 910

Gln Ile Ile Lys Asn Val Ala Val Ile Ile Asn Asp His Tyr Thr Asn
        915                 920                 925

Thr Asn Ile Val Thr Val Arg Ala Glu Leu Ser His Gln Phe Arg Glu
    930                 935                 940

Arg Tyr Lys Ile Tyr Lys Asn Arg Asp Ile Asn Asp Phe His His Ala
945                 950                 955                 960
```

```
His Asp Ala Tyr Ile Ala Cys Ile Val Gly Gln Phe Met His Gln Asn
               965                 970                 975

Phe Glu His Leu Asp Ala Lys Ile Ile Tyr Gly Gln Tyr Lys Lys Asn
            980                 985                 990

Tyr Lys Lys Asn Tyr Gly Phe Ile  Leu Asn Ser Met Asn  His Leu Gln
        995                 1000                1005

Ser Asp  Ile Asp Thr Gly Glu  Val Met Trp Asp Pro  Ala Lys Ile
    1010                1015                1020

Gly Lys  Ile Lys Ser Cys Phe  Tyr Tyr Lys Asp Val  Tyr Val Thr
    1025                1030                1035

Lys Lys  Leu Glu Gln Asn Ser  Gly Thr Leu Phe Asn  Thr Val Leu
    1040                1045                1050

Pro Asn  Asp Ala His Ser Glu  Lys Gly Ala Thr Val  Pro Leu Asn
    1055                1060                1065

Lys Tyr  Arg Ala Asp Val His  Lys Tyr Gly Gly Phe  Gly Asn Val
    1070                1075                1080

Gln Ser  Ile Ile Val Ala Ile  Glu Gly Lys Lys Lys  Lys Gly Lys
    1085                1090                1095

Lys Leu  Ile Asp Val Arg Lys  Leu Thr Ser Ile Pro  Leu His Leu
    1100                1105                1110

Lys Asn  Ala Pro Val Glu Glu  Gln Leu Ser Tyr Ile  Ala Ser Pro
    1115                1120                1125

Glu His  Glu Asp Leu Ile Asp  Val Arg Ile Val Lys  Glu Ile Leu
    1130                1135                1140

Lys Asn  Gln Leu Ile Glu Ile  Asp Gly Gly Leu Tyr  Tyr Val Thr
    1145                1150                1155
```

```
Ser Glu  Tyr Val Thr Ala Arg  Gln Leu Ser Leu Asn  Glu Gln Ser
    1160                 1165                 1170


Cys Lys  Leu Ile Ser Glu Ile  Tyr Ala Ala Met Leu  Lys Lys Arg
    1175                 1180                 1185


Tyr Glu  Tyr Leu Asp Glu Glu  Glu Ile Phe Asp Leu  Tyr Leu Gln
    1190                 1195                 1200


Leu Leu  Gln Lys Met Asp Thr  Leu Tyr Pro Ala Tyr  Lys Gly Ile
    1205                 1210                 1215


Ala Lys  Arg Phe Phe Asp Phe  Lys Asn Ile Asp Val  Val Glu Lys
    1220                 1225                 1230


Cys Asp  Val Ile Gln Ile Leu  Ile Ile Met His Ala  Gly Pro Met
    1235                 1240                 1245


Asn Gly  Asn Ile Met Tyr Asp  Asp Phe Lys Phe Thr  Asn Arg Ile
    1250                 1255                 1260


Gly Arg  Phe Thr His Lys Asn  Ile Asp Leu Lys Thr  Thr Phe Ile
    1265                 1270                 1275


Ser Thr  Ser Val Thr Gly Leu  Phe Ser Lys Lys Tyr  Lys Leu
    1280                 1285                 1290


<210>  354
<211>  1359
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  354

Ala Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                  10                  15


Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30
```

```
Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45

Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240
```

```
Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445
```

```
Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655
```

```
Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860
```

```
Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065
```

```
Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260
```

```
Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355
```

<210> 355
<211> 1359
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 355

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Met Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45
```

```
Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60

Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80

Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255
```

```
Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460
```

```
Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670
```

```
Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp Ala Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880
```

```
Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080
```

```
Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275
```

```
Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355
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<210> 356
<211> 1359
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 356

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Met Asp Lys Lys Tyr Ser Ile Gly Leu Asp Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80
```

```
Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95

Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285
```

```
Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300

Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495
```

```
Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510

Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700
```

```
Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720

His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp His Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910
```

```
Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925

Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110
```

```
Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                 1120                 1125

Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                 1135                 1140

Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                 1150                 1155

Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                 1165                 1170

Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                 1180                 1185

Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                 1195                 1200

Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                 1210                 1215

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                 1225                 1230

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                 1240                 1245

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                 1255                 1260

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                 1270                 1275

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                 1285                 1290

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                 1300                 1305
```

```
Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1325                1330                1335


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1340                1345                1350


Ser Gln  Leu Gly Gly Asp
    1355


<210>  357
<211>  1359
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  357

Met Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val
1               5                   10                  15


Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe
            20                  25                  30


Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile
        35                  40                  45


Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu
    50                  55                  60


Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys
65                  70                  75                  80


Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser
                85                  90                  95
```

```
Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys
            100                 105                 110

His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr
        115                 120                 125

His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp
    130                 135                 140

Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His
145                 150                 155                 160

Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro
                165                 170                 175

Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr
            180                 185                 190

Asn Gln Leu Phe Glu Glu Asn Ile Asn Ala Ser Gly Val Asp Ala Lys
        195                 200                 205

Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu
    210                 215                 220

Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu
225                 230                 235                 240

Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp
                245                 250                 255

Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp
            260                 265                 270

Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu
        275                 280                 285

Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile
    290                 295                 300
```

```
Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met
305                 310                 315                 320

Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala
                325                 330                 335

Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp
            340                 345                 350

Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln
        355                 360                 365

Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly
    370                 375                 380

Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys
385                 390                 395                 400

Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly
                405                 410                 415

Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu
            420                 425                 430

Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro
        435                 440                 445

Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met
    450                 455                 460

Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val
465                 470                 475                 480

Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn
                485                 490                 495

Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu
            500                 505                 510
```

```
Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr
        515                 520                 525

Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys
    530                 535                 540

Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val
545                 550                 555                 560

Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser
                565                 570                 575

Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr
            580                 585                 590

Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys Asp Phe Leu Asp Asn
        595                 600                 605

Glu Glu Asn Glu Asp Ile Leu Glu Asp Ile Val Leu Thr Leu Thr Leu
    610                 615                 620

Phe Glu Asp Arg Glu Met Ile Glu Glu Arg Leu Lys Thr Tyr Ala His
625                 630                 635                 640

Leu Phe Asp Asp Lys Val Met Lys Gln Leu Lys Arg Arg Arg Tyr Thr
                645                 650                 655

Gly Trp Gly Arg Leu Ser Arg Lys Leu Ile Asn Gly Ile Arg Asp Lys
            660                 665                 670

Gln Ser Gly Lys Thr Ile Leu Asp Phe Leu Lys Asp Gly Phe Ala Asn
        675                 680                 685

Arg Asn Phe Met Gln Leu Ile His Asp Asp Ser Leu Thr Phe Lys Glu
    690                 695                 700

Asp Ile Gln Lys Ala Gln Val Ser Gly Gln Gly Asp Ser Leu His Glu
705                 710                 715                 720
```

```
His Ile Ala Asn Leu Ala Gly Ser Pro Ala Ile Lys Lys Gly Ile Leu
                725                 730                 735

Gln Thr Val Lys Val Val Asp Glu Leu Val Lys Val Met Gly Arg His
            740                 745                 750

Lys Pro Glu Asn Ile Val Ile Glu Met Ala Arg Glu Asn Gln Thr Thr
        755                 760                 765

Gln Lys Gly Gln Lys Asn Ser Arg Glu Arg Met Lys Arg Ile Glu Glu
    770                 775                 780

Gly Ile Lys Glu Leu Gly Ser Gln Ile Leu Lys Glu His Pro Val Glu
785                 790                 795                 800

Asn Thr Gln Leu Gln Asn Glu Lys Leu Tyr Leu Tyr Tyr Leu Gln Asn
                805                 810                 815

Gly Arg Asp Met Tyr Val Asp Gln Glu Leu Asp Ile Asn Arg Leu Ser
            820                 825                 830

Asp Tyr Asp Val Asp Ala Ile Val Pro Gln Ser Phe Leu Lys Asp Asp
        835                 840                 845

Ser Ile Asp Asn Lys Val Leu Thr Arg Ser Asp Lys Asn Arg Gly Lys
    850                 855                 860

Ser Asp Asn Val Pro Ser Glu Glu Val Val Lys Lys Met Lys Asn Tyr
865                 870                 875                 880

Trp Arg Gln Leu Leu Asn Ala Lys Leu Ile Thr Gln Arg Lys Phe Asp
                885                 890                 895

Asn Leu Thr Lys Ala Glu Arg Gly Gly Leu Ser Glu Leu Asp Lys Ala
            900                 905                 910

Gly Phe Ile Lys Arg Gln Leu Val Glu Thr Arg Gln Ile Thr Lys His
        915                 920                 925
```

```
Val Ala Gln Ile Leu Asp Ser Arg Met Asn Thr Lys Tyr Asp Glu Asn
    930                 935                 940

Asp Lys Leu Ile Arg Glu Val Lys Val Ile Thr Leu Lys Ser Lys Leu
945                 950                 955                 960

Val Ser Asp Phe Arg Lys Asp Phe Gln Phe Tyr Lys Val Arg Glu Ile
                965                 970                 975

Asn Asn Tyr His His Ala His Asp Ala Tyr Leu Asn Ala Val Val Gly
            980                 985                 990

Thr Ala Leu Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
        995                 1000                1005

Gly Asp  Tyr Lys Val Tyr Asp  Val Ser Glu Gln Glu  Ile Gly Lys
    1010                1015                1020

Ala Thr  Ala Lys Tyr Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe
    1025                1030                1035

Lys Thr  Glu Ile Thr Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro
    1040                1045                1050

Leu Ile  Glu Thr Asn Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys
    1055                1060                1065

Gly Arg  Asp Phe Ala Thr Val  Arg Lys Val Leu Ser  Met Pro Gln
    1070                1075                1080

Val Asn  Ile Val Lys Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser
    1085                1090                1095

Lys Glu  Ser Ile Leu Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala
    1100                1105                1110

Arg Lys  Lys Asp Trp Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser
    1115                1120                1125
```

```
Pro Thr  Val Ala Tyr Ser Val  Leu Val Val Ala Lys  Val Glu Lys
    1130                1135                1140


Gly Lys  Ser Lys Lys Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile
    1145                1150                1155


Thr Ile  Met Glu Arg Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe
    1160                1165                1170


Leu Glu  Ala Lys Gly Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile
    1175                1180                1185


Lys Leu  Pro Lys Tyr Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys
    1190                1195                1200


Arg Met  Leu Ala Ser Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1205                1210                1215


Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1220                1225                1230


Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1235                1240                1245


Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1250                1255                1260


Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1265                1270                1275


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1280                1285                1290


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1295                1300                1305


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1310                1315                1320
```

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1325 1330 1335

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1340 1345 1350

Ser Gln Leu Gly Gly Asp
1355

<210> 358
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 358
agaaaaacaa ttttagtatt tgg 23

<210> 359
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 359
gcagaaatag actaattgca tgg 23

<210> 360
<211> 20
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 360
gtcacccctg cgctgacagc 20

<210> 361
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 361
cttcggcttc ccctggagag agcgagattc tccgcgctgt agaagtcatc attgttgtgc 60

acgacgacat cattccgtgg cgttatccag ctaagc 96

<210> 362
<211> 34
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 362

Thr Ser Ala Ser Pro Gly Glu Ser Glu Ile Leu Arg Ala Val Glu Val
1 5 10 15

Ile Ile Val Val His Asp Asp Ile Ile Pro Trp Arg Trp Arg Tyr Pro
            20 25 30

Ala Lys

<210> 363
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 363
gtaaacaaag catagactga ggg 23

<210> 364
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 364
gaagaccaag gatagactgc tgg 23

<210> 365
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 365
gttttgttta gtaactgacg tcc 23

<210> 366
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 366
cttgtatttc ttatcttact acc 23

<210> 367
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 367
cttgtgtttc gtatctgacg ccc 23

<210> 368
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 368
gaatactaag catagactcc agg 23

<210> 369
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 369
gaaaacaaat cattgactgc agg 23

<210> 370
<211> 23
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 370
gaacataaag aatagaatga tgg 23

<210> 371
<211> 183
<212> PRT
<213> Salmonella typhimurium

<400> 371

Met Pro Pro Ala Phe Ile Thr Gly Val Thr Ser Leu Ser Asp Val Glu
1 5 10 15

Leu Asp His Glu Tyr Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg
20 25 30

Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val Leu Val His Asn
35 40 45

His Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile Gly Arg His Asp
50 55 60

Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val
65 70 75 80

Leu Gln Asn Tyr Arg Leu Leu Asp Thr Thr Leu Tyr Val Thr Leu Glu

85 90 95

Pro Cys Val Met Cys Ala Gly Ala Met Val His Ser Arg Ile Gly Arg
100 105 110

Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala Ala Gly Ser Leu
115 120 125

Ile Asp Val Leu His His Pro Gly Met Asn His Arg Val Glu Ile Ile
130 135 140

Glu Gly Val Leu Arg Asp Glu Cys Ala Thr Leu Leu Ser Asp Phe Phe
145 150 155 160

Arg Met Arg Arg Gln Glu Ile Lys Ala Leu Lys Lys Ala Asp Arg Ala
165 170 175

Glu Gly Ala Gly Pro Ala Val
180

<210> 372
<211> 164
<212> PRT
<213> Shewanella putrefaciens

<400> 372

Met Asp Glu Tyr Trp Met Gln Val Ala Met Gln Met Ala Glu Lys Ala
1 5 10 15

Glu Ala Ala Gly Glu Val Pro Val Gly Ala Val Leu Val Lys Asp Gly
20 25 30

Gln Gln Ile Ala Thr Gly Tyr Asn Leu Ser Ile Ser Gln His Asp Pro
35 40 45

Thr Ala His Ala Glu Ile Leu Cys Leu Arg Ser Ala Gly Lys Lys Leu
50 55 60

Glu Asn Tyr Arg Leu Leu Asp Ala Thr Leu Tyr Ile Thr Leu Glu Pro
65 70 75 80

```
Cys Ala Met Cys Ala Gly Ala Met Val His Ser Arg Ile Ala Arg Val
                85                  90                  95

Val Tyr Gly Ala Arg Asp Glu Lys Thr Gly Ala Ala Gly Thr Val Val
            100                 105                 110

Asn Leu Leu Gln His Pro Ala Phe Asn His Gln Val Glu Val Thr Ser
        115                 120                 125

Gly Val Leu Ala Glu Ala Cys Ser Ala Gln Leu Ser Arg Phe Phe Lys
    130                 135                 140

Arg Arg Arg Asp Glu Lys Lys Ala Leu Lys Leu Ala Gln Arg Ala Gln
145                 150                 155                 160

Gln Gly Ile Glu
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<210> 373
<211> 173
<212> PRT
<213> Haemophilus influenzae

<400> 373

```
Met Asp Ala Ala Lys Val Arg Ser Glu Phe Asp Glu Lys Met Met Arg
1               5                   10                  15

Tyr Ala Leu Glu Leu Ala Asp Lys Ala Glu Ala Leu Gly Glu Ile Pro
            20                  25                  30

Val Gly Ala Val Leu Val Asp Asp Ala Arg Asn Ile Ile Gly Glu Gly
        35                  40                  45

Trp Asn Leu Ser Ile Val Gln Ser Asp Pro Thr Ala His Ala Glu Ile
    50                  55                  60

Ile Ala Leu Arg Asn Gly Ala Lys Asn Ile Gln Asn Tyr Arg Leu Leu
65                  70                  75                  80
```

```
Asn Ser Thr Leu Tyr Val Thr Leu Glu Pro Cys Thr Met Cys Ala Gly
                85                  90                  95

Ala Ile Leu His Ser Arg Ile Lys Arg Leu Val Phe Gly Ala Ser Asp
            100                 105                 110

Tyr Lys Thr Gly Ala Ile Gly Ser Arg Phe His Phe Phe Asp Asp Tyr
        115                 120                 125

Lys Met Asn His Thr Leu Glu Ile Thr Ser Gly Val Leu Ala Glu Glu
    130                 135                 140

Cys Ser Gln Lys Leu Ser Thr Phe Phe Gln Lys Arg Arg Glu Glu Lys
145                 150                 155                 160

Lys Ile Glu Lys Ala Leu Leu Lys Ser Leu Ser Asp Lys
                165                 170
```

<210> 374
<211> 161
<212> PRT
<213> Caulobacter crescentus

<400> 374

```
Met Arg Thr Asp Glu Ser Glu Asp Gln Asp His Arg Met Met Arg Leu
1               5                   10                  15

Ala Leu Asp Ala Ala Arg Ala Ala Ala Glu Ala Gly Glu Thr Pro Val
            20                  25                  30

Gly Ala Val Ile Leu Asp Pro Ser Thr Gly Glu Val Ile Ala Thr Ala
        35                  40                  45

Gly Asn Gly Pro Ile Ala Ala His Asp Pro Thr Ala His Ala Glu Ile
    50                  55                  60

Ala Ala Met Arg Ala Ala Ala Ala Lys Leu Gly Asn Tyr Arg Leu Thr
65                  70                  75                  80
```

Asp Leu Thr Leu Val Val Thr Leu Glu Pro Cys Ala Met Cys Ala Gly
85 90 95

Ala Ile Ser His Ala Arg Ile Gly Arg Val Val Phe Gly Ala Asp Asp
100 105 110

Pro Lys Gly Gly Ala Val Val His Gly Pro Lys Phe Phe Ala Gln Pro
115 120 125

Thr Cys His Trp Arg Pro Glu Val Thr Gly Gly Val Leu Ala Asp Glu
130 135 140

Ser Ala Asp Leu Leu Arg Gly Phe Phe Arg Ala Arg Arg Lys Ala Lys
145 150 155 160

Ile

<210> 375
<211> 179
<212> PRT
<213> Geobacter sulfurreducens

<400> 375

Met Ser Ser Leu Lys Lys Thr Pro Ile Arg Asp Asp Ala Tyr Trp Met
1 5 10 15

Gly Lys Ala Ile Arg Glu Ala Ala Lys Ala Ala Ala Arg Asp Glu Val
20 25 30

Pro Ile Gly Ala Val Ile Val Arg Asp Gly Ala Val Ile Gly Arg Gly
35 40 45

His Asn Leu Arg Glu Gly Ser Asn Asp Pro Ser Ala His Ala Glu Met
50 55 60

Ile Ala Ile Arg Gln Ala Ala Arg Arg Ser Ala Asn Trp Arg Leu Thr
65 70 75 80

Gly Ala Thr Leu Tyr Val Thr Leu Glu Pro Cys Leu Met Cys Met Gly

85 90 95

Ala Ile Ile Leu Ala Arg Leu Glu Arg Val Val Phe Gly Cys Tyr Asp
100 105 110

Pro Lys Gly Gly Ala Ala Gly Ser Leu Tyr Asp Leu Ser Ala Asp Pro
115 120 125

Arg Leu Asn His Gln Val Arg Leu Ser Pro Gly Val Cys Gln Glu Glu
130 135 140

Cys Gly Thr Met Leu Ser Asp Phe Phe Arg Asp Leu Arg Arg Arg Lys
145 150 155 160

Lys Ala Lys Ala Thr Pro Ala Leu Phe Ile Asp Glu Arg Lys Val Pro
165 170 175

Pro Glu Pro

<210> 376
<211> 1300
<212> PRT
<213> Francisella novicida

<400> 376

Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1 5 10 15

Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
20 25 30

Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
35 40 45

Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
50 55 60

Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65 70 75 80

```
Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85                  90                  95

Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100                 105                 110

Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115                 120                 125

Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130                 135                 140

Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr
145                 150                 155                 160

Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr
                165                 170                 175

Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
            180                 185                 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
        195                 200                 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
    210                 215                 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225                 230                 235                 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
                245                 250                 255

Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
            260                 265                 270

Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
        275                 280                 285
```

```
Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
    290                 295                 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305                 310                 315                 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
                325                 330                 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
            340                 345                 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys
        355                 360                 365

Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln
    370                 375                 380

Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385                 390                 395                 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
                405                 410                 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
            420                 425                 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
        435                 440                 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
    450                 455                 460

Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465                 470                 475                 480

Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
                485                 490                 495
```

```
Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
            500                 505                 510

Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
        515                 520                 525

Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
    530                 535                 540

Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545                 550                 555                 560

Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val
                565                 570                 575

Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
            580                 585                 590

Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
        595                 600                 605

Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
    610                 615                 620

Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625                 630                 635                 640

Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
                645                 650                 655

Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
            660                 665                 670

Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
        675                 680                 685

Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
    690                 695                 700
```

```
Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705                 710                 715                 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
                725                 730                 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
            740                 745                 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
        755                 760                 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr
    770                 775                 780

Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg
785                 790                 795                 800

Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
                805                 810                 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
            820                 825                 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
        835                 840                 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
    850                 855                 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865                 870                 875                 880

His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
                885                 890                 895

Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
            900                 905                 910
```

```
Ile Leu Ser Ile Asp Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
        915                 920                 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
    930                 935                 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945                 950                 955                 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
                965                 970                 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
            980                 985                 990

Ala Lys Leu Val Ile Glu Tyr Asn  Ala Ile Val Val Phe  Glu Asp Leu
        995                 1000                1005

Asn Phe  Gly Phe Lys Arg Gly  Arg Phe Lys Val Glu  Lys Gln Val
    1010                1015                1020

Tyr Gln  Lys Leu Glu Lys Met  Leu Ile Glu Lys Leu  Asn Tyr Leu
    1025                1030                1035

Val Phe  Lys Asp Asn Glu Phe  Asp Lys Thr Gly Gly  Val Leu Arg
    1040                1045                1050

Ala Tyr  Gln Leu Thr Ala Pro  Phe Glu Thr Phe Lys  Lys Met Gly
    1055                1060                1065

Lys Gln  Thr Gly Ile Ile Tyr  Tyr Val Pro Ala Gly  Phe Thr Ser
    1070                1075                1080

Lys Ile  Cys Pro Val Thr Gly  Phe Val Asn Gln Leu  Tyr Pro Lys
    1085                1090                1095

Tyr Glu  Ser Val Ser Lys Ser  Gln Glu Phe Phe Ser  Lys Phe Asp
    1100                1105                1110
```

```
Lys Ile  Cys Tyr Asn Leu Asp  Lys Gly Tyr Phe Glu  Phe Ser Phe
    1115                1120                1125

Asp Tyr  Lys Asn Phe Gly Asp  Lys Ala Ala Lys Gly  Lys Trp Thr
    1130                1135                1140

Ile Ala  Ser Phe Gly Ser Arg  Leu Ile Asn Phe Arg  Asn Ser Asp
    1145                1150                1155

Lys Asn  His Asn Trp Asp Thr  Arg Glu Val Tyr Pro  Thr Lys Glu
    1160                1165                1170

Leu Glu  Lys Leu Leu Lys Asp  Tyr Ser Ile Glu Tyr  Gly His Gly
    1175                1180                1185

Glu Cys  Ile Lys Ala Ala Ile  Cys Gly Glu Ser Asp  Lys Lys Phe
    1190                1195                1200

Phe Ala  Lys Leu Thr Ser Val  Leu Asn Thr Ile Leu  Gln Met Arg
    1205                1210                1215

Asn Ser  Lys Thr Gly Thr Glu  Leu Asp Tyr Leu Ile  Ser Pro Val
    1220                1225                1230

Ala Asp  Val Asn Gly Asn Phe  Phe Asp Ser Arg Gln  Ala Pro Lys
    1235                1240                1245

Asn Met  Pro Gln Asp Ala Asp  Ala Asn Gly Ala Tyr  His Ile Gly
    1250                1255                1260

Leu Lys  Gly Leu Met Leu Leu  Gly Arg Ile Lys Asn  Asn Gln Glu
    1265                1270                1275

Gly Lys  Lys Leu Asn Leu Val  Ile Lys Asn Glu Glu  Tyr Phe Glu
    1280                1285                1290

Phe Val  Gln Asn Arg Asn Asn
    1295                1300
```

<210> 377
<211> 1300
<212> PRT
<213> Francisella novicida

<400> 377

```
Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1               5                  10                  15


Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
            20                  25                  30


Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
        35                  40                  45


Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
    50                  55                  60


Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65                  70                  75                  80


Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85                  90                  95


Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100                 105                 110


Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115                 120                 125


Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130                 135                 140


Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr
145                 150                 155                 160


Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr
                165                 170                 175
```

```
Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
            180                 185                 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
        195                 200                 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
    210                 215                 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225                 230                 235                 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
                245                 250                 255

Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
            260                 265                 270

Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
        275                 280                 285

Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
    290                 295                 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305                 310                 315                 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
                325                 330                 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
            340                 345                 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys
        355                 360                 365

Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln
    370                 375                 380
```

```
Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385                 390                 395                 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
                405                 410                 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
            420                 425                 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
        435                 440                 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
    450                 455                 460

Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465                 470                 475                 480

Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
                485                 490                 495

Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
            500                 505                 510

Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
        515                 520                 525

Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
    530                 535                 540

Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545                 550                 555                 560

Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val
                565                 570                 575

Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
            580                 585                 590
```

```
Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
        595                 600                 605

Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
    610                 615                 620

Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625                 630                 635                 640

Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
                645                 650                 655

Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
            660                 665                 670

Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
        675                 680                 685

Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
    690                 695                 700

Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705                 710                 715                 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
                725                 730                 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
            740                 745                 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
        755                 760                 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr
    770                 775                 780

Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg
785                 790                 795                 800
```

```
Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
               805                 810                 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
            820                 825                 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
        835                 840                 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
    850                 855                 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865                 870                 875                 880

His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
               885                 890                 895

Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
            900                 905                 910

Ile Leu Ser Ile Ala Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
        915                 920                 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
    930                 935                 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945                 950                 955                 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
               965                 970                 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
            980                 985                 990

Ala Lys Leu Val Ile Glu Tyr Asn  Ala Ile Val Val Phe  Glu Asp Leu
        995                 1000                1005
```

```
Asn Phe  Gly Phe Lys Arg Gly  Arg Phe Lys Val Glu  Lys Gln Val
    1010                1015                1020

Tyr Gln  Lys Leu Glu Lys Met  Leu Ile Glu Lys Leu  Asn Tyr Leu
    1025                1030                1035

Val Phe  Lys Asp Asn Glu Phe  Asp Lys Thr Gly Gly  Val Leu Arg
    1040                1045                1050

Ala Tyr  Gln Leu Thr Ala Pro  Phe Glu Thr Phe Lys  Lys Met Gly
    1055                1060                1065

Lys Gln  Thr Gly Ile Ile Tyr  Tyr Val Pro Ala Gly  Phe Thr Ser
    1070                1075                1080

Lys Ile  Cys Pro Val Thr Gly  Phe Val Asn Gln Leu  Tyr Pro Lys
    1085                1090                1095

Tyr Glu  Ser Val Ser Lys Ser  Gln Glu Phe Phe Ser  Lys Phe Asp
    1100                1105                1110

Lys Ile  Cys Tyr Asn Leu Asp  Lys Gly Tyr Phe Glu  Phe Ser Phe
    1115                1120                1125

Asp Tyr  Lys Asn Phe Gly Asp  Lys Ala Ala Lys Gly  Lys Trp Thr
    1130                1135                1140

Ile Ala  Ser Phe Gly Ser Arg  Leu Ile Asn Phe Arg  Asn Ser Asp
    1145                1150                1155

Lys Asn  His Asn Trp Asp Thr  Arg Glu Val Tyr Pro  Thr Lys Glu
    1160                1165                1170

Leu Glu  Lys Leu Leu Lys Asp  Tyr Ser Ile Glu Tyr  Gly His Gly
    1175                1180                1185

Glu Cys  Ile Lys Ala Ala Ile  Cys Gly Glu Ser Asp  Lys Lys Phe
    1190                1195                1200
```

```
Phe Ala  Lys Leu Thr Ser Val  Leu Asn Thr Ile Leu  Gln Met Arg
    1205                 1210                 1215


Asn Ser  Lys Thr Gly Thr Glu  Leu Asp Tyr Leu Ile  Ser Pro Val
    1220                 1225                 1230


Ala Asp  Val Asn Gly Asn Phe  Phe Asp Ser Arg Gln  Ala Pro Lys
    1235                 1240                 1245


Asn Met  Pro Gln Asp Ala Asp  Ala Asn Gly Ala Tyr  His Ile Gly
    1250                 1255                 1260


Leu Lys  Gly Leu Met Leu Leu  Gly Arg Ile Lys Asn  Asn Gln Glu
    1265                 1270                 1275


Gly Lys  Lys Leu Asn Leu Val  Ile Lys Asn Glu Glu  Tyr Phe Glu
    1280                 1285                 1290


Phe Val  Gln Asn Arg Asn Asn
    1295                 1300
```

<210> 378
<211> 1300
<212> PRT
<213> Francisella novicida

<400> 378

```
Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1               5                  10                  15


Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
            20                  25                  30


Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
        35                  40                  45


Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
    50                  55                  60
```

```
Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65                  70                  75                  80

Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85                  90                  95

Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100                 105                 110

Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115                 120                 125

Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130                 135                 140

Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr
145                 150                 155                 160

Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr
                165                 170                 175

Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
            180                 185                 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
        195                 200                 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
    210                 215                 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225                 230                 235                 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
                245                 250                 255

Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
            260                 265                 270
```

```
Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
        275                 280                 285

Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
    290                 295                 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305                 310                 315                 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
                325                 330                 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
            340                 345                 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys
        355                 360                 365

Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln
    370                 375                 380

Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385                 390                 395                 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
                405                 410                 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
            420                 425                 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
        435                 440                 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
    450                 455                 460

Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465                 470                 475                 480
```

```
Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
                485                 490                 495

Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
            500                 505                 510

Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
        515                 520                 525

Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
    530                 535                 540

Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545                 550                 555                 560

Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val
                565                 570                 575

Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
            580                 585                 590

Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
        595                 600                 605

Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
    610                 615                 620

Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625                 630                 635                 640

Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
                645                 650                 655

Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
            660                 665                 670

Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
        675                 680                 685
```

```
Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
    690                 695                 700

Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705                 710                 715                 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
                725                 730                 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
            740                 745                 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
        755                 760                 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr
    770                 775                 780

Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg
785                 790                 795                 800

Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
                805                 810                 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
            820                 825                 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
        835                 840                 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
    850                 855                 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865                 870                 875                 880

His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
                885                 890                 895
```

```
Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
            900                 905                 910

Ile Leu Ser Ile Asp Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
        915                 920                 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
    930                 935                 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945                 950                 955                 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
                965                 970                 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
            980                 985                 990

Ala Lys Leu Val Ile Glu Tyr Asn  Ala Ile Val Val Phe  Ala Asp Leu
        995                 1000                1005

Asn Phe  Gly Phe Lys Arg Gly  Arg Phe Lys Val Glu  Lys Gln Val
    1010                1015                1020

Tyr Gln  Lys Leu Glu Lys Met  Leu Ile Glu Lys Leu  Asn Tyr Leu
    1025                1030                1035

Val Phe  Lys Asp Asn Glu Phe  Asp Lys Thr Gly Gly  Val Leu Arg
    1040                1045                1050

Ala Tyr  Gln Leu Thr Ala Pro  Phe Glu Thr Phe Lys  Lys Met Gly
    1055                1060                1065

Lys Gln  Thr Gly Ile Ile Tyr  Tyr Val Pro Ala Gly  Phe Thr Ser
    1070                1075                1080

Lys Ile  Cys Pro Val Thr Gly  Phe Val Asn Gln Leu  Tyr Pro Lys
    1085                1090                1095
```

```
Tyr Glu  Ser Val Ser Lys Ser  Gln Glu Phe Phe Ser  Lys Phe Asp
    1100                1105                1110

Lys Ile  Cys Tyr Asn Leu Asp  Lys Gly Tyr Phe Glu  Phe Ser Phe
    1115                1120                1125

Asp Tyr  Lys Asn Phe Gly Asp  Lys Ala Ala Lys Gly  Lys Trp Thr
    1130                1135                1140

Ile Ala  Ser Phe Gly Ser Arg  Leu Ile Asn Phe Arg  Asn Ser Asp
    1145                1150                1155

Lys Asn  His Asn Trp Asp Thr  Arg Glu Val Tyr Pro  Thr Lys Glu
    1160                1165                1170

Leu Glu  Lys Leu Leu Lys Asp  Tyr Ser Ile Glu Tyr  Gly His Gly
    1175                1180                1185

Glu Cys  Ile Lys Ala Ala Ile  Cys Gly Glu Ser Asp  Lys Lys Phe
    1190                1195                1200

Phe Ala  Lys Leu Thr Ser Val  Leu Asn Thr Ile Leu  Gln Met Arg
    1205                1210                1215

Asn Ser  Lys Thr Gly Thr Glu  Leu Asp Tyr Leu Ile  Ser Pro Val
    1220                1225                1230

Ala Asp  Val Asn Gly Asn Phe  Phe Asp Ser Arg Gln  Ala Pro Lys
    1235                1240                1245

Asn Met  Pro Gln Asp Ala Asp  Ala Asn Gly Ala Tyr  His Ile Gly
    1250                1255                1260

Leu Lys  Gly Leu Met Leu Leu  Gly Arg Ile Lys Asn  Asn Gln Glu
    1265                1270                1275

Gly Lys  Lys Leu Asn Leu Val  Ile Lys Asn Glu Glu  Tyr Phe Glu
    1280                1285                1290
```

Phe Val Gln Asn Arg Asn Asn
    1295   1300

<210> 379
<211> 1300
<212> PRT
<213> Francisella novicida

<400> 379

Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1   5   10   15

Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
            20   25   30

Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
        35   40   45

Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
    50   55   60

Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65   70   75   80

Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85   90   95

Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100   105   110

Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115   120   125

Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130   135   140

Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr
145   150   155   160

Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr

165 170 175

Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
180 185 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
195 200 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
210 215 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225 230 235 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
245 250 255

Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
260 265 270

Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
275 280 285

Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
290 295 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305 310 315 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
325 330 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
340 345 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys
355 360 365

Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln

```
    370                 375                 380

Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385                 390                 395                 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
                405                 410                 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
            420                 425                 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
        435                 440                 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
    450                 455                 460

Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465                 470                 475                 480

Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
                485                 490                 495

Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
            500                 505                 510

Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
        515                 520                 525

Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
    530                 535                 540

Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545                 550                 555                 560

Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val
                565                 570                 575

Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
```

580 585 590

Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
595 600 605

Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
610 615 620

Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625 630 635 640

Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
645 650 655

Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
660 665 670

Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
675 680 685

Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
690 695 700

Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705 710 715 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
725 730 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
740 745 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
755 760 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr
770 775 780

Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg

785 790 795 800

Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
805 810 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
820 825 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
835 840 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
850 855 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865 870 875 880

His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
885 890 895

Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
900 905 910

Ile Leu Ser Ile Asp Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
915 920 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
930 935 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945 950 955 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
965 970 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
980 985 990

Ala Lys Leu Val Ile Glu Tyr Asn Ala Ile Val Val Phe Glu Asp Leu

995 1000 1005

Asn Phe Gly Phe Lys Arg Gly Arg Phe Lys Val Glu Lys Gln Val
1010 1015 1020

Tyr Gln Lys Leu Glu Lys Met Leu Ile Glu Lys Leu Asn Tyr Leu
1025 1030 1035

Val Phe Lys Asp Asn Glu Phe Asp Lys Thr Gly Gly Val Leu Arg
1040 1045 1050

Ala Tyr Gln Leu Thr Ala Pro Phe Glu Thr Phe Lys Lys Met Gly
1055 1060 1065

Lys Gln Thr Gly Ile Ile Tyr Tyr Val Pro Ala Gly Phe Thr Ser
1070 1075 1080

Lys Ile Cys Pro Val Thr Gly Phe Val Asn Gln Leu Tyr Pro Lys
1085 1090 1095

Tyr Glu Ser Val Ser Lys Ser Gln Glu Phe Phe Ser Lys Phe Asp
1100 1105 1110

Lys Ile Cys Tyr Asn Leu Asp Lys Gly Tyr Phe Glu Phe Ser Phe
1115 1120 1125

Asp Tyr Lys Asn Phe Gly Asp Lys Ala Ala Lys Gly Lys Trp Thr
1130 1135 1140

Ile Ala Ser Phe Gly Ser Arg Leu Ile Asn Phe Arg Asn Ser Asp
1145 1150 1155

Lys Asn His Asn Trp Asp Thr Arg Glu Val Tyr Pro Thr Lys Glu
1160 1165 1170

Leu Glu Lys Leu Leu Lys Asp Tyr Ser Ile Glu Tyr Gly His Gly
1175 1180 1185

Glu Cys Ile Lys Ala Ala Ile Cys Gly Glu Ser Asp Lys Lys Phe

1190 1195 1200

Phe Ala Lys Leu Thr Ser Val Leu Asn Thr Ile Leu Gln Met Arg
1205 1210 1215

Asn Ser Lys Thr Gly Thr Glu Leu Asp Tyr Leu Ile Ser Pro Val
1220 1225 1230

Ala Asp Val Asn Gly Asn Phe Phe Asp Ser Arg Gln Ala Pro Lys
1235 1240 1245

Asn Met Pro Gln Asp Ala Ala Ala Asn Gly Ala Tyr His Ile Gly
1250 1255 1260

Leu Lys Gly Leu Met Leu Leu Gly Arg Ile Lys Asn Asn Gln Glu
1265 1270 1275

Gly Lys Lys Leu Asn Leu Val Ile Lys Asn Glu Glu Tyr Phe Glu
1280 1285 1290

Phe Val Gln Asn Arg Asn Asn
1295 1300

<210> 380
<211> 1300
<212> PRT
<213> Francisella novicida

<400> 380

Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1 5 10 15

Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
20 25 30

Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
35 40 45

Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
50 55 60

```
Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65                  70                  75                  80

Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85                  90                  95

Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100                 105                 110

Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115                 120                 125

Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130                 135                 140

Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr
145                 150                 155                 160

Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr
                165                 170                 175

Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
            180                 185                 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
        195                 200                 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
    210                 215                 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225                 230                 235                 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
                245                 250                 255

Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
            260                 265                 270
```

```
Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
        275                 280                 285

Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
    290                 295                 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305                 310                 315                 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
                325                 330                 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
            340                 345                 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys
        355                 360                 365

Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln
    370                 375                 380

Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385                 390                 395                 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
                405                 410                 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
            420                 425                 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
        435                 440                 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
    450                 455                 460

Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465                 470                 475                 480
```

```
Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
                485                 490                 495

Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
            500                 505                 510

Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
        515                 520                 525

Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
    530                 535                 540

Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545                 550                 555                 560

Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val
                565                 570                 575

Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
            580                 585                 590

Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
        595                 600                 605

Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
    610                 615                 620

Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625                 630                 635                 640

Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
                645                 650                 655

Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
            660                 665                 670

Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
        675                 680                 685
```

```
Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
    690                 695                 700

Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705                 710                 715                 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
                725                 730                 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
            740                 745                 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
        755                 760                 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr
    770                 775                 780

Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg
785                 790                 795                 800

Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
                805                 810                 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
            820                 825                 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
        835                 840                 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
    850                 855                 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865                 870                 875                 880

His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
                885                 890                 895
```

```
Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
            900                 905                 910

Ile Leu Ser Ile Ala Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
        915                 920                 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
    930                 935                 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945                 950                 955                 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
                965                 970                 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
            980                 985                 990

Ala Lys Leu Val Ile Glu Tyr Asn  Ala Ile Val Val Phe  Ala Asp Leu
        995                 1000                1005

Asn Phe  Gly Phe Lys Arg Gly  Arg Phe Lys Val Glu  Lys Gln Val
    1010                1015                1020

Tyr Gln  Lys Leu Glu Lys Met  Leu Ile Glu Lys Leu  Asn Tyr Leu
    1025                1030                1035

Val Phe  Lys Asp Asn Glu Phe  Asp Lys Thr Gly Gly  Val Leu Arg
    1040                1045                1050

Ala Tyr  Gln Leu Thr Ala Pro  Phe Glu Thr Phe Lys  Lys Met Gly
    1055                1060                1065

Lys Gln  Thr Gly Ile Ile Tyr  Tyr Val Pro Ala Gly  Phe Thr Ser
    1070                1075                1080

Lys Ile  Cys Pro Val Thr Gly  Phe Val Asn Gln Leu  Tyr Pro Lys
    1085                1090                1095
```

```
Tyr Glu  Ser Val Ser Lys Ser  Gln Glu Phe Phe Ser  Lys Phe Asp
    1100                1105                1110

Lys Ile  Cys Tyr Asn Leu Asp  Lys Gly Tyr Phe Glu  Phe Ser Phe
    1115                1120                1125

Asp Tyr  Lys Asn Phe Gly Asp  Lys Ala Ala Lys Gly  Lys Trp Thr
    1130                1135                1140

Ile Ala  Ser Phe Gly Ser Arg  Leu Ile Asn Phe Arg  Asn Ser Asp
    1145                1150                1155

Lys Asn  His Asn Trp Asp Thr  Arg Glu Val Tyr Pro  Thr Lys Glu
    1160                1165                1170

Leu Glu  Lys Leu Leu Lys Asp  Tyr Ser Ile Glu Tyr  Gly His Gly
    1175                1180                1185

Glu Cys  Ile Lys Ala Ala Ile  Cys Gly Glu Ser Asp  Lys Lys Phe
    1190                1195                1200

Phe Ala  Lys Leu Thr Ser Val  Leu Asn Thr Ile Leu  Gln Met Arg
    1205                1210                1215

Asn Ser  Lys Thr Gly Thr Glu  Leu Asp Tyr Leu Ile  Ser Pro Val
    1220                1225                1230

Ala Asp  Val Asn Gly Asn Phe  Phe Asp Ser Arg Gln  Ala Pro Lys
    1235                1240                1245

Asn Met  Pro Gln Asp Ala Asp  Ala Asn Gly Ala Tyr  His Ile Gly
    1250                1255                1260

Leu Lys  Gly Leu Met Leu Leu  Gly Arg Ile Lys Asn  Asn Gln Glu
    1265                1270                1275

Gly Lys  Lys Leu Asn Leu Val  Ile Lys Asn Glu Glu  Tyr Phe Glu
    1280                1285                1290
```

```
Phe Val  Gln Asn Arg Asn Asn
    1295                1300


<210>  381
<211>  1300
<212>  PRT
<213>  Francisella novicida

<400>  381

Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1               5                  10                  15


Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
            20                  25                  30


Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
        35                  40                  45


Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
    50                  55                  60


Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65                  70                  75                  80


Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85                  90                  95


Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100                 105                 110


Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115                 120                 125


Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130                 135                 140


Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr
145                 150                 155                 160
```

```
Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr
                165                 170                 175

Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
            180                 185                 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
        195                 200                 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
    210                 215                 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225                 230                 235                 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
                245                 250                 255

Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
            260                 265                 270

Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
        275                 280                 285

Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
    290                 295                 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305                 310                 315                 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
                325                 330                 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
            340                 345                 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys
        355                 360                 365
```

```
Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln
    370                 375                 380

Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385                 390                 395                 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
                405                 410                 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
            420                 425                 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
        435                 440                 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
    450                 455                 460

Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465                 470                 475                 480

Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
                485                 490                 495

Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
            500                 505                 510

Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
        515                 520                 525

Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
    530                 535                 540

Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545                 550                 555                 560

Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val
                565                 570                 575
```

```
Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
            580                 585                 590

Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
        595                 600                 605

Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
    610                 615                 620

Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625                 630                 635                 640

Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
                645                 650                 655

Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
            660                 665                 670

Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
        675                 680                 685

Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
    690                 695                 700

Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705                 710                 715                 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
                725                 730                 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
            740                 745                 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
        755                 760                 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr
    770                 775                 780
```

```
Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg
785                 790                 795                 800

Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
                805                 810                 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
            820                 825                 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
        835                 840                 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
    850                 855                 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865                 870                 875                 880

His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
                885                 890                 895

Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
            900                 905                 910

Ile Leu Ser Ile Ala Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
        915                 920                 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
    930                 935                 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945                 950                 955                 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
                965                 970                 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
            980                 985                 990
```

```
Ala Lys Leu Val Ile Glu Tyr Asn  Ala Ile Val Val Phe  Glu Asp Leu
        995                 1000                1005


Asn Phe  Gly Phe Lys Arg Gly  Arg Phe Lys Val Glu  Lys Gln Val
    1010                1015                1020


Tyr Gln  Lys Leu Glu Lys Met  Leu Ile Glu Lys Leu  Asn Tyr Leu
    1025                1030                1035


Val Phe  Lys Asp Asn Glu Phe  Asp Lys Thr Gly Gly  Val Leu Arg
    1040                1045                1050


Ala Tyr  Gln Leu Thr Ala Pro  Phe Glu Thr Phe Lys  Lys Met Gly
    1055                1060                1065


Lys Gln  Thr Gly Ile Ile Tyr  Tyr Val Pro Ala Gly  Phe Thr Ser
    1070                1075                1080


Lys Ile  Cys Pro Val Thr Gly  Phe Val Asn Gln Leu  Tyr Pro Lys
    1085                1090                1095


Tyr Glu  Ser Val Ser Lys Ser  Gln Glu Phe Phe Ser  Lys Phe Asp
    1100                1105                1110


Lys Ile  Cys Tyr Asn Leu Asp  Lys Gly Tyr Phe Glu  Phe Ser Phe
    1115                1120                1125


Asp Tyr  Lys Asn Phe Gly Asp  Lys Ala Ala Lys Gly  Lys Trp Thr
    1130                1135                1140


Ile Ala  Ser Phe Gly Ser Arg  Leu Ile Asn Phe Arg  Asn Ser Asp
    1145                1150                1155


Lys Asn  His Asn Trp Asp Thr  Arg Glu Val Tyr Pro  Thr Lys Glu
    1160                1165                1170


Leu Glu  Lys Leu Leu Lys Asp  Tyr Ser Ile Glu Tyr  Gly His Gly
    1175                1180                1185
```

```
Glu Cys  Ile Lys Ala Ala Ile  Cys Gly Glu Ser Asp  Lys Lys Phe
    1190                 1195                 1200


Phe Ala  Lys Leu Thr Ser Val  Leu Asn Thr Ile Leu  Gln Met Arg
    1205                 1210                 1215


Asn Ser  Lys Thr Gly Thr Glu  Leu Asp Tyr Leu Ile  Ser Pro Val
    1220                 1225                 1230


Ala Asp  Val Asn Gly Asn Phe  Phe Asp Ser Arg Gln  Ala Pro Lys
    1235                 1240                 1245


Asn Met  Pro Gln Asp Ala Ala  Ala Asn Gly Ala Tyr  His Ile Gly
    1250                 1255                 1260


Leu Lys  Gly Leu Met Leu Leu  Gly Arg Ile Lys Asn  Asn Gln Glu
    1265                 1270                 1275


Gly Lys  Lys Leu Asn Leu Val  Ile Lys Asn Glu Glu  Tyr Phe Glu
    1280                 1285                 1290


Phe Val  Gln Asn Arg Asn Asn
    1295                 1300


<210>  382
<211>  1300
<212>  PRT
<213>  Francisella novicida

<400>  382

Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1               5                  10                  15


Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
            20                  25                  30


Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
        35                  40                  45
```

```
Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
    50                  55                  60

Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65                  70                  75                  80

Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85                  90                  95

Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100                 105                 110

Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115                 120                 125

Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130                 135                 140

Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr
145                 150                 155                 160

Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr
                165                 170                 175

Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
            180                 185                 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
        195                 200                 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
    210                 215                 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225                 230                 235                 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
                245                 250                 255
```

```
Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
            260                 265                 270

Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
        275                 280                 285

Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
    290                 295                 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305                 310                 315                 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
                325                 330                 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
            340                 345                 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys
        355                 360                 365

Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln
    370                 375                 380

Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385                 390                 395                 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
                405                 410                 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
            420                 425                 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
        435                 440                 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
    450                 455                 460
```

```
Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465                 470                 475                 480


Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
                485                 490                 495


Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
            500                 505                 510


Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
        515                 520                 525


Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
    530                 535                 540


Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545                 550                 555                 560


Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val
                565                 570                 575


Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
            580                 585                 590


Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
        595                 600                 605


Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
    610                 615                 620


Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625                 630                 635                 640


Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
                645                 650                 655


Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
            660                 665                 670
```

```
Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
        675                 680                 685

Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
    690                 695                 700

Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705                 710                 715                 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
                725                 730                 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
            740                 745                 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
        755                 760                 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr
    770                 775                 780

Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg
785                 790                 795                 800

Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
                805                 810                 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
            820                 825                 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
        835                 840                 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
    850                 855                 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865                 870                 875                 880
```

```
His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
               885                 890                 895

Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
            900                 905                 910

Ile Leu Ser Ile Asp Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
        915                 920                 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
    930                 935                 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945                 950                 955                 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
               965                 970                 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
            980                 985                 990

Ala Lys Leu Val Ile Glu Tyr Asn  Ala Ile Val Val Phe  Ala Asp Leu
        995                 1000                1005

Asn Phe  Gly Phe Lys Arg Gly  Arg Phe Lys Val Glu  Lys Gln Val
    1010                1015                1020

Tyr Gln  Lys Leu Glu Lys Met  Leu Ile Glu Lys Leu  Asn Tyr Leu
    1025                1030                1035

Val Phe  Lys Asp Asn Glu Phe  Asp Lys Thr Gly Gly  Val Leu Arg
    1040                1045                1050

Ala Tyr  Gln Leu Thr Ala Pro  Phe Glu Thr Phe Lys  Lys Met Gly
    1055                1060                1065

Lys Gln  Thr Gly Ile Ile Tyr  Tyr Val Pro Ala Gly  Phe Thr Ser
    1070                1075                1080
```

```
Lys Ile  Cys Pro Val Thr Gly  Phe Val Asn Gln Leu  Tyr Pro Lys
    1085                1090                1095

Tyr Glu  Ser Val Ser Lys Ser  Gln Glu Phe Phe Ser  Lys Phe Asp
    1100                1105                1110

Lys Ile  Cys Tyr Asn Leu Asp  Lys Gly Tyr Phe Glu  Phe Ser Phe
    1115                1120                1125

Asp Tyr  Lys Asn Phe Gly Asp  Lys Ala Ala Lys Gly  Lys Trp Thr
    1130                1135                1140

Ile Ala  Ser Phe Gly Ser Arg  Leu Ile Asn Phe Arg  Asn Ser Asp
    1145                1150                1155

Lys Asn  His Asn Trp Asp Thr  Arg Glu Val Tyr Pro  Thr Lys Glu
    1160                1165                1170

Leu Glu  Lys Leu Leu Lys Asp  Tyr Ser Ile Glu Tyr  Gly His Gly
    1175                1180                1185

Glu Cys  Ile Lys Ala Ala Ile  Cys Gly Glu Ser Asp  Lys Lys Phe
    1190                1195                1200

Phe Ala  Lys Leu Thr Ser Val  Leu Asn Thr Ile Leu  Gln Met Arg
    1205                1210                1215

Asn Ser  Lys Thr Gly Thr Glu  Leu Asp Tyr Leu Ile  Ser Pro Val
    1220                1225                1230

Ala Asp  Val Asn Gly Asn Phe  Phe Asp Ser Arg Gln  Ala Pro Lys
    1235                1240                1245

Asn Met  Pro Gln Asp Ala Ala  Ala Asn Gly Ala Tyr  His Ile Gly
    1250                1255                1260

Leu Lys  Gly Leu Met Leu Leu  Gly Arg Ile Lys Asn  Asn Gln Glu
    1265                1270                1275
```

Gly Lys Lys Leu Asn Leu Val Ile Lys Asn Glu Glu Tyr Phe Glu
    1280   1285   1290

Phe Val Gln Asn Arg Asn Asn
    1295   1300

<210> 383
<211> 1300
<212> PRT
<213> Francisella novicida

<400> 383

Met Ser Ile Tyr Gln Glu Phe Val Asn Lys Tyr Ser Leu Ser Lys Thr
1   5   10   15

Leu Arg Phe Glu Leu Ile Pro Gln Gly Lys Thr Leu Glu Asn Ile Lys
            20   25   30

Ala Arg Gly Leu Ile Leu Asp Asp Glu Lys Arg Ala Lys Asp Tyr Lys
        35   40   45

Lys Ala Lys Gln Ile Ile Asp Lys Tyr His Gln Phe Phe Ile Glu Glu
    50   55   60

Ile Leu Ser Ser Val Cys Ile Ser Glu Asp Leu Leu Gln Asn Tyr Ser
65   70   75   80

Asp Val Tyr Phe Lys Leu Lys Lys Ser Asp Asp Asp Asn Leu Gln Lys
                85   90   95

Asp Phe Lys Ser Ala Lys Asp Thr Ile Lys Lys Gln Ile Ser Glu Tyr
            100   105   110

Ile Lys Asp Ser Glu Lys Phe Lys Asn Leu Phe Asn Gln Asn Leu Ile
        115   120   125

Asp Ala Lys Lys Gly Gln Glu Ser Asp Leu Ile Leu Trp Leu Lys Gln
    130   135   140

Ser Lys Asp Asn Gly Ile Glu Leu Phe Lys Ala Asn Ser Asp Ile Thr

145 150 155 160

Asp Ile Asp Glu Ala Leu Glu Ile Ile Lys Ser Phe Lys Gly Trp Thr
165 170 175

Thr Tyr Phe Lys Gly Phe His Glu Asn Arg Lys Asn Val Tyr Ser Ser
180 185 190

Asn Asp Ile Pro Thr Ser Ile Ile Tyr Arg Ile Val Asp Asp Asn Leu
195 200 205

Pro Lys Phe Leu Glu Asn Lys Ala Lys Tyr Glu Ser Leu Lys Asp Lys
210 215 220

Ala Pro Glu Ala Ile Asn Tyr Glu Gln Ile Lys Lys Asp Leu Ala Glu
225 230 235 240

Glu Leu Thr Phe Asp Ile Asp Tyr Lys Thr Ser Glu Val Asn Gln Arg
245 250 255

Val Phe Ser Leu Asp Glu Val Phe Glu Ile Ala Asn Phe Asn Asn Tyr
260 265 270

Leu Asn Gln Ser Gly Ile Thr Lys Phe Asn Thr Ile Ile Gly Gly Lys
275 280 285

Phe Val Asn Gly Glu Asn Thr Lys Arg Lys Gly Ile Asn Glu Tyr Ile
290 295 300

Asn Leu Tyr Ser Gln Gln Ile Asn Asp Lys Thr Leu Lys Lys Tyr Lys
305 310 315 320

Met Ser Val Leu Phe Lys Gln Ile Leu Ser Asp Thr Glu Ser Lys Ser
325 330 335

Phe Val Ile Asp Lys Leu Glu Asp Asp Ser Asp Val Val Thr Thr Met
340 345 350

Gln Ser Phe Tyr Glu Gln Ile Ala Ala Phe Lys Thr Val Glu Glu Lys

355 360 365

Ser Ile Lys Glu Thr Leu Ser Leu Leu Phe Asp Asp Leu Lys Ala Gln
370 375 380

Lys Leu Asp Leu Ser Lys Ile Tyr Phe Lys Asn Asp Lys Ser Leu Thr
385 390 395 400

Asp Leu Ser Gln Gln Val Phe Asp Asp Tyr Ser Val Ile Gly Thr Ala
405 410 415

Val Leu Glu Tyr Ile Thr Gln Gln Ile Ala Pro Lys Asn Leu Asp Asn
420 425 430

Pro Ser Lys Lys Glu Gln Glu Leu Ile Ala Lys Lys Thr Glu Lys Ala
435 440 445

Lys Tyr Leu Ser Leu Glu Thr Ile Lys Leu Ala Leu Glu Glu Phe Asn
450 455 460

Lys His Arg Asp Ile Asp Lys Gln Cys Arg Phe Glu Glu Ile Leu Ala
465 470 475 480

Asn Phe Ala Ala Ile Pro Met Ile Phe Asp Glu Ile Ala Gln Asn Lys
485 490 495

Asp Asn Leu Ala Gln Ile Ser Ile Lys Tyr Gln Asn Gln Gly Lys Lys
500 505 510

Asp Leu Leu Gln Ala Ser Ala Glu Asp Asp Val Lys Ala Ile Lys Asp
515 520 525

Leu Leu Asp Gln Thr Asn Asn Leu Leu His Lys Leu Lys Ile Phe His
530 535 540

Ile Ser Gln Ser Glu Asp Lys Ala Asn Ile Leu Asp Lys Asp Glu His
545 550 555 560

Phe Tyr Leu Val Phe Glu Glu Cys Tyr Phe Glu Leu Ala Asn Ile Val

565 570 575

Pro Leu Tyr Asn Lys Ile Arg Asn Tyr Ile Thr Gln Lys Pro Tyr Ser
580 585 590

Asp Glu Lys Phe Lys Leu Asn Phe Glu Asn Ser Thr Leu Ala Asn Gly
595 600 605

Trp Asp Lys Asn Lys Glu Pro Asp Asn Thr Ala Ile Leu Phe Ile Lys
610 615 620

Asp Asp Lys Tyr Tyr Leu Gly Val Met Asn Lys Lys Asn Asn Lys Ile
625 630 635 640

Phe Asp Asp Lys Ala Ile Lys Glu Asn Lys Gly Glu Gly Tyr Lys Lys
645 650 655

Ile Val Tyr Lys Leu Leu Pro Gly Ala Asn Lys Met Leu Pro Lys Val
660 665 670

Phe Phe Ser Ala Lys Ser Ile Lys Phe Tyr Asn Pro Ser Glu Asp Ile
675 680 685

Leu Arg Ile Arg Asn His Ser Thr His Thr Lys Asn Gly Ser Pro Gln
690 695 700

Lys Gly Tyr Glu Lys Phe Glu Phe Asn Ile Glu Asp Cys Arg Lys Phe
705 710 715 720

Ile Asp Phe Tyr Lys Gln Ser Ile Ser Lys His Pro Glu Trp Lys Asp
725 730 735

Phe Gly Phe Arg Phe Ser Asp Thr Gln Arg Tyr Asn Ser Ile Asp Glu
740 745 750

Phe Tyr Arg Glu Val Glu Asn Gln Gly Tyr Lys Leu Thr Phe Glu Asn
755 760 765

Ile Ser Glu Ser Tyr Ile Asp Ser Val Val Asn Gln Gly Lys Leu Tyr

```
    770                 775                 780

Leu Phe Gln Ile Tyr Asn Lys Asp Phe Ser Ala Tyr Ser Lys Gly Arg
785                 790                 795                 800

Pro Asn Leu His Thr Leu Tyr Trp Lys Ala Leu Phe Asp Glu Arg Asn
                805                 810                 815

Leu Gln Asp Val Val Tyr Lys Leu Asn Gly Glu Ala Glu Leu Phe Tyr
            820                 825                 830

Arg Lys Gln Ser Ile Pro Lys Lys Ile Thr His Pro Ala Lys Glu Ala
        835                 840                 845

Ile Ala Asn Lys Asn Lys Asp Asn Pro Lys Lys Glu Ser Val Phe Glu
    850                 855                 860

Tyr Asp Leu Ile Lys Asp Lys Arg Phe Thr Glu Asp Lys Phe Phe Phe
865                 870                 875                 880

His Cys Pro Ile Thr Ile Asn Phe Lys Ser Ser Gly Ala Asn Lys Phe
                885                 890                 895

Asn Asp Glu Ile Asn Leu Leu Leu Lys Glu Lys Ala Asn Asp Val His
            900                 905                 910

Ile Leu Ser Ile Ala Arg Gly Glu Arg His Leu Ala Tyr Tyr Thr Leu
        915                 920                 925

Val Asp Gly Lys Gly Asn Ile Ile Lys Gln Asp Thr Phe Asn Ile Ile
    930                 935                 940

Gly Asn Asp Arg Met Lys Thr Asn Tyr His Asp Lys Leu Ala Ala Ile
945                 950                 955                 960

Glu Lys Asp Arg Asp Ser Ala Arg Lys Asp Trp Lys Lys Ile Asn Asn
                965                 970                 975

Ile Lys Glu Met Lys Glu Gly Tyr Leu Ser Gln Val Val His Glu Ile
```

980 985 990

Ala Lys Leu Val Ile Glu Tyr Asn Ala Ile Val Val Phe Ala Asp Leu
995 1000 1005

Asn Phe Gly Phe Lys Arg Gly Arg Phe Lys Val Glu Lys Gln Val
1010 1015 1020

Tyr Gln Lys Leu Glu Lys Met Leu Ile Glu Lys Leu Asn Tyr Leu
1025 1030 1035

Val Phe Lys Asp Asn Glu Phe Asp Lys Thr Gly Gly Val Leu Arg
1040 1045 1050

Ala Tyr Gln Leu Thr Ala Pro Phe Glu Thr Phe Lys Lys Met Gly
1055 1060 1065

Lys Gln Thr Gly Ile Ile Tyr Tyr Val Pro Ala Gly Phe Thr Ser
1070 1075 1080

Lys Ile Cys Pro Val Thr Gly Phe Val Asn Gln Leu Tyr Pro Lys
1085 1090 1095

Tyr Glu Ser Val Ser Lys Ser Gln Glu Phe Phe Ser Lys Phe Asp
1100 1105 1110

Lys Ile Cys Tyr Asn Leu Asp Lys Gly Tyr Phe Glu Phe Ser Phe
1115 1120 1125

Asp Tyr Lys Asn Phe Gly Asp Lys Ala Ala Lys Gly Lys Trp Thr
1130 1135 1140

Ile Ala Ser Phe Gly Ser Arg Leu Ile Asn Phe Arg Asn Ser Asp
1145 1150 1155

Lys Asn His Asn Trp Asp Thr Arg Glu Val Tyr Pro Thr Lys Glu
1160 1165 1170

Leu Glu Lys Leu Leu Lys Asp Tyr Ser Ile Glu Tyr Gly His Gly

1175 1180 1185

Glu Cys Ile Lys Ala Ala Ile Cys Gly Glu Ser Asp Lys Lys Phe
1190 1195 1200

Phe Ala Lys Leu Thr Ser Val Leu Asn Thr Ile Leu Gln Met Arg
1205 1210 1215

Asn Ser Lys Thr Gly Thr Glu Leu Asp Tyr Leu Ile Ser Pro Val
1220 1225 1230

Ala Asp Val Asn Gly Asn Phe Phe Asp Ser Arg Gln Ala Pro Lys
1235 1240 1245

Asn Met Pro Gln Asp Ala Ala Ala Asn Gly Ala Tyr His Ile Gly
1250 1255 1260

Leu Lys Gly Leu Met Leu Leu Gly Arg Ile Lys Asn Asn Gln Glu
1265 1270 1275

Gly Lys Lys Leu Asn Leu Val Ile Lys Asn Glu Glu Tyr Phe Glu
1280 1285 1290

Phe Val Gln Asn Arg Asn Asn
1295 1300

<210> 384
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 384

Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala
1 5 10 15

Thr Pro Glu Ser Ser Gly Gly Ser
20

<210> 385
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 385

Ser Gly Gly Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr
1 5 10 15

Ser Glu Ser Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser
20 25 30

<210> 386
<211> 104
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 386

Gly Gly Ser Gly Gly Ser Pro Gly Ser Pro Ala Gly Ser Pro Thr Ser
1 5 10 15

Thr Glu Glu Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Gly Pro Gly
20 25 30

Thr Ser Thr Glu Pro Ser Glu Gly Ser Ala Pro Gly Ser Pro Ala Gly
35 40 45

Ser Pro Thr Ser Thr Glu Glu Gly Thr Ser Thr Glu Pro Ser Glu Gly
50 55 60

Ser Ala Pro Gly Thr Ser Thr Glu Pro Ser Glu Gly Ser Ala Pro Gly
65 70 75 80

Thr Ser Glu Ser Ala Thr Pro Glu Ser Gly Pro Gly Ser Glu Pro Ala
85 90 95

Thr Ser Gly Gly Ser Gly Gly Ser
100

<210> 387
<211> 1782
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 387

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
85 90 95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
100 105 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
115 120 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
130 135 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys

145 150 155 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
165 170 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
180 185 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
195 200 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
210 215 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225 230 235 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
245 250 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
260 265 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
275 280 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
290 295 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305 310 315 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
325 330 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
340 345 350

Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile

355 360 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
370 375 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385 390 395 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
405 410 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
420 425 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
435 440 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
450 455 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465 470 475 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
485 490 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
500 505 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
515 520 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
530 535 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545 550 555 560

Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn

565 570 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
580 585 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
595 600 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
610 615 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625 630 635 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
645 650 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
660 665 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
675 680 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
690 695 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705 710 715 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
725 730 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
740 745 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
755 760 765

Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys

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    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975

Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
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            980                 985                 990

Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                1000                1005

Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020

Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035

Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050

Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065

Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080

Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095

Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110

Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125

Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140

Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155

Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170

Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
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1175 1180 1185

Glu Phe Val Tyr Gly Asp Tyr Lys Val Tyr Asp Val Arg Lys Met
1190 1195 1200

Ile Ala Lys Ser Glu Gln Glu Ile Gly Lys Ala Thr Ala Lys Tyr
1205 1210 1215

Phe Phe Tyr Ser Asn Ile Met Asn Phe Phe Lys Thr Glu Ile Thr
1220 1225 1230

Leu Ala Asn Gly Glu Ile Arg Lys Arg Pro Leu Ile Glu Thr Asn
1235 1240 1245

Gly Glu Thr Gly Glu Ile Val Trp Asp Lys Gly Arg Asp Phe Ala
1250 1255 1260

Thr Val Arg Lys Val Leu Ser Met Pro Gln Val Asn Ile Val Lys
1265 1270 1275

Lys Thr Glu Val Gln Thr Gly Gly Phe Ser Lys Glu Ser Ile Leu
1280 1285 1290

Pro Lys Arg Asn Ser Asp Lys Leu Ile Ala Arg Lys Lys Asp Trp
1295 1300 1305

Asp Pro Lys Lys Tyr Gly Gly Phe Asp Ser Pro Thr Val Ala Tyr
1310 1315 1320

Ser Val Leu Val Val Ala Lys Val Glu Lys Gly Lys Ser Lys Lys
1325 1330 1335

Leu Lys Ser Val Lys Glu Leu Leu Gly Ile Thr Ile Met Glu Arg
1340 1345 1350

Ser Ser Phe Glu Lys Asn Pro Ile Asp Phe Leu Glu Ala Lys Gly
1355 1360 1365

Tyr Lys Glu Val Lys Lys Asp Leu Ile Ile Lys Leu Pro Lys Tyr

1370 1375 1380

Ser Leu Phe Glu Leu Glu Asn Gly Arg Lys Arg Met Leu Ala Ser
1385 1390 1395

Ala Gly Glu Leu Gln Lys Gly Asn Glu Leu Ala Leu Pro Ser Lys
1400 1405 1410

Tyr Val Asn Phe Leu Tyr Leu Ala Ser His Tyr Glu Lys Leu Lys
1415 1420 1425

Gly Ser Pro Glu Asp Asn Glu Gln Lys Gln Leu Phe Val Glu Gln
1430 1435 1440

His Lys His Tyr Leu Asp Glu Ile Ile Glu Gln Ile Ser Glu Phe
1445 1450 1455

Ser Lys Arg Val Ile Leu Ala Asp Ala Asn Leu Asp Lys Val Leu
1460 1465 1470

Ser Ala Tyr Asn Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala
1475 1480 1485

Glu Asn Ile Ile His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro
1490 1495 1500

Ala Ala Phe Lys Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg Tyr
1505 1510 1515

Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser
1520 1525 1530

Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly
1535 1540 1545

Gly Asp Gly Gly Ser Lys Gly His Leu Thr Arg Leu Gly Leu Glu
1550 1555 1560

Phe Phe Asp Gln Pro Ala Val Pro Leu Ala Arg Ala Phe Leu Gly

1565 1570 1575

Gln Val Leu Val Arg Arg Leu Pro Asn Gly Thr Glu Leu Arg Gly
1580 1585 1590

Arg Ile Val Glu Thr Gln Ala Tyr Leu Gly Pro Glu Asp Glu Ala
1595 1600 1605

Ala His Ser Arg Gly Gly Arg Gln Thr Pro Arg Asn Arg Gly Met
1610 1615 1620

Phe Met Lys Pro Gly Thr Leu Tyr Val Tyr Ile Ile Tyr Gly Met
1625 1630 1635

Tyr Phe Cys Met Asn Ile Ser Ser Gln Gly Asp Gly Ala Cys Val
1640 1645 1650

Leu Leu Arg Ala Leu Glu Pro Leu Glu Gly Leu Glu Thr Met Arg
1655 1660 1665

Gln Leu Arg Ser Thr Leu Arg Lys Gly Thr Ala Ser Arg Val Leu
1670 1675 1680

Lys Asp Arg Glu Leu Cys Ser Gly Pro Ser Lys Leu Cys Gln Ala
1685 1690 1695

Leu Ala Ile Asn Lys Ser Phe Asp Gln Arg Asp Leu Ala Gln Asp
1700 1705 1710

Glu Ala Val Trp Leu Glu Arg Gly Pro Leu Glu Pro Ser Glu Pro
1715 1720 1725

Ala Val Val Ala Ala Ala Arg Val Gly Val Gly His Ala Gly Glu
1730 1735 1740

Trp Ala Arg Lys Pro Leu Arg Phe Tyr Val Arg Gly Ser Pro Trp
1745 1750 1755

Val Ser Val Val Asp Arg Val Ala Glu Gln Asp Thr Gln Ala Gly

1760 1765 1770

Gly Ser Pro Lys Lys Lys Arg Lys Val
1775 1780

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Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
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Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
85 90 95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asn Ala Lys Thr Gly
100 105 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
115 120 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
130 135 140

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Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr Ser
                165                 170                 175

Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala
            180                 185                 190

Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys
        195                 200                 205

Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser
    210                 215                 220

Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr
225                 230                 235                 240

Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg
                245                 250                 255

Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met
            260                 265                 270

Ala Lys Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu
        275                 280                 285

Val Glu Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile
    290                 295                 300

Val Asp Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu
305                 310                 315                 320

Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile
                325                 330                 335

Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile
            340                 345                 350
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Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile
        355                 360                 365

Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn
    370                 375                 380

Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys
385                 390                 395                 400

Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys
                405                 410                 415

Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro
            420                 425                 430

Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu
        435                 440                 445

Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile
    450                 455                 460

Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp
465                 470                 475                 480

Ala Ile Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys
                485                 490                 495

Ala Pro Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln
            500                 505                 510

Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys
        515                 520                 525

Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr
    530                 535                 540

Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro
545                 550                 555                 560
```

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Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn
                565                 570                 575

Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile
            580                 585                 590

Pro His Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln
        595                 600                 605

Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys
    610                 615                 620

Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly
625                 630                 635                 640

Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr
                645                 650                 655

Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser
            660                 665                 670

Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys
        675                 680                 685

Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn
    690                 695                 700

Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala
705                 710                 715                 720

Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys
                725                 730                 735

Thr Asn Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys
            740                 745                 750

Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg
        755                 760                 765
```

```
Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys
    770                 775                 780

Asp Lys Asp Phe Leu Asp Asn Glu Glu Asn Glu Asp Ile Leu Glu Asp
785                 790                 795                 800

Ile Val Leu Thr Leu Thr Leu Phe Glu Asp Arg Glu Met Ile Glu Glu
                805                 810                 815

Arg Leu Lys Thr Tyr Ala His Leu Phe Asp Asp Lys Val Met Lys Gln
            820                 825                 830

Leu Lys Arg Arg Arg Tyr Thr Gly Trp Gly Arg Leu Ser Arg Lys Leu
        835                 840                 845

Ile Asn Gly Ile Arg Asp Lys Gln Ser Gly Lys Thr Ile Leu Asp Phe
    850                 855                 860

Leu Lys Ser Asp Gly Phe Ala Asn Arg Asn Phe Met Gln Leu Ile His
865                 870                 875                 880

Asp Asp Ser Leu Thr Phe Lys Glu Asp Ile Gln Lys Ala Gln Val Ser
                885                 890                 895

Gly Gln Gly Asp Ser Leu His Glu His Ile Ala Asn Leu Ala Gly Ser
            900                 905                 910

Pro Ala Ile Lys Lys Gly Ile Leu Gln Thr Val Lys Val Val Asp Glu
        915                 920                 925

Leu Val Lys Val Met Gly Arg His Lys Pro Glu Asn Ile Val Ile Glu
    930                 935                 940

Met Ala Arg Glu Asn Gln Thr Thr Gln Lys Gly Gln Lys Asn Ser Arg
945                 950                 955                 960

Glu Arg Met Lys Arg Ile Glu Glu Gly Ile Lys Glu Leu Gly Ser Gln
                965                 970                 975
```

```
Ile Leu Lys Glu His Pro Val Glu Asn Thr Gln Leu Gln Asn Glu Lys
            980                 985                 990


Leu Tyr Leu Tyr Tyr Leu Gln Asn  Gly Arg Asp Met Tyr  Val Asp Gln
        995                 1000                1005


Glu Leu  Asp Ile Asn Arg Leu  Ser Asp Tyr Asp Val  Asp His Ile
    1010                1015                1020


Val Pro  Gln Ser Phe Leu Lys  Asp Asp Ser Ile Asp  Asn Lys Val
    1025                1030                1035


Leu Thr  Arg Ser Asp Lys Asn  Arg Gly Lys Ser Asp  Asn Val Pro
    1040                1045                1050


Ser Glu  Glu Val Val Lys Lys  Met Lys Asn Tyr Trp  Arg Gln Leu
    1055                1060                1065


Leu Asn  Ala Lys Leu Ile Thr  Gln Arg Lys Phe Asp  Asn Leu Thr
    1070                1075                1080


Lys Ala  Glu Arg Gly Gly Leu  Ser Glu Leu Asp Lys  Ala Gly Phe
    1085                1090                1095


Ile Lys  Arg Gln Leu Val Glu  Thr Arg Gln Ile Thr  Lys His Val
    1100                1105                1110


Ala Gln  Ile Leu Asp Ser Arg  Met Asn Thr Lys Tyr  Asp Glu Asn
    1115                1120                1125


Asp Lys  Leu Ile Arg Glu Val  Lys Val Ile Thr Leu  Lys Ser Lys
    1130                1135                1140


Leu Val  Ser Asp Phe Arg Lys  Asp Phe Gln Phe Tyr  Lys Val Arg
    1145                1150                1155


Glu Ile  Asn Asn Tyr His His  Ala His Asp Ala Tyr  Leu Asn Ala
    1160                1165                1170
```

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Val Val  Gly Thr Ala Leu Ile  Lys Lys Tyr Pro Lys  Leu Glu Ser
    1175                1180                1185

Glu Phe  Val Tyr Gly Asp Tyr  Lys Val Tyr Asp Val  Arg Lys Met
    1190                1195                1200

Ile Ala  Lys Ser Glu Gln Glu  Ile Gly Lys Ala Thr  Ala Lys Tyr
    1205                1210                1215

Phe Phe  Tyr Ser Asn Ile Met  Asn Phe Phe Lys Thr  Glu Ile Thr
    1220                1225                1230

Leu Ala  Asn Gly Glu Ile Arg  Lys Arg Pro Leu Ile  Glu Thr Asn
    1235                1240                1245

Gly Glu  Thr Gly Glu Ile Val  Trp Asp Lys Gly Arg  Asp Phe Ala
    1250                1255                1260

Thr Val  Arg Lys Val Leu Ser  Met Pro Gln Val Asn  Ile Val Lys
    1265                1270                1275

Lys Thr  Glu Val Gln Thr Gly  Gly Phe Ser Lys Glu  Ser Ile Leu
    1280                1285                1290

Pro Lys  Arg Asn Ser Asp Lys  Leu Ile Ala Arg Lys  Lys Asp Trp
    1295                1300                1305

Asp Pro  Lys Lys Tyr Gly Gly  Phe Asp Ser Pro Thr  Val Ala Tyr
    1310                1315                1320

Ser Val  Leu Val Val Ala Lys  Val Glu Lys Gly Lys  Ser Lys Lys
    1325                1330                1335

Leu Lys  Ser Val Lys Glu Leu  Leu Gly Ile Thr Ile  Met Glu Arg
    1340                1345                1350

Ser Ser  Phe Glu Lys Asn Pro  Ile Asp Phe Leu Glu  Ala Lys Gly
    1355                1360                1365
```

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Tyr Lys  Glu Val Lys Lys Asp  Leu Ile Ile Lys Leu  Pro Lys Tyr
    1370                1375                1380

Ser Leu  Phe Glu Leu Glu Asn  Gly Arg Lys Arg Met  Leu Ala Ser
    1385                1390                1395

Ala Gly  Glu Leu Gln Lys Gly  Asn Glu Leu Ala Leu  Pro Ser Lys
    1400                1405                1410

Tyr Val  Asn Phe Leu Tyr Leu  Ala Ser His Tyr Glu  Lys Leu Lys
    1415                1420                1425

Gly Ser  Pro Glu Asp Asn Glu  Gln Lys Gln Leu Phe  Val Glu Gln
    1430                1435                1440

His Lys  His Tyr Leu Asp Glu  Ile Ile Glu Gln Ile  Ser Glu Phe
    1445                1450                1455

Ser Lys  Arg Val Ile Leu Ala  Asp Ala Asn Leu Asp  Lys Val Leu
    1460                1465                1470

Ser Ala  Tyr Asn Lys His Arg  Asp Lys Pro Ile Arg  Glu Gln Ala
    1475                1480                1485

Glu Asn  Ile Ile His Leu Phe  Thr Leu Thr Asn Leu  Gly Ala Pro
    1490                1495                1500

Ala Ala  Phe Lys Tyr Phe Asp  Thr Thr Ile Asp Arg  Lys Arg Tyr
    1505                1510                1515

Thr Ser  Thr Lys Glu Val Leu  Asp Ala Thr Leu Ile  His Gln Ser
    1520                1525                1530

Ile Thr  Gly Leu Tyr Glu Thr  Arg Ile Asp Leu Ser  Gln Leu Gly
    1535                1540                1545

Gly Asp  Gly Gly Ser Asp Leu  Ala Ser Leu Arg Ala  Gln Gln Ile
    1550                1555                1560
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Glu Leu  Ala Ser Ser Val Ile  Arg Glu Asp Arg Leu  Asp Lys Asp
    1565                1570                1575

Pro Pro  Asp Leu Ile Ala Gly  Ala Ala Val Gly Phe  Glu Gln Gly
    1580                1585                1590

Gly Glu  Val Thr Arg Ala Ala  Met Val Leu Leu Lys  Tyr Pro Ser
    1595                1600                1605

Leu Glu  Leu Val Glu Tyr Lys  Val Ala Arg Ile Ala  Thr Thr Met
    1610                1615                1620

Pro Tyr  Ile Pro Gly Phe Leu  Ser Phe Arg Glu Tyr  Pro Ala Leu
    1625                1630                1635

Leu Ala  Ala Trp Glu Met Leu  Ser Gln Lys Pro Asp  Leu Val Phe
    1640                1645                1650

Val Asp  Gly His Gly Ile Ser  His Pro Arg Arg Leu  Gly Val Ala
    1655                1660                1665

Ser His  Phe Gly Leu Leu Val  Asp Val Pro Thr Ile  Gly Val Ala
    1670                1675                1680

Lys Lys  Arg Leu Cys Gly Lys  Phe Glu Pro Leu Ser  Ser Glu Pro
    1685                1690                1695

Gly Ala  Leu Ala Pro Leu Met  Asp Lys Gly Glu Gln  Leu Ala Trp
    1700                1705                1710

Val Trp  Arg Ser Lys Ala Arg  Cys Asn Pro Leu Phe  Ile Ala Thr
    1715                1720                1725

Gly His  Arg Val Ser Val Asp  Ser Ala Leu Ala Trp  Val Gln Arg
    1730                1735                1740

Cys Met  Lys Gly Tyr Arg Leu  Pro Glu Pro Thr Arg  Trp Ala Asp
    1745                1750                1755
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Ala Val Ala Ser Glu Arg Pro Ala Phe Val Arg Tyr Thr Ala Asn
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Gln Pro Gly Gly Ser Pro Lys Lys Lys Arg Lys Val
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uggcaccgag ucggugcuuu uu   82

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<210> 405
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<210> 406
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<210> 407
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<210> 411
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<210> 413
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<400> 413
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<210> 415
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<223> Synthetic Polynucleotide

<400> 415
gtcatcttag tcattacctg 20

<210> 416
<211> 887
<212> PRT
<213> Natronobacterium gregoryi

<400> 416

Met Thr Val Ile Asp Leu Asp Ser Thr Thr Thr Ala Asp Glu Leu Thr
1 5 10 15

Ser Gly His Thr Tyr Asp Ile Ser Val Thr Leu Thr Gly Val Tyr Asp
20 25 30

Asn Thr Asp Glu Gln His Pro Arg Met Ser Leu Ala Phe Glu Gln Asp
35 40 45

Asn Gly Glu Arg Arg Tyr Ile Thr Leu Trp Lys Asn Thr Thr Pro Lys
50 55 60

Asp Val Phe Thr Tyr Asp Tyr Ala Thr Gly Ser Thr Tyr Ile Phe Thr
65 70 75 80

Asn Ile Asp Tyr Glu Val Lys Asp Gly Tyr Glu Asn Leu Thr Ala Thr
85 90 95

```
Tyr Gln Thr Thr Val Glu Asn Ala Thr Ala Gln Glu Val Gly Thr Thr
            100                 105                 110

Asp Glu Asp Glu Thr Phe Ala Gly Gly Glu Pro Leu Asp His His Leu
        115                 120                 125

Asp Asp Ala Leu Asn Glu Thr Pro Asp Asp Ala Glu Thr Glu Ser Asp
    130                 135                 140

Ser Gly His Val Met Thr Ser Phe Ala Ser Arg Asp Gln Leu Pro Glu
145                 150                 155                 160

Trp Thr Leu His Thr Tyr Thr Leu Thr Ala Thr Asp Gly Ala Lys Thr
                165                 170                 175

Asp Thr Glu Tyr Ala Arg Arg Thr Leu Ala Tyr Thr Val Arg Gln Glu
            180                 185                 190

Leu Tyr Thr Asp His Asp Ala Ala Pro Val Ala Thr Asp Gly Leu Met
        195                 200                 205

Leu Leu Thr Pro Glu Pro Leu Gly Glu Thr Pro Leu Asp Leu Asp Cys
    210                 215                 220

Gly Val Arg Val Glu Ala Asp Glu Thr Arg Thr Leu Asp Tyr Thr Thr
225                 230                 235                 240

Ala Lys Asp Arg Leu Leu Ala Arg Glu Leu Val Glu Glu Gly Leu Lys
                245                 250                 255

Arg Ser Leu Trp Asp Asp Tyr Leu Val Arg Gly Ile Asp Glu Val Leu
            260                 265                 270

Ser Lys Glu Pro Val Leu Thr Cys Asp Glu Phe Asp Leu His Glu Arg
        275                 280                 285

Tyr Asp Leu Ser Val Glu Val Gly His Ser Gly Arg Ala Tyr Leu His
    290                 295                 300
```

```
Ile Asn Phe Arg His Arg Phe Val Pro Lys Leu Thr Leu Ala Asp Ile
305                 310                 315                 320

Asp Asp Asp Asn Ile Tyr Pro Gly Leu Arg Val Lys Thr Thr Tyr Arg
                325                 330                 335

Pro Arg Arg Gly His Ile Val Trp Gly Leu Arg Asp Glu Cys Ala Thr
            340                 345                 350

Asp Ser Leu Asn Thr Leu Gly Asn Gln Ser Val Val Ala Tyr His Arg
        355                 360                 365

Asn Asn Gln Thr Pro Ile Asn Thr Asp Leu Leu Asp Ala Ile Glu Ala
    370                 375                 380

Ala Asp Arg Arg Val Val Glu Thr Arg Arg Gln Gly His Gly Asp Asp
385                 390                 395                 400

Ala Val Ser Phe Pro Gln Glu Leu Leu Ala Val Glu Pro Asn Thr His
                405                 410                 415

Gln Ile Lys Gln Phe Ala Ser Asp Gly Phe His Gln Gln Ala Arg Ser
            420                 425                 430

Lys Thr Arg Leu Ser Ala Ser Arg Cys Ser Glu Lys Ala Gln Ala Phe
        435                 440                 445

Ala Glu Arg Leu Asp Pro Val Arg Leu Asn Gly Ser Thr Val Glu Phe
    450                 455                 460

Ser Ser Glu Phe Phe Thr Gly Asn Asn Glu Gln Gln Leu Arg Leu Leu
465                 470                 475                 480

Tyr Glu Asn Gly Glu Ser Val Leu Thr Phe Arg Asp Gly Ala Arg Gly
                485                 490                 495

Ala His Pro Asp Glu Thr Phe Ser Lys Gly Ile Val Asn Pro Pro Glu
            500                 505                 510
```

```
Ser Phe Glu Val Ala Val Val Leu Pro Glu Gln Gln Ala Asp Thr Cys
        515                 520                 525

Lys Ala Gln Trp Asp Thr Met Ala Asp Leu Leu Asn Gln Ala Gly Ala
    530                 535                 540

Pro Pro Thr Arg Ser Glu Thr Val Gln Tyr Asp Ala Phe Ser Ser Pro
545                 550                 555                 560

Glu Ser Ile Ser Leu Asn Val Ala Gly Ala Ile Asp Pro Ser Glu Val
                565                 570                 575

Asp Ala Ala Phe Val Val Leu Pro Pro Asp Gln Glu Gly Phe Ala Asp
            580                 585                 590

Leu Ala Ser Pro Thr Glu Thr Tyr Asp Glu Leu Lys Lys Ala Leu Ala
        595                 600                 605

Asn Met Gly Ile Tyr Ser Gln Met Ala Tyr Phe Asp Arg Phe Arg Asp
    610                 615                 620

Ala Lys Ile Phe Tyr Thr Arg Asn Val Ala Leu Gly Leu Leu Ala Ala
625                 630                 635                 640

Ala Gly Gly Val Ala Phe Thr Thr Glu His Ala Met Pro Gly Asp Ala
                645                 650                 655

Asp Met Phe Ile Gly Ile Asp Val Ser Arg Ser Tyr Pro Glu Asp Gly
            660                 665                 670

Ala Ser Gly Gln Ile Asn Ile Ala Ala Thr Ala Thr Ala Val Tyr Lys
        675                 680                 685

Asp Gly Thr Ile Leu Gly His Ser Ser Thr Arg Pro Gln Leu Gly Glu
    690                 695                 700

Lys Leu Gln Ser Thr Asp Val Arg Asp Ile Met Lys Asn Ala Ile Leu
705                 710                 715                 720
```

```
Gly Tyr Gln Gln Val Thr Gly Glu Ser Pro Thr His Ile Val Ile His
                725                 730                 735

Arg Asp Gly Phe Met Asn Glu Asp Leu Asp Pro Ala Thr Glu Phe Leu
            740                 745                 750

Asn Glu Gln Gly Val Glu Tyr Asp Ile Val Glu Ile Arg Lys Gln Pro
        755                 760                 765

Gln Thr Arg Leu Leu Ala Val Ser Asp Val Gln Tyr Asp Thr Pro Val
    770                 775                 780

Lys Ser Ile Ala Ala Ile Asn Gln Asn Glu Pro Arg Ala Thr Val Ala
785                 790                 795                 800

Thr Phe Gly Ala Pro Glu Tyr Leu Ala Thr Arg Asp Gly Gly Gly Leu
                805                 810                 815

Pro Arg Pro Ile Gln Ile Glu Arg Val Ala Gly Glu Thr Asp Ile Glu
            820                 825                 830

Thr Leu Thr Arg Gln Val Tyr Leu Leu Ser Gln Ser His Ile Gln Val
        835                 840                 845

His Asn Ser Thr Ala Arg Leu Pro Ile Thr Thr Ala Tyr Ala Asp Gln
    850                 855                 860

Ala Ser Thr His Ala Thr Lys Gly Tyr Leu Val Gln Thr Gly Ala Phe
865                 870                 875                 880

Glu Ser Asn Val Gly Phe Leu
                885
```

<210> 417
<211> 345
<212> PRT
<213> Sulfolobus islandicus

<400> 417

```
Met Glu Val Pro Leu Tyr Asn Ile Phe Gly Asp Asn Tyr Ile Ile Gln
1               5                  10                  15

Val Ala Thr Glu Ala Glu Asn Ser Thr Ile Tyr Asn Asn Lys Val Glu
            20                  25                  30

Ile Asp Asp Glu Glu Leu Arg Asn Val Leu Asn Leu Ala Tyr Lys Ile
        35                  40                  45

Ala Lys Asn Asn Glu Asp Ala Ala Ala Glu Arg Arg Gly Lys Ala Lys
    50                  55                  60

Lys Lys Lys Gly Glu Glu Gly Glu Thr Thr Thr Ser Asn Ile Ile Leu
65                  70                  75                  80

Pro Leu Ser Gly Asn Asp Lys Asn Pro Trp Thr Glu Thr Leu Lys Cys
                85                  90                  95

Tyr Asn Phe Pro Thr Thr Val Ala Leu Ser Glu Val Phe Lys Asn Phe
            100                 105                 110

Ser Gln Val Lys Glu Cys Glu Glu Val Ser Ala Pro Ser Phe Val Lys
        115                 120                 125

Pro Glu Phe Tyr Glu Phe Gly Arg Ser Pro Gly Met Val Glu Arg Thr
    130                 135                 140

Arg Arg Val Lys Leu Glu Val Glu Pro His Tyr Leu Ile Ile Ala Ala
145                 150                 155                 160

Ala Gly Trp Val Leu Thr Arg Leu Gly Lys Ala Lys Val Ser Glu Gly
                165                 170                 175

Asp Tyr Val Gly Val Asn Val Phe Thr Pro Thr Arg Gly Ile Leu Tyr
            180                 185                 190

Ser Leu Ile Gln Asn Val Asn Gly Ile Val Pro Gly Ile Lys Pro Glu
        195                 200                 205
```

```
Thr Ala Phe Gly Leu Trp Ile Ala Arg Lys Val Val Ser Ser Val Thr
    210                 215                 220


Asn Pro Asn Val Ser Val Val Arg Ile Tyr Thr Ile Ser Asp Ala Val
225                 230                 235                 240


Gly Gln Asn Pro Thr Thr Ile Asn Gly Gly Phe Ser Ile Asp Leu Thr
                245                 250                 255


Lys Leu Leu Glu Lys Arg Tyr Leu Leu Ser Glu Arg Leu Glu Ala Ile
            260                 265                 270


Ala Arg Asn Ala Leu Ser Ile Ser Ser Asn Met Arg Glu Arg Tyr Ile
        275                 280                 285


Val Leu Ala Asn Tyr Ile Tyr Glu Tyr Leu Thr Gly Ser Lys Arg Leu
    290                 295                 300


Glu Asp Leu Leu Tyr Phe Ala Asn Arg Asp Leu Ile Met Asn Leu Asn
305                 310                 315                 320


Ser Asp Asp Gly Lys Val Arg Asp Leu Lys Leu Ile Ser Ala Tyr Val
                325                 330                 335


Asn Gly Glu Leu Ile Arg Gly Glu Gly
            340                 345


<210>  418
<211>  345
<212>  PRT
<213>  Sulfolobus islandicus

<400>  418

Met Glu Val Pro Leu Tyr Asn Ile Phe Gly Asp Asn Tyr Ile Ile Gln
1               5                   10                  15


Val Ala Thr Glu Ala Glu Asn Ser Thr Ile Tyr Asn Asn Lys Val Glu
            20                  25                  30
```

```
Ile Asp Asp Glu Glu Leu Arg Asn Val Leu Asn Leu Ala Tyr Lys Ile
        35                  40                  45

Ala Lys Asn Asn Glu Asp Ala Ala Ala Glu Arg Arg Gly Lys Ala Lys
    50                  55                  60

Lys Lys Lys Gly Glu Glu Gly Glu Thr Thr Thr Ser Asn Ile Ile Leu
65                  70                  75                  80

Pro Leu Ser Gly Asn Asp Lys Asn Pro Trp Thr Glu Thr Leu Lys Cys
                85                  90                  95

Tyr Asn Phe Pro Thr Thr Val Ala Leu Ser Glu Val Phe Lys Asn Phe
            100                 105                 110

Ser Gln Val Lys Glu Cys Glu Glu Val Ser Ala Pro Ser Phe Val Lys
        115                 120                 125

Pro Glu Phe Tyr Lys Phe Gly Arg Ser Pro Gly Met Val Glu Arg Thr
    130                 135                 140

Arg Arg Val Lys Leu Glu Val Glu Pro His Tyr Leu Ile Met Ala Ala
145                 150                 155                 160

Ala Gly Trp Val Leu Thr Arg Leu Gly Lys Ala Lys Val Ser Glu Gly
                165                 170                 175

Asp Tyr Val Gly Val Asn Val Phe Thr Pro Thr Arg Gly Ile Leu Tyr
            180                 185                 190

Ser Leu Ile Gln Asn Val Asn Gly Ile Val Pro Gly Ile Lys Pro Glu
        195                 200                 205

Thr Ala Phe Gly Leu Trp Ile Ala Arg Lys Val Val Ser Ser Val Thr
    210                 215                 220

Asn Pro Asn Val Ser Val Val Ser Ile Tyr Thr Ile Ser Asp Ala Val
225                 230                 235                 240
```

Gly Gln Asn Pro Thr Thr Ile Asn Gly Gly Phe Ser Ile Asp Leu Thr
245 250 255

Lys Leu Leu Glu Lys Arg Asp Leu Leu Ser Glu Arg Leu Glu Ala Ile
260 265 270

Ala Arg Asn Ala Leu Ser Ile Ser Ser Asn Met Arg Glu Arg Tyr Ile
275 280 285

Val Leu Ala Asn Tyr Ile Tyr Glu Tyr Leu Thr Gly Ser Lys Arg Leu
290 295 300

Glu Asp Leu Leu Tyr Phe Ala Asn Arg Asp Leu Ile Met Asn Leu Asn
305 310 315 320

Ser Asp Asp Gly Lys Val Arg Asp Leu Lys Leu Ile Ser Ala Tyr Val
325 330 335

Asn Gly Glu Leu Ile Arg Gly Glu Gly
340 345

<210> 419
<211> 1210
<212> PRT
<213> Parcubacteria group bacterium

<400> 419

Met Ser Lys Arg His Pro Arg Ile Ser Gly Val Lys Gly Tyr Arg Leu
1 5 10 15

His Ala Gln Arg Leu Glu Tyr Thr Gly Lys Ser Gly Ala Met Arg Thr
20 25 30

Ile Lys Tyr Pro Leu Tyr Ser Ser Pro Ser Gly Gly Arg Thr Val Pro
35 40 45

Arg Glu Ile Val Ser Ala Ile Asn Asp Asp Tyr Val Gly Leu Tyr Gly
50 55 60

Leu Ser Asn Phe Asp Asp Leu Tyr Asn Ala Glu Lys Arg Asn Glu Glu

65 70 75 80

Lys Val Tyr Ser Val Leu Asp Phe Trp Tyr Asp Cys Val Gln Tyr Gly
85 90 95

Ala Val Phe Ser Tyr Thr Ala Pro Gly Leu Leu Lys Asn Val Ala Glu
100 105 110

Val Arg Gly Gly Ser Tyr Glu Leu Thr Lys Thr Leu Lys Gly Ser His
115 120 125

Leu Tyr Asp Glu Leu Gln Ile Asp Lys Val Ile Lys Phe Leu Asn Lys
130 135 140

Lys Glu Ile Ser Arg Ala Asn Gly Ser Leu Asp Lys Leu Lys Lys Asp
145 150 155 160

Ile Ile Asp Cys Phe Lys Ala Glu Tyr Arg Glu Arg His Lys Asp Gln
165 170 175

Cys Asn Lys Leu Ala Asp Asp Ile Lys Asn Ala Lys Lys Asp Ala Gly
180 185 190

Ala Ser Leu Gly Glu Arg Gln Lys Lys Leu Phe Arg Asp Phe Phe Gly
195 200 205

Ile Ser Glu Gln Ser Glu Asn Asp Lys Pro Ser Phe Thr Asn Pro Leu
210 215 220

Asn Leu Thr Cys Cys Leu Leu Pro Phe Asp Thr Val Asn Asn Asn Arg
225 230 235 240

Asn Arg Gly Glu Val Leu Phe Asn Lys Leu Lys Glu Tyr Ala Gln Lys
245 250 255

Leu Asp Lys Asn Glu Gly Ser Leu Glu Met Trp Glu Tyr Ile Gly Ile
260 265 270

Gly Asn Ser Gly Thr Ala Phe Ser Asn Phe Leu Gly Glu Gly Phe Leu

275 280 285

Gly Arg Leu Arg Glu Asn Lys Ile Thr Glu Leu Lys Lys Ala Met Met
290 295 300

Asp Ile Thr Asp Ala Trp Arg Gly Gln Glu Gln Glu Glu Glu Leu Glu
305 310 315 320

Lys Arg Leu Arg Ile Leu Ala Ala Leu Thr Ile Lys Leu Arg Glu Pro
325 330 335

Lys Phe Asp Asn His Trp Gly Gly Tyr Arg Ser Asp Ile Asn Gly Lys
340 345 350

Leu Ser Ser Trp Leu Gln Asn Tyr Ile Asn Gln Thr Val Lys Ile Lys
355 360 365

Glu Asp Leu Lys Gly His Lys Lys Asp Leu Lys Lys Ala Lys Glu Met
370 375 380

Ile Asn Arg Phe Gly Glu Ser Asp Thr Lys Glu Glu Ala Val Val Ser
385 390 395 400

Ser Leu Leu Glu Ser Ile Glu Lys Ile Val Pro Asp Asp Ser Ala Asp
405 410 415

Asp Glu Lys Pro Asp Ile Pro Ala Ile Ala Ile Tyr Arg Arg Phe Leu
420 425 430

Ser Asp Gly Arg Leu Thr Leu Asn Arg Phe Val Gln Arg Glu Asp Val
435 440 445

Gln Glu Ala Leu Ile Lys Glu Arg Leu Glu Ala Glu Lys Lys Lys Lys
450 455 460

Pro Lys Lys Arg Lys Lys Lys Ser Asp Ala Glu Asp Glu Lys Glu Thr
465 470 475 480

Ile Asp Phe Lys Glu Leu Phe Pro His Leu Ala Lys Pro Leu Lys Leu

485 490 495

Val Pro Asn Phe Tyr Gly Asp Ser Lys Arg Glu Leu Tyr Lys Lys Tyr
500 505 510

Lys Asn Ala Ala Ile Tyr Thr Asp Ala Leu Trp Lys Ala Val Glu Lys
515 520 525

Ile Tyr Lys Ser Ala Phe Ser Ser Ser Leu Lys Asn Ser Phe Phe Asp
530 535 540

Thr Asp Phe Asp Lys Asp Phe Phe Ile Lys Arg Leu Gln Lys Ile Phe
545 550 555 560

Ser Val Tyr Arg Arg Phe Asn Thr Asp Lys Trp Lys Pro Ile Val Lys
565 570 575

Asn Ser Phe Ala Pro Tyr Cys Asp Ile Val Ser Leu Ala Glu Asn Glu
580 585 590

Val Leu Tyr Lys Pro Lys Gln Ser Arg Ser Arg Lys Ser Ala Ala Ile
595 600 605

Asp Lys Asn Arg Val Arg Leu Pro Ser Thr Glu Asn Ile Ala Lys Ala
610 615 620

Gly Ile Ala Leu Ala Arg Glu Leu Ser Val Ala Gly Phe Asp Trp Lys
625 630 635 640

Asp Leu Leu Lys Lys Glu Glu His Glu Glu Tyr Ile Asp Leu Ile Glu
645 650 655

Leu His Lys Thr Ala Leu Ala Leu Leu Leu Ala Val Thr Glu Thr Gln
660 665 670

Leu Asp Ile Ser Ala Leu Asp Phe Val Glu Asn Gly Thr Val Lys Asp
675 680 685

Phe Met Lys Thr Arg Asp Gly Asn Leu Val Leu Glu Gly Arg Phe Leu

690 695 700

Glu Met Phe Ser Gln Ser Ile Val Phe Ser Glu Leu Arg Gly Leu Ala
705 710 715 720

Gly Leu Met Ser Arg Lys Glu Phe Ile Thr Arg Ser Ala Ile Gln Thr
725 730 735

Met Asn Gly Lys Gln Ala Glu Leu Leu Tyr Ile Pro His Glu Phe Gln
740 745 750

Ser Ala Lys Ile Thr Thr Pro Lys Glu Met Ser Arg Ala Phe Leu Asp
755 760 765

Leu Ala Pro Ala Glu Phe Ala Thr Ser Leu Glu Pro Glu Ser Leu Ser
770 775 780

Glu Lys Ser Leu Leu Lys Leu Lys Gln Met Arg Tyr Tyr Pro His Tyr
785 790 795 800

Phe Gly Tyr Glu Leu Thr Arg Thr Gly Gln Gly Ile Asp Gly Gly Val
805 810 815

Ala Glu Asn Ala Leu Arg Leu Glu Lys Ser Pro Val Lys Lys Arg Glu
820 825 830

Ile Lys Cys Lys Gln Tyr Lys Thr Leu Gly Arg Gly Gln Asn Lys Ile
835 840 845

Val Leu Tyr Val Arg Ser Ser Tyr Tyr Gln Thr Gln Phe Leu Glu Trp
850 855 860

Phe Leu His Arg Pro Lys Asn Val Gln Thr Asp Val Ala Val Ser Gly
865 870 875 880

Ser Phe Leu Ile Asp Glu Lys Lys Val Lys Thr Arg Trp Asn Tyr Asp
885 890 895

Ala Leu Thr Val Ala Leu Glu Pro Val Ser Gly Ser Glu Arg Val Phe

900 905 910

Val Ser Gln Pro Phe Thr Ile Phe Pro Glu Lys Ser Ala Glu Glu Glu
915 920 925

Gly Gln Arg Tyr Leu Gly Ile Asp Ile Gly Glu Tyr Gly Ile Ala Tyr
930 935 940

Thr Ala Leu Glu Ile Thr Gly Asp Ser Ala Lys Ile Leu Asp Gln Asn
945 950 955 960

Phe Ile Ser Asp Pro Gln Leu Lys Thr Leu Arg Glu Glu Val Lys Gly
965 970 975

Leu Lys Leu Asp Gln Arg Arg Gly Thr Phe Ala Met Pro Ser Thr Lys
980 985 990

Ile Ala Arg Ile Arg Glu Ser Leu Val His Ser Leu Arg Asn Arg Ile
995 1000 1005

His His Leu Ala Leu Lys His Lys Ala Lys Ile Val Tyr Glu Leu
1010 1015 1020

Glu Val Ser Arg Phe Glu Glu Gly Lys Gln Lys Ile Lys Lys Val
1025 1030 1035

Tyr Ala Thr Leu Lys Lys Ala Asp Val Tyr Ser Glu Ile Asp Ala
1040 1045 1050

Asp Lys Asn Leu Gln Thr Thr Val Trp Gly Lys Leu Ala Val Ala
1055 1060 1065

Ser Glu Ile Ser Ala Ser Tyr Thr Ser Gln Phe Cys Gly Ala Cys
1070 1075 1080

Lys Lys Leu Trp Arg Ala Glu Met Gln Val Asp Glu Thr Ile Thr
1085 1090 1095

Thr Gln Glu Leu Ile Gly Thr Val Arg Val Ile Lys Gly Gly Thr

1100 1105 1110

Leu Ile Asp Ala Ile Lys Asp Phe Met Arg Pro Pro Ile Phe Asp
1115 1120 1125

Glu Asn Asp Thr Pro Phe Pro Lys Tyr Arg Asp Phe Cys Asp Lys
1130 1135 1140

His His Ile Ser Lys Lys Met Arg Gly Asn Ser Cys Leu Phe Ile
1145 1150 1155

Cys Pro Phe Cys Arg Ala Asn Ala Asp Ala Asp Ile Gln Ala Ser
1160 1165 1170

Gln Thr Ile Ala Leu Leu Arg Tyr Val Lys Glu Glu Lys Lys Val
1175 1180 1185

Glu Asp Tyr Phe Glu Arg Phe Arg Lys Leu Lys Asn Ile Lys Val
1190 1195 1200

Leu Gly Gln Met Lys Lys Ile
1205 1210

<210> 420
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 420

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Ala Gly Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

```
Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Asn Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Glu Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 421
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 421

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
```

35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 422
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 422

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

```
Leu Val His Thr Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Thr Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 423
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 423

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
```

20 25 30

Leu Val His Ser Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 424
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 424

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 425
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 425

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr

1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Arg Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 426
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 426

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Leu Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 427
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 427

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Asn Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 428
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 428

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Cys Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 429
<211> 166
<212> PRT

<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 429

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15


Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30


Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45


Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60


Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80


Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95


Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110


Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125


Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140


Arg Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160


Ala Gln Ser Ser Thr Asp
                165
```

<210> 430

<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 430

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15


Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30


Leu Val His Ser Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45


Gly His His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60


Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80


Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95


Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110


Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125


Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140


Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145                 150                 155                 160


Ala Gln Ser Ser Thr Asp
                165
```

<210> 431
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 431

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Leu His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Asn Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp

165

<210> 432
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 432

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly His His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Asn Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 433
<211> 159
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 433

Gly Ser His Met Thr Asn Asp Ile Tyr Phe Met Thr Leu Ala Ile Glu
1 5 10 15

Glu Ala Lys Lys Ala Ala Gln Leu Gly Glu Val Pro Ile Gly Ala Ile
20 25 30

Ile Thr Lys Asp Asp Glu Val Ile Ala Arg Ala His Asn Leu Arg Glu
35 40 45

Thr Leu Gln Gln Pro Thr Ala His Ala Glu His Ile Ala Ile Glu Arg
50 55 60

Ala Ala Lys Val Leu Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Thr Ile Val Met Ser
85 90 95

Arg Ile Pro Arg Val Val Tyr Gly Ala Asp Asn Pro Lys Gly Gly Cys
100 105 110

Ser Gly Ser Leu Met Asn Leu Leu Gln Gln Ser Asn Phe Asn His Arg
115 120 125

Ala Ile Val Asp Lys Gly Val Leu Lys Glu Ala Cys Ser Thr Leu Leu
130 135 140

Thr Thr Phe Phe Lys Asn Leu Arg Ala Asn Lys Lys Ser Thr Asn

145 150 155

<210> 434
<211> 159
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 434

Gly Ser His Met Thr Asn Asp Ile Tyr Phe Met Thr Leu Ala Ile Glu
1 5 10 15

Glu Ala Lys Lys Ala Ala Gln Leu Gly Glu Val Pro Ile Gly Ala Ile
20 25 30

Ile Thr Lys Asp Asp Glu Val Ile Ala Arg Ala His Asn Leu Arg Glu
35 40 45

Thr Leu Gln Gln Pro Thr Ala His Ala Glu His Ile Ala Ile Glu Arg
50 55 60

Ala Ala Lys Val Leu Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Thr Ile Val Met Ser
85 90 95

Arg Ile Pro Arg Val Val Tyr Gly Ala Ala Asn Pro Lys Gly Gly Cys
100 105 110

Ser Gly Ser Leu Met Asn Leu Leu Gln Gln Ser Asn Phe Asn His Arg
115 120 125

Ala Ile Val Asp Lys Gly Val Leu Lys Glu Ala Cys Ser Thr Leu Leu
130 135 140

Thr Thr Phe Phe Lys Asn Leu Arg Ala Asn Lys Lys Ser Thr Asn
145 150 155

<210> 435
<211> 159
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 435

Gly Ser His Met Thr Asn Asp Ile Tyr Phe Met Thr Leu Ala Ile Glu
1 5 10 15

Glu Ala Lys Lys Ala Ala Gln Leu Pro Glu Val Pro Ile Gly Ala Ile
20 25 30

Ile Thr Lys Asp Asp Glu Val Ile Ala Arg Ala His Asn Leu Arg Glu
35 40 45

Thr Leu Gln Gln Pro Thr Ala His Ala Glu His Ile Ala Ile Glu Arg
50 55 60

Ala Ala Lys Val Leu Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Thr Ile Val Met Ser
85 90 95

Arg Ile Pro Arg Val Val Tyr Gly Ala Ala Asn Pro Lys Gly Gly Cys
100 105 110

Ser Gly Ser Leu Met Asn Leu Leu Gln Gln Ser Asn Phe Asn His Arg
115 120 125

Ala Ile Val Asp Lys Gly Val Leu Lys Glu Ala Cys Ser Thr Leu Leu
130 135 140

Thr Thr Phe Phe Lys Asn Leu Arg Ala Asn Lys Lys Ser Thr Asn
145 150 155

<210> 436

<211> 159
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 436

Gly Ser His Met Thr Asn Asp Ile Tyr Phe Met Thr Leu Ala Ile Glu
1 5 10 15

Glu Ala Lys Lys Ala Ala Gln Leu Pro Glu Val Pro Ile Gly Ala Ile
20 25 30

Ile Thr Lys Asp Asp Glu Val Ile Ala Arg Ala His Asn Leu Arg Glu
35 40 45

Thr Leu Gln Gln Pro Thr Ala His Ala Glu His Ile Ala Ile Glu Arg
50 55 60

Ala Ala Lys Val Leu Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Thr Ile Val Met Ser
85 90 95

Arg Ile Pro Arg Val Val Tyr Gly Ala Ala Asn Pro Lys Gly Gly Cys
100 105 110

Ser Gly Ser Leu Met Asn Leu Leu Gln Gln Ser Asn Phe Asn His Arg
115 120 125

Ala Ile Val Asp Lys Gly Val Leu Lys Glu Ala Cys Ala Thr Leu Leu
130 135 140

Thr Thr Phe Phe Lys Asn Leu Arg Ala Asn Lys Lys Ser Thr Asn
145 150 155

<210> 437
<211> 159
<212> PRT

<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 437

Gly Ser His Met Thr Asn Asp Ile Tyr Phe Met Thr Leu Ala Ile Glu
1 5 10 15

Glu Ala Lys Lys Ala Ala Gln Leu Gly Glu Val Pro Ile Gly Ala Ile
20 25 30

Ile Thr Lys Asp Asp Glu Val Ile Ala Arg Ala His Asn Leu Arg Glu
35 40 45

Thr Leu Gln Gln Pro Thr Ala His Ala Glu His Ile Ala Ile Glu Arg
50 55 60

Ala Ala Lys Val Leu Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Thr Ile Val Met Ser
85 90 95

Arg Ile Pro Arg Val Val Tyr Gly Ala Ala Asn Pro Lys Gly Gly Cys
100 105 110

Ser Gly Ser Leu Met Asn Leu Leu Gln Gln Ser Asn Phe Asn His Arg
115 120 125

Ala Ile Val Asp Lys Gly Val Leu Lys Glu Ala Cys Ala Thr Leu Leu
130 135 140

Thr Thr Phe Phe Lys Asn Leu Arg Ala Asn Lys Lys Ser Thr Asn
145 150 155

<210> 438
<211> 1129
<212> PRT
<213> Alicyclobacillus acidoterrestris

<400> 438

```
Met Ala Val Lys Ser Ile Lys Val Lys Leu Arg Leu Asp Asp Met Pro
1               5                  10                  15

Glu Ile Arg Ala Gly Leu Trp Lys Leu His Lys Glu Val Asn Ala Gly
            20                  25                  30

Val Arg Tyr Tyr Thr Glu Trp Leu Ser Leu Leu Arg Gln Glu Asn Leu
        35                  40                  45

Tyr Arg Arg Ser Pro Asn Gly Asp Gly Glu Gln Glu Cys Asp Lys Thr
    50                  55                  60

Ala Glu Glu Cys Lys Ala Glu Leu Leu Glu Arg Leu Arg Ala Arg Gln
65                  70                  75                  80

Val Glu Asn Gly His Arg Gly Pro Ala Gly Ser Asp Asp Glu Leu Leu
                85                  90                  95

Gln Leu Ala Arg Gln Leu Tyr Glu Leu Leu Val Pro Gln Ala Ile Gly
            100                 105                 110

Ala Lys Gly Asp Ala Gln Gln Ile Ala Arg Lys Phe Leu Ser Pro Leu
        115                 120                 125

Ala Asp Lys Asp Ala Val Gly Gly Leu Gly Ile Ala Lys Ala Gly Asn
    130                 135                 140

Lys Pro Arg Trp Val Arg Met Arg Glu Ala Gly Glu Pro Gly Trp Glu
145                 150                 155                 160

Glu Glu Lys Glu Lys Ala Glu Thr Arg Lys Ser Ala Asp Arg Thr Ala
                165                 170                 175

Asp Val Leu Arg Ala Leu Ala Asp Phe Gly Leu Lys Pro Leu Met Arg
            180                 185                 190

Val Tyr Thr Asp Ser Glu Met Ser Ser Val Glu Trp Lys Pro Leu Arg
        195                 200                 205
```

```
Lys Gly Gln Ala Val Arg Thr Trp Asp Arg Asp Met Phe Gln Gln Ala
    210                 215                 220

Ile Glu Arg Met Met Ser Trp Glu Ser Trp Asn Gln Arg Val Gly Gln
225                 230                 235                 240

Glu Tyr Ala Lys Leu Val Glu Gln Lys Asn Arg Phe Glu Gln Lys Asn
                245                 250                 255

Phe Val Gly Gln Glu His Leu Val His Leu Val Asn Gln Leu Gln Gln
            260                 265                 270

Asp Met Lys Glu Ala Ser Pro Gly Leu Glu Ser Lys Glu Gln Thr Ala
        275                 280                 285

His Tyr Val Thr Gly Arg Ala Leu Arg Gly Ser Asp Lys Val Phe Glu
    290                 295                 300

Lys Trp Gly Lys Leu Ala Pro Asp Ala Pro Phe Asp Leu Tyr Asp Ala
305                 310                 315                 320

Glu Ile Lys Asn Val Gln Arg Arg Asn Thr Arg Arg Phe Gly Ser His
                325                 330                 335

Asp Leu Phe Ala Lys Leu Ala Glu Pro Glu Tyr Gln Ala Leu Trp Arg
            340                 345                 350

Glu Asp Ala Ser Phe Leu Thr Arg Tyr Ala Val Tyr Asn Ser Ile Leu
        355                 360                 365

Arg Lys Leu Asn His Ala Lys Met Phe Ala Thr Phe Thr Leu Pro Asp
    370                 375                 380

Ala Thr Ala His Pro Ile Trp Thr Arg Phe Asp Lys Leu Gly Gly Asn
385                 390                 395                 400

Leu His Gln Tyr Thr Phe Leu Phe Asn Glu Phe Gly Glu Arg Arg His
                405                 410                 415
```

```
Ala Ile Arg Phe His Lys Leu Leu Lys Val Glu Asn Gly Val Ala Arg
            420                 425                 430

Glu Val Asp Asp Val Thr Val Pro Ile Ser Met Ser Glu Gln Leu Asp
        435                 440                 445

Asn Leu Leu Pro Arg Asp Pro Asn Glu Pro Ile Ala Leu Tyr Phe Arg
    450                 455                 460

Asp Tyr Gly Ala Glu Gln His Phe Thr Gly Glu Phe Gly Gly Ala Lys
465                 470                 475                 480

Ile Gln Cys Arg Arg Asp Gln Leu Ala His Met His Arg Arg Arg Gly
                485                 490                 495

Ala Arg Asp Val Tyr Leu Asn Val Ser Val Arg Val Gln Ser Gln Ser
            500                 505                 510

Glu Ala Arg Gly Glu Arg Arg Pro Pro Tyr Ala Ala Val Phe Arg Leu
        515                 520                 525

Val Gly Asp Asn His Arg Ala Phe Val His Phe Asp Lys Leu Ser Asp
    530                 535                 540

Tyr Leu Ala Glu His Pro Asp Asp Gly Lys Leu Gly Ser Glu Gly Leu
545                 550                 555                 560

Leu Ser Gly Leu Arg Val Met Ser Val Asp Leu Gly Leu Arg Thr Ser
                565                 570                 575

Ala Ser Ile Ser Val Phe Arg Val Ala Arg Lys Asp Glu Leu Lys Pro
            580                 585                 590

Asn Ser Lys Gly Arg Val Pro Phe Phe Phe Pro Ile Lys Gly Asn Asp
        595                 600                 605

Asn Leu Val Ala Val His Glu Arg Ser Gln Leu Leu Lys Leu Pro Gly
    610                 615                 620
```

```
Glu Thr Glu Ser Lys Asp Leu Arg Ala Ile Arg Glu Glu Arg Gln Arg
625                 630                 635                 640

Thr Leu Arg Gln Leu Arg Thr Gln Leu Ala Tyr Leu Arg Leu Leu Val
                645                 650                 655

Arg Cys Gly Ser Glu Asp Val Gly Arg Arg Glu Arg Ser Trp Ala Lys
            660                 665                 670

Leu Ile Glu Gln Pro Val Asp Ala Ala Asn His Met Thr Pro Asp Trp
        675                 680                 685

Arg Glu Ala Phe Glu Asn Glu Leu Gln Lys Leu Lys Ser Leu His Gly
    690                 695                 700

Ile Cys Ser Asp Lys Glu Trp Met Asp Ala Val Tyr Glu Ser Val Arg
705                 710                 715                 720

Arg Val Trp Arg His Met Gly Lys Gln Val Arg Asp Trp Arg Lys Asp
                725                 730                 735

Val Arg Ser Gly Glu Arg Pro Lys Ile Arg Gly Tyr Ala Lys Asp Val
            740                 745                 750

Val Gly Gly Asn Ser Ile Glu Gln Ile Glu Tyr Leu Glu Arg Gln Tyr
        755                 760                 765

Lys Phe Leu Lys Ser Trp Ser Phe Phe Gly Lys Val Ser Gly Gln Val
    770                 775                 780

Ile Arg Ala Glu Lys Gly Ser Arg Phe Ala Ile Thr Leu Arg Glu His
785                 790                 795                 800

Ile Asp His Ala Lys Glu Asp Arg Leu Lys Lys Leu Ala Asp Arg Ile
                805                 810                 815

Ile Met Glu Ala Leu Gly Tyr Val Tyr Ala Leu Asp Glu Arg Gly Lys
            820                 825                 830
```

```
Gly Lys Trp Val Ala Lys Tyr Pro Pro Cys Gln Leu Ile Leu Leu Glu
        835                 840                 845

Glu Leu Ser Glu Tyr Gln Phe Asn Asn Asp Arg Pro Pro Ser Glu Asn
    850                 855                 860

Asn Gln Leu Met Gln Trp Ser His Arg Gly Val Phe Gln Glu Leu Ile
865                 870                 875                 880

Asn Gln Ala Gln Val His Asp Leu Leu Val Gly Thr Met Tyr Ala Ala
                885                 890                 895

Phe Ser Ser Arg Phe Asp Ala Arg Thr Gly Ala Pro Gly Ile Arg Cys
            900                 905                 910

Arg Arg Val Pro Ala Arg Cys Thr Gln Glu His Asn Pro Glu Pro Phe
        915                 920                 925

Pro Trp Trp Leu Asn Lys Phe Val Val Glu His Thr Leu Asp Ala Cys
    930                 935                 940

Pro Leu Arg Ala Asp Asp Leu Ile Pro Thr Gly Glu Gly Glu Ile Phe
945                 950                 955                 960

Val Ser Pro Phe Ser Ala Glu Glu Gly Asp Phe His Gln Ile His Ala
                965                 970                 975

Asp Leu Asn Ala Ala Gln Asn Leu Gln Gln Arg Leu Trp Ser Asp Phe
            980                 985                 990

Asp Ile Ser Gln Ile Arg Leu Arg  Cys Asp Trp Gly Glu  Val Asp Gly
        995                 1000                1005

Glu Leu  Val Leu Ile Pro Arg  Leu Thr Gly Lys Arg  Thr Ala Asp
    1010                1015                1020

Ser Tyr  Ser Asn Lys Val Phe  Tyr Thr Asn Thr Gly  Val Thr Tyr
    1025                1030                1035
```

```
Tyr Glu  Arg Glu Arg Gly Lys  Lys Arg Arg Lys Val  Phe Ala Gln
    1040                1045                1050

Glu Lys  Leu Ser Glu Glu Glu  Ala Glu Leu Leu Val  Glu Ala Asp
    1055                1060                1065

Glu Ala  Arg Glu Lys Ser Val  Val Leu Met Arg Asp  Pro Ser Gly
    1070                1075                1080

Ile Ile  Asn Arg Gly Asn Trp  Thr Arg Gln Lys Glu  Phe Trp Ser
    1085                1090                1095

Met Val  Asn Gln Arg Ile Glu  Gly Tyr Leu Val Lys  Gln Ile Arg
    1100                1105                1110

Ser Arg  Val Pro Leu Gln Asp  Ser Ala Cys Glu Asn  Thr Gly Asp
    1115                1120                1125

Ile
```

<210> 439
<211> 1389
<212> PRT
<213> Leptotrichia shahii

<400> 439

```
Met Gly Asn Leu Phe Gly His Lys Arg Trp Tyr Glu Val Arg Asp Lys
1               5                   10                  15

Lys Asp Phe Lys Ile Lys Arg Lys Val Lys Val Lys Arg Asn Tyr Asp
            20                  25                  30

Gly Asn Lys Tyr Ile Leu Asn Ile Asn Glu Asn Asn Asn Lys Glu Lys
        35                  40                  45

Ile Asp Asn Asn Lys Phe Ile Arg Lys Tyr Ile Asn Tyr Lys Lys Asn
    50                  55                  60
```

```
Asp Asn Ile Leu Lys Glu Phe Thr Arg Lys Phe His Ala Gly Asn Ile
65                  70                  75                  80

Leu Phe Lys Leu Lys Gly Lys Glu Gly Ile Ile Arg Ile Glu Asn Asn
                85                  90                  95

Asp Asp Phe Leu Glu Thr Glu Glu Val Val Leu Tyr Ile Glu Ala Tyr
            100                 105                 110

Gly Lys Ser Glu Lys Leu Lys Ala Leu Gly Ile Thr Lys Lys Lys Ile
        115                 120                 125

Ile Asp Glu Ala Ile Arg Gln Gly Ile Thr Lys Asp Asp Lys Lys Ile
    130                 135                 140

Glu Ile Lys Arg Gln Glu Asn Glu Glu Glu Ile Glu Ile Asp Ile Arg
145                 150                 155                 160

Asp Glu Tyr Thr Asn Lys Thr Leu Asn Asp Cys Ser Ile Ile Leu Arg
                165                 170                 175

Ile Ile Glu Asn Asp Glu Leu Glu Thr Lys Lys Ser Ile Tyr Glu Ile
            180                 185                 190

Phe Lys Asn Ile Asn Met Ser Leu Tyr Lys Ile Ile Glu Lys Ile Ile
        195                 200                 205

Glu Asn Glu Thr Glu Lys Val Phe Glu Asn Arg Tyr Tyr Glu Glu His
    210                 215                 220

Leu Arg Glu Lys Leu Leu Lys Asp Asp Lys Ile Asp Val Ile Leu Thr
225                 230                 235                 240

Asn Phe Met Glu Ile Arg Glu Lys Ile Lys Ser Asn Leu Glu Ile Leu
                245                 250                 255

Gly Phe Val Lys Phe Tyr Leu Asn Val Gly Gly Asp Lys Lys Lys Ser
            260                 265                 270
```

```
Lys Asn Lys Lys Met Leu Val Glu Lys Ile Leu Asn Ile Asn Val Asp
        275                 280                 285

Leu Thr Val Glu Asp Ile Ala Asp Phe Val Ile Lys Glu Leu Glu Phe
    290                 295                 300

Trp Asn Ile Thr Lys Arg Ile Glu Lys Val Lys Lys Val Asn Asn Glu
305                 310                 315                 320

Phe Leu Glu Lys Arg Arg Asn Arg Thr Tyr Ile Lys Ser Tyr Val Leu
                325                 330                 335

Leu Asp Lys His Glu Lys Phe Lys Ile Glu Arg Glu Asn Lys Lys Asp
            340                 345                 350

Lys Ile Val Lys Phe Phe Val Glu Asn Ile Lys Asn Asn Ser Ile Lys
        355                 360                 365

Glu Lys Ile Glu Lys Ile Leu Ala Glu Phe Lys Ile Asp Glu Leu Ile
    370                 375                 380

Lys Lys Leu Glu Lys Glu Leu Lys Lys Gly Asn Cys Asp Thr Glu Ile
385                 390                 395                 400

Phe Gly Ile Phe Lys Lys His Tyr Lys Val Asn Phe Asp Ser Lys Lys
                405                 410                 415

Phe Ser Lys Lys Ser Asp Glu Glu Lys Glu Leu Tyr Lys Ile Ile Tyr
            420                 425                 430

Arg Tyr Leu Lys Gly Arg Ile Glu Lys Ile Leu Val Asn Glu Gln Lys
        435                 440                 445

Val Arg Leu Lys Lys Met Glu Lys Ile Glu Ile Glu Lys Ile Leu Asn
    450                 455                 460

Glu Ser Ile Leu Ser Glu Lys Ile Leu Lys Arg Val Lys Gln Tyr Thr
465                 470                 475                 480
```

```
Leu Glu His Ile Met Tyr Leu Gly Lys Leu Arg His Asn Asp Ile Asp
                485                 490                 495

Met Thr Thr Val Asn Thr Asp Asp Phe Ser Arg Leu His Ala Lys Glu
            500                 505                 510

Glu Leu Asp Leu Glu Leu Ile Thr Phe Phe Ala Ser Thr Asn Met Glu
        515                 520                 525

Leu Asn Lys Ile Phe Ser Arg Glu Asn Ile Asn Asn Asp Glu Asn Ile
    530                 535                 540

Asp Phe Phe Gly Gly Asp Arg Glu Lys Asn Tyr Val Leu Asp Lys Lys
545                 550                 555                 560

Ile Leu Asn Ser Lys Ile Lys Ile Ile Arg Asp Leu Asp Phe Ile Asp
                565                 570                 575

Asn Lys Asn Asn Ile Thr Asn Asn Phe Ile Arg Lys Phe Thr Lys Ile
            580                 585                 590

Gly Thr Asn Glu Arg Asn Arg Ile Leu His Ala Ile Ser Lys Glu Arg
        595                 600                 605

Asp Leu Gln Gly Thr Gln Asp Asp Tyr Asn Lys Val Ile Asn Ile Ile
    610                 615                 620

Gln Asn Leu Lys Ile Ser Asp Glu Glu Val Ser Lys Ala Leu Asn Leu
625                 630                 635                 640

Asp Val Val Phe Lys Asp Lys Lys Asn Ile Ile Thr Lys Ile Asn Asp
                645                 650                 655

Ile Lys Ile Ser Glu Glu Asn Asn Asn Asp Ile Lys Tyr Leu Pro Ser
            660                 665                 670

Phe Ser Lys Val Leu Pro Glu Ile Leu Asn Leu Tyr Arg Asn Asn Pro
        675                 680                 685
```

```
Lys Asn Glu Pro Phe Asp Thr Ile Glu Thr Glu Lys Ile Val Leu Asn
    690                 695                 700

Ala Leu Ile Tyr Val Asn Lys Glu Leu Tyr Lys Lys Leu Ile Leu Glu
705                 710                 715                 720

Asp Asp Leu Glu Glu Asn Glu Ser Lys Asn Ile Phe Leu Gln Glu Leu
                725                 730                 735

Lys Lys Thr Leu Gly Asn Ile Asp Glu Ile Asp Glu Asn Ile Ile Glu
            740                 745                 750

Asn Tyr Tyr Lys Asn Ala Gln Ile Ser Ala Ser Lys Gly Asn Asn Lys
        755                 760                 765

Ala Ile Lys Lys Tyr Gln Lys Lys Val Ile Glu Cys Tyr Ile Gly Tyr
    770                 775                 780

Leu Arg Lys Asn Tyr Glu Glu Leu Phe Asp Phe Ser Asp Phe Lys Met
785                 790                 795                 800

Asn Ile Gln Glu Ile Lys Lys Gln Ile Lys Asp Ile Asn Asp Asn Lys
                805                 810                 815

Thr Tyr Glu Arg Ile Thr Val Lys Thr Ser Asp Lys Thr Ile Val Ile
            820                 825                 830

Asn Asp Asp Phe Glu Tyr Ile Ile Ser Ile Phe Ala Leu Leu Asn Ser
        835                 840                 845

Asn Ala Val Ile Asn Lys Ile Arg Asn Arg Phe Phe Ala Thr Ser Val
    850                 855                 860

Trp Leu Asn Thr Ser Glu Tyr Gln Asn Ile Ile Asp Ile Leu Asp Glu
865                 870                 875                 880

Ile Met Gln Leu Asn Thr Leu Arg Asn Glu Cys Ile Thr Glu Asn Trp
                885                 890                 895
```

```
Asn Leu Asn Leu Glu Glu Phe Ile Gln Lys Met Lys Glu Ile Glu Lys
            900                 905                 910

Asp Phe Asp Asp Phe Lys Ile Gln Thr Lys Lys Glu Ile Phe Asn Asn
        915                 920                 925

Tyr Tyr Glu Asp Ile Lys Asn Asn Ile Leu Thr Glu Phe Lys Asp Asp
    930                 935                 940

Ile Asn Gly Cys Asp Val Leu Glu Lys Lys Leu Glu Lys Ile Val Ile
945                 950                 955                 960

Phe Asp Asp Glu Thr Lys Phe Glu Ile Asp Lys Lys Ser Asn Ile Leu
                965                 970                 975

Gln Asp Glu Gln Arg Lys Leu Ser Asn Ile Asn Lys Lys Asp Leu Lys
            980                 985                 990

Lys Lys Val Asp Gln Tyr Ile Lys  Asp Lys Asp Gln Glu  Ile Lys Ser
        995                 1000                1005

Lys Ile  Leu Cys Arg Ile Ile  Phe Asn Ser Asp Phe  Leu Lys Lys
    1010                1015                1020

Tyr Lys  Lys Glu Ile Asp Asn  Leu Ile Glu Asp Met  Glu Ser Glu
    1025                1030                1035

Asn Glu  Asn Lys Phe Gln Glu  Ile Tyr Tyr Pro Lys  Glu Arg Lys
    1040                1045                1050

Asn Glu  Leu Tyr Ile Tyr Lys  Lys Asn Leu Phe Leu  Asn Ile Gly
    1055                1060                1065

Asn Pro  Asn Phe Asp Lys Ile  Tyr Gly Leu Ile Ser  Asn Asp Ile
    1070                1075                1080

Lys Met  Ala Asp Ala Lys Phe  Leu Phe Asn Ile Asp  Gly Lys Asn
    1085                1090                1095
```

```
Ile Arg  Lys Asn Lys Ile Ser  Glu Ile Asp Ala Ile  Leu Lys Asn
    1100                1105                1110

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Tyr Ile  Lys Lys Leu Lys Glu  Asn Asp Asp Phe Phe  Ala Lys Asn
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Ile Gln  Asn Lys Asn Tyr Lys  Ser Phe Glu Lys Asp  Tyr Asn Arg
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Val Ser  Glu Tyr Lys Lys Ile  Arg Asp Leu Val Glu  Phe Asn Tyr
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Leu Asn  Lys Ile Glu Ser Tyr  Leu Ile Asp Ile Asn  Trp Lys Leu
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Ala Ile  Gln Met Ala Arg Phe  Glu Arg Asp Met His  Tyr Ile Val
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Asn Gly  Leu Arg Glu Leu Gly  Ile Ile Lys Leu Ser  Gly Tyr Asn
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Thr Gly  Ile Ser Arg Ala Tyr  Pro Lys Arg Asn Gly  Ser Asp Gly
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Phe Tyr  Thr Thr Thr Ala Tyr  Tyr Lys Phe Phe Asp  Glu Glu Ser
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Tyr Lys  Lys Phe Glu Lys Ile  Cys Tyr Gly Phe Gly  Ile Asp Leu
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Ser Glu  Asn Ser Glu Ile Asn  Lys Pro Glu Asn Glu  Ser Ile Arg
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Asn Tyr  Ile Ser His Phe Tyr  Ile Val Arg Asn Pro  Phe Ala Asp
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Val Phe  Lys Lys Asp Val Asn  Leu Asp Tyr Asp Glu  Leu Lys Lys
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Lys Phe  Lys Leu Ile Gly Asn  Asn Asp Ile Leu Glu  Arg Leu Met
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Lys Pro  Lys Lys Val Ser Val  Leu Glu Leu Glu Ser  Tyr Asn Ser
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Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
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Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
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Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
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Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
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Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
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Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser Gly
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Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser Gly
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Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr Trp
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Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu
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Gly Trp Asn Arg Pro Ile Gly Arg His Asp Pro Thr Ala His Ala Glu
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Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu
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Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
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Glu Cys Ala Ala Leu Leu Ser Tyr Phe Phe Arg Met Arg Arg Gln Val
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Phe Lys Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser
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Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys Tyr
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Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val Ile
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Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly Asn
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Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu Phe
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Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys Ala
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Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe Arg
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Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp Val
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Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe Glu
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Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu Ser
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Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln Leu
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Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu Ser
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Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu Asp
                645                 650                 655

Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp Asn
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Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala Ala
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Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg Gln
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Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys Asn
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Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe Tyr
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Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu Leu
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Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr Phe
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Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn Arg
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Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val Gly
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Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys Ser
850 855 860

Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys Gly
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Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys Asn

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Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu Tyr
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Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu Gly
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Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile Val
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Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile Ser
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Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp Leu
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Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg
20 25 30

Asp Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
50 55 60

Glu Cys
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Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg
20 25 30

Asp Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
50 55 60

Glu Cys
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20 25 30

Asp Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
50 55 60

Glu Cys
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20 25 30

Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Ser His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
50 55 60

Glu Cys
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Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg
20 25 30

Gly Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
50 55 60

Glu Cys
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Ile Asp Ala Thr Leu Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala
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Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg

20 25 30

Gly Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
50 55 60

Glu Cys
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Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val Arg
20 25 30

Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His

35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
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Glu Cys
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Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg
20 25 30

Gly Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp

50 55 60

Glu Cys
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Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val Arg
20 25 30

Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His His
35 40 45

Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp
50 55 60

Glu Cys

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cacagtcgca ttggtcgcgt ggtctttggt gcgcgtggcg cgaaaactgg cgctgcggga 120

tctttaatgg atgtgctgca tcatccgggt atgaatcacc gagtggaaat tacggaagga 180

atactggcgg atgagtg 197

<210> 608
<211> 192
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<220>
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tctttcgcat gcgccgccag gwaattaaag cgcagaaaaa agcgcaatcc tcgacggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 609
<211> 65
<212> PRT
<213> Artificial Sequence

<220>
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<400> 609

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1 5 10 15

Leu Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Val Ile Lys Ala
            20   25   30

Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly
        35   40   45

Thr Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly
    50   55   60

Leu
65

<210> 610
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

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tctttcgcat gcgccgccag gaaattaaag cgcagaaaaa agcgcaatcc tcgacggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 611
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
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<400> 611

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1   5   10   15

Leu Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln
            20   25   30

Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu
50 55 60

<210> 612
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

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tctttcgcat gcgccgccag gatattaaag cgcagaaaca agcgcaatcc tcgacggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 613
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 613

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1 5 10 15

Leu Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Asp Ile Lys Ala Gln
20 25 30

Lys Gln Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu
50 55 60

<210> 614
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 614
accgagtgga aattacagaa ggaatactgg cggatgagtg cgcggcgttg ctcagtgact 60

tctttcgcat gtgccgccat gaaattaaag cgcagaaaaa agcgcaatcc tcgacggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 615
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 615

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1 5 10 15

Leu Leu Ser Asp Phe Phe Arg Met Cys Arg His Glu Ile Lys Ala Gln
20 25 30

Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu
50 55 60

<210> 616
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
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tctttcgcat gcgccgccgg ggaattaaag cgcagaaaaa agcgcattcc tcgacggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 617
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 617

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1 5 10 15

Leu Leu Ser Asp Phe Phe Arg Met Arg Arg Arg Gly Ile Lys Ala Gln
20 25 30

Lys Lys Ala His Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu
50 55 60

<210> 618
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
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tctttcgcat gcgccgccag gatattaaag cgcagaaaca agcgcaatcc tcgacggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 619
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 619

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1 5 10 15

Leu Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Asp Ile Lys Ala Gln
20 25 30

Lys Gln Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu
50 55 60

<210> 620
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
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accgagtgga aattacggaa ggaatactgg cggatgagtg cgcggcgttg ctcagtgact 60

tctttcgcat gcgccgccag gtaattaaag cgcagaaaaa agcgcaatcc tcgccggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 621
<211> 64
<212> PRT
<213> Artificial Sequence

<220>

<223> Synthetic Polypeptide

<400> 621

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1 5 10 15

Leu Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Val Ile Lys Ala Gln
20 25 30

Lys Lys Ala Gln Ser Ser Pro Asp Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu
50 55 60

<210> 622
<211> 192
<212> DNA
<213> Artificial Sequence

<220>
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tctttcgcat gcgccgccag gtaattaaag cgcagaaaaa agcgcaatcc tcgacggatt 120

ccggtagcga aacaccgggg acttcagaat cggccacccc ggagtctgat aagaaatact 180

caataggctt ag 192

<210> 623
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 623

His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala
1 5 10 15

Leu Leu Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Ile Lys Ala Gln
20 25 30

Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu
50 55 60

<210> 624
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 624
gacaggatga ggatcctttc gcatgatcga acaagatgga ttgcacgcag gttctccggc 60

<210> 625
<211> 13
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 625

Met Ile Glu Gln Asp Gly Leu His Ala Gly Ser Pro Ala
1 5 10

<210> 626
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 626
gacaggatga ggatcctttc gcatgatcga ataagatgga ttgcacgcag gttctccggc 60

<210> 627
<211> 13

<212> PRT
<213> Artificial Sequence

<220>
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<220>
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<223> Xaa is a stop codon

<400> 627

Met Ile Glu Xaa Asp Gly Leu His Ala Gly Ser Pro Ala
1 5 10

<210> 628
<211> 60
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 628
gacaggatga ggatcctttc gcatgatcga acaagatgga ttgcacgcag gttctccggc 60

<210> 629
<211> 81
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 629
atgattgaac aagatggatt gcacgcaggt tctccggccg cttgggtgga gcgcctattc 60

ggctatgact gggcacaaca g 81

<210> 630
<211> 27
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 630

Met Ile Glu Gln Asp Gly Leu His Ala Gly Ser Pro Ala Ala Trp Val
1 5 10 15

Glu Arg Leu Phe Gly Tyr Asp Trp Ala Gln Gln
20 25

<210> 631
<211> 81
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 631
atgattgaac aagatggatt gcacgcaggt tctccggccg cttaggtgga gcgcctattc 60

ggctatgact gggcacaaca g 81

<210> 632
<211> 27
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<220>
<221> MISC_FEATURE
<222> (15)..(15)
<223> Xaa is a stop codon

<400> 632

Met Ile Glu Gln Asp Gly Leu His Ala Gly Ser Pro Ala Ala Xaa Val
1 5 10 15

Glu Arg Leu Phe Gly Tyr Asp Trp Ala Gln Gln
20 25

<210> 633
<211> 81
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 633
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ggctatgact gggcacaaca g 81

<210> 634
<211> 63
<212> PRT
<213> Artificial Sequence

<220>
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<220>
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<220>
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<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (17)..(17)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (27)..(27)
<223> X can be Ile or Leu

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<222> (28)..(29)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (36)..(36)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (47)..(47)

<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (54)..(54)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (56)..(56)
<223> Xaa can be any naturally occurring amino acid

<220>
<221> misc_feature
<222> (62)..(62)
<223> Xaa can be any naturally occurring amino acid

<400> 634

Met Pro Pro Ala Phe Ile Thr Met Xaa Xaa Xaa Lys Ser Xaa Val Glu
1   5   10   15

Xaa Asp Asp Glu Tyr Trp Met Arg His Ala Xaa Xaa Xaa Ala Lys Lys
            20   25   30

Ala Glu Ala Xaa Gly Glu Val Pro Val Gly Ala Val Leu Val Xaa Asp
        35   40   45

Gly Arg Val Ile Gly Xaa Gly Xaa Asn Leu Arg Ile Gly Xaa His
    50   55   60

<210> 635
<211> 52
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 635

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1   5   10   15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20   25   30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His
50

<210> 636
<211> 51
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 636

Met Ser His Met Thr Asn Asp Ile Tyr Phe Met Thr Leu Ala Ile Glu
1 5 10 15

Glu Ala Lys Lys Ala Ala Gln Leu Gly Glu Val Pro Ile Gly Ala Ile
20 25 30

Ile Thr Lys Asp Asp Glu Val Ile Ala Arg Ala His Asn Leu Arg Glu
35 40 45

Thr Leu Gln
50

<210> 637
<211> 63
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 637

Met Pro Pro Ala Phe Ile Thr Gly Val Thr Ser Leu Ser Asp Val Glu
1 5 10 15

Leu Asp His Glu Tyr Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg
20 25 30

Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val Leu Val His Asn
        35   40   45

His Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile Gly Arg His
    50   55   60

<210> 638
<211> 56
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 638

Met Asp Ala Ala Lys Val Arg Ser Glu Phe Asp Glu Lys Met Met Arg
1   5   10   15

Tyr Ala Leu Glu Leu Ala Asp Lys Ala Glu Ala Leu Gly Glu Ile Pro
            20   25   30

Val Gly Ala Val Leu Val Asp Asp Ala Arg Asn Ile Ile Gly Glu Gly
        35   40   45

Trp Asn Leu Ser Ile Val Gln Ser
    50   55

<210> 639
<211> 46
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 639

Met Asp Glu Tyr Trp Met Gln Val Ala Met Gln Met Ala Glu Lys Ala
1   5   10   15

Glu Ala Ala Gly Glu Val Pro Val Gly Ala Val Leu Val Lys Asp Gly
            20   25   30

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Gln Gln Ile Ala Thr Gly Tyr Asn Leu Ser Ile Ser Gln His
        35                  40                  45


<210>  640
<211>  48
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  640

Met Thr Gln Asp Glu Leu Tyr Met Lys Glu Ala Ile Lys Glu Ala Lys
1               5                   10                  15


Lys Ala Glu Glu Lys Gly Glu Val Pro Ile Gly Ala Val Leu Val Ile
            20                  25                  30


Asn Gly Glu Ile Ile Ala Arg Ala His Asn Leu Arg Glu Thr Glu Gln
        35                  40                  45


<210>  641
<211>  56
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  641

Met Ser Ser Leu Lys Lys Thr Pro Ile Arg Asp Asp Ala Tyr Trp Met
1               5                   10                  15


Gly Lys Ala Ile Arg Glu Ala Ala Lys Ala Ala Ala Arg Asp Glu Val
            20                  25                  30


Pro Ile Gly Ala Val Ile Val Arg Asp Gly Ala Val Ile Gly Arg Gly
        35                  40                  45


His Asn Leu Arg Glu Gly Ser Asn
    50                  55
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<210> 642
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
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<220>
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<220>
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<222> (42)..(42)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (48)..(48)
<223> Xaa can be any naturally occurring amino acid

<400> 642

Asp Pro Thr Ala His Ala Glu Ile Ile Ala Leu Arg Gln Ala Xaa Lys
1 5 10 15

Val Leu Gln Asn Tyr Arg Leu Leu Xaa Ala Thr Leu Tyr Val Thr Leu
20 25 30

Glu Pro Cys Val Met Cys Ala Gly Ala Xaa Val His Ser Arg Ile Xaa
35 40 45

Arg Val Val Phe Gly Ala Arg Asp Pro Lys Thr Gly Ala Ala Gly Ser
50 55 60

<210> 643
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 643

Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln Gly Gly Leu
1   5   10   15

Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr Val Thr Leu
            20   25   30

Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser Arg Ile Gly
        35   40   45

Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala Ala Gly Ser
    50   55   60

<210> 644
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 644

Gln Pro Thr Ala His Ala Glu His Ile Ala Ile Glu Arg Ala Ala Lys
1   5   10   15

Val Leu Gly Ser Trp Arg Leu Glu Gly Cys Thr Leu Tyr Val Thr Leu
            20   25   30

Glu Pro Cys Val Met Cys Ala Gly Thr Ile Val Met Ser Arg Ile Pro
        35   40   45

Arg Val Val Tyr Gly Ala Asp Asp Pro Lys Gly Gly Cys Ser Gly Ser
    50   55   60

<210> 645
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 645

Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln Gly Gly Leu
1   5   10   15

Val Leu Gln Asn Tyr Arg Leu Leu Asp Thr Thr Leu Tyr Val Thr Leu
            20   25   30

Glu Pro Cys Val Met Cys Ala Gly Ala Met Val His Ser Arg Ile Gly
        35   40   45

Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala Ala Gly Ser
    50   55   60

<210> 646
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 646

Asp Pro Thr Ala His Ala Glu Ile Ile Ala Leu Arg Asn Gly Ala Lys
1   5   10   15

Asn Ile Gln Asn Tyr Arg Leu Leu Asn Ser Thr Leu Tyr Val Thr Leu
            20   25   30

Glu Pro Cys Thr Met Cys Ala Gly Ala Ile Leu His Ser Arg Ile Lys
        35   40   45

Arg Leu Val Phe Gly Ala Ser Asp Tyr Lys Thr Gly Ala Ile Gly Ser
    50   55   60

<210> 647
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 647

Asp Pro Thr Ala His Ala Glu Ile Leu Cys Leu Arg Ser Ala Gly Lys
1   5   10   15

Lys Leu Glu Asn Tyr Arg Leu Leu Asp Ala Thr Leu Tyr Ile Thr Leu
            20   25   30

Glu Pro Cys Ala Met Cys Ala Gly Ala Met Val His Ser Arg Ile Ala
        35   40   45

Arg Val Val Tyr Gly Ala Arg Asp Glu Lys Thr Gly Ala Ala Gly Thr
    50   55   60

<210> 648
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 648

Arg Ser Ile Ala His Ala Glu Met Leu Val Ile Asp Glu Ala Cys Lys
1   5   10   15

Ala Leu Gly Thr Trp Arg Leu Glu Gly Ala Thr Leu Tyr Val Thr Leu
            20   25   30

Glu Pro Cys Pro Met Cys Ala Gly Ala Val Val Leu Ser Arg Val Glu
        35   40   45

Lys Val Val Phe Gly Ala Phe Asp Pro Lys Gly Gly Cys Ser Gly Thr
    50   55   60

<210> 649
<211> 64
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 649

Asp Pro Ser Ala His Ala Glu Met Ile Ala Ile Arg Gln Ala Ala Arg
1   5   10   15

Arg Ser Ala Asn Trp Arg Leu Thr Gly Ala Thr Leu Tyr Val Thr Leu
            20   25   30

Glu Pro Cys Leu Met Cys Met Gly Ala Ile Ile Leu Ala Arg Leu Glu
        35   40   45

Arg Val Val Phe Gly Cys Tyr Asp Pro Lys Gly Gly Ala Ala Gly Ser
    50   55   60

<210> 650
<211> 56
<212> PRT
<213> Artificial Sequence

<220>
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<220>
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<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (13)..(13)
<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

<220>
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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

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<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (49)..(49)
<223> Xaa can be any naturally occurring amino acid

<220>
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<222> (53)..(54)
<223> Xaa can be any naturally occurring amino acid

<400> 650

Leu Met Asx Leu Leu Gln His Pro Xaa Xaa Asn His Xaa Val Glu Xaa
1 5 10 15

Thr Ser Gly Val Leu Ala Glu Glu Cys Ser Thr Leu Leu Ser Asp Phe
20 25 30

Phe Arg Met Arg Arg Gln Glu Lys Lys Ala Xaa Lys Xaa Ala Xaa Lys
35 40 45

Xaa Leu Ser Glu Xaa Xaa Ala Val
50 55

<210> 651
<211> 51
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 651

Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg Val Glu Ile
1 5 10 15

Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu Ser Asp Phe

20 25 30

Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys Ala Gln Ser
35 40 45

Ser Thr Asp
50

<210> 652
<211> 44
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 652

Leu Met Asn Leu Leu Gln Gln Ser Asn Phe Asn His Arg Ala Ile Val
1 5 10 15

Asp Lys Gly Val Leu Lys Glu Ala Cys Ser Thr Leu Leu Thr Thr Phe
20 25 30

Phe Lys Asn Leu Arg Ala Asn Lys Lys Ser Thr Asn
35 40

<210> 653
<211> 56
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 653

Leu Ile Asp Val Leu His His Pro Gly Met Asn His Arg Val Glu Ile
1 5 10 15

Ile Glu Gly Val Leu Arg Asp Glu Cys Ala Thr Leu Leu Ser Asp Phe
20 25 30

Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Leu Lys Lys Ala Asp Arg

35 40 45

Ala Glu Gly Ala Gly Pro Ala Val
50 55

<210> 654
<211> 53
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 654

Arg Phe His Phe Phe Asp Asp Tyr Lys Met Asn His Thr Leu Glu Ile
1 5 10 15

Thr Ser Gly Val Leu Ala Glu Glu Cys Ser Gln Lys Leu Ser Thr Phe
20 25 30

Phe Gln Lys Arg Arg Glu Glu Lys Lys Ile Glu Lys Ala Leu Leu Lys
35 40 45

Ser Leu Ser Asp Lys
50

<210> 655
<211> 55
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 655

Val Val Asn Leu Leu Gln His Pro Ala Phe Asn His Gln Val Glu Val
1 5 10 15

Thr Ser Gly Val Leu Ala Glu Ala Cys Ser Ala Gln Leu Ser Arg Phe
20 25 30

Phe Glu Lys Arg Arg Arg Asp Glu Lys Lys Ala Leu Lys Leu Ala Gln

35 40 45

Arg Ala Gln Gln Gly Ile Glu
50 55

<210> 656
<211> 49
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 656

Leu Met Asn Leu Leu Gln Glu Glu Arg Phe Asn His Gln Ala Glu Val
1 5 10 15

Val Ser Gly Val Leu Glu Glu Glu Cys Gly Gly Met Leu Ser Ala Phe
20 25 30

Phe Arg Glu Leu Arg Lys Lys Lys Lys Ala Ala Arg Lys Asn Leu Ser
35 40 45

Glu

<210> 657
<211> 59
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 657

Leu Tyr Asp Leu Ser Ala Asp Pro Arg Leu Asn His Gln Val Arg Leu
1 5 10 15

Ser Pro Gly Val Cys Gln Glu Glu Cys Gly Thr Met Leu Ser Asp Phe
20 25 30

Phe Arg Asp Leu Arg Arg Arg Lys Lys Ala Lys Ala Thr Pro Ala Leu

35 40 45

Phe Ile Asp Glu Arg Lys Val Pro Pro Glu Pro
50 55

<210> 658
<211> 131
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 658
aagatctgat caagagacag gatgaggatc ctttcgcatg atcgaacaag atggattgca 60

cgcaggttct ccggccgctt gggtggagcg cctattcggc tatgactggg cacaacagac 120

aatcggctgc t 131

<210> 659
<211> 31
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 659

Met Ile Glu Gln Asp Gly Leu His Ala Gly Ser Pro Ala Ala Trp Val
1 5 10 15

Glu Arg Leu Phe Gly Tyr Asp Trp Ala Gln Gln Thr Ile Gly Cys
20 25 30

<210> 660
<211> 131
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 660
aagatctgat caagagacag gatgaggatc ctttcgcatg atcgaataag atggattgca 60

cgcaggttct ccggccgctt aggtggagcg cctattcggc tatgactggg cacaacagac 120

aatcggctgc t 131

<210> 661
<211> 30
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<220>
<221> MISC_FEATURE
<222> (4)..(4)
<223> Xaa is a stop codon

<400> 661

Met Ile Glu Xaa Asp Gly Leu His Ala Gly Ser Pro Ala Ala Val Glu
1 5 10 15

Arg Leu Phe Gly Tyr Asp Trp Ala Gln Gln Thr Ile Gly Cys
20 25 30

<210> 662
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 662
cttcggcttc ccctggagag agcgagattc tccgcgctgt agaagtcatc attgttgtgc 60

acgacgacat cattccgtgg cgttatccag ctaagc 96

<210> 663
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 663

Thr Ser Ala Ser Pro Gly Glu Ser Glu Ile Leu Arg Ala Val Glu Val
1 5 10 15

Ile Ile Val Val His Asp Asp Ile Ile Pro Trp Arg Tyr Pro Ala Lys
20 25 30

<210> 664
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 664
cttcggcttc ccctggagag agcgagattc tccgcgctgt agaagtcacc attgttgtgc 60

acgacgacat cattccgtgg cgttatccag ctaagc 96

<210> 665
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide
<400> 665

Thr Ser Ala Ser Pro Gly Glu Ser Glu Ile Leu Arg Ala Val Glu Val
1 5 10 15

Thr Ile Val Val His Asp Asp Ile Ile Pro Trp Arg Tyr Pro Ala Lys
20 25 30

<210> 666
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 666
cttcggcttc ccctggagag agcgagattc tccgcgctgt agaagtcacc attgttgtgc 60

acgacgacat cattccgtgg cgttatccag ctaagc 96

<210> 667
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 667

Thr Ser Ala Ser Pro Gly Glu Ser Glu Ile Leu Arg Ala Val Glu Val
1 5 10 15

Thr Ile Val Val His Asp Asp Ile Ile Pro Trp Arg Tyr Pro Ala Lys
20 25 30

<210> 668
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 668
cttcggcttc ccctggagag agcgagattc tccgcgctgt agaagtcacc attgttgtgc 60

acgacgacat cattccgtgg cgttatccag ctaagc 96

<210> 669
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 669

Thr Ser Ala Ser Pro Gly Glu Ser Glu Ile Leu Arg Ala Val Glu Val
1 5 10 15

Thr Ile Val Val His Asp Asp Ile Ile Pro Trp Arg Tyr Pro Ala Lys
20 25 30

<210> 670
<211> 96
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic Polynucleotide

<400> 670
cttcggcttc ccctggagag agcgagattc tccgcgctgt agaagtcacc attgttgtgc 60

acgacgacat cattccgtgg cgttatccag ctaagc 96

<210> 671
<211> 32
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 671

Thr Ser Ala Ser Pro Gly Glu Ser Glu Ile Leu Arg Ala Val Glu Val
1 5 10 15

Thr Ile Val Val His Asp Asp Ile Ile Pro Trp Arg Tyr Pro Ala Lys
20 25 30

<210> 672
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 672

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Ser Ile
35 40 45

```
Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 673
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 673

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30
```

```
Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Thr Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 674
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 674

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30
```

```
Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Ala Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 675
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 675

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15
```

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Asn Ala Leu Leu
130 135 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 676
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 676

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

```
Leu Ala Lys Arg Ala Arg Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 677
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 677

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                  10                  15

Leu Ala Lys Arg Ala Leu Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35                  40                  45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
            100                 105                 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
        115                 120                 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140

Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys Lys
145                 150                 155                 160

Ala Gln Ser Ser Thr Asp
                165
```

<210> 678
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 678

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Asp Phe Phe Arg Met Pro Arg Gln Glu Ile Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 679
<211> 166
<212> PRT
<213> Artificial Sequence

<220>

<223> Synthetic Polypeptide

<400> 679

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Ser Asp Phe Phe Arg Met His Arg Gln Glu Ile Lys Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 680
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 680

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1   5   10   15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20   25   30

Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
        35   40   45

Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50   55   60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65   70   75   80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85   90   95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100   105   110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115   120   125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130   135   140

Ser Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Lys Ala Gln Lys Lys
145   150   155   160

Ala Gln Ser Ser Thr Asp
                165

<210> 681
<211> 166

<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 681

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro Ile
35 40 45

Gly Leu His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Cys Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Asn Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 682
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 682

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Ser Ile
35 40 45

Gly Leu His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Cys Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Asn Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 683
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 683

```
Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1               5                   10                  15


Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala Val
            20                  25                  30


Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Ala Ile
        35                  40                  45


Gly Leu His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
    50                  55                  60


Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65                  70                  75                  80


Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
                85                  90                  95


Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
            100                 105                 110


Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
        115                 120                 125


Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
    130                 135                 140


Cys Tyr Phe Phe Arg Met Arg Arg Gln Val Phe Asn Ala Gln Lys Lys
145                 150                 155                 160
```

Ala Gln Ser Ser Thr Asp
165

<210> 684
<211> 166
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 684

Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu Thr
1 5 10 15

Leu Ala Lys Arg Ala Leu Asp Glu Arg Glu Val Pro Val Gly Ala Val
20 25 30

Leu Val Leu Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Ala Ile
35 40 45

Gly Leu His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg Gln
50 55 60

Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu Tyr
65 70 75 80

Val Thr Phe Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His Ser
85 90 95

Arg Ile Gly Arg Val Val Phe Gly Val Arg Asn Ala Lys Thr Gly Ala
100 105 110

Ala Gly Ser Leu Met Asp Val Leu His Tyr Pro Gly Met Asn His Arg
115 120 125

Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu Leu
130 135 140

Cys Tyr Phe Phe Arg Met Pro Arg Gln Val Phe Asn Ala Gln Lys Lys
145 150 155 160

Ala Gln Ser Ser Thr Asp
165

<210> 685
<211> 24
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 685

Ser Gly Gly Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr
1 5 10 15

Ser Glu Ser Ala Thr Pro Glu Ser
20

<210> 686
<211> 40
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 686

Ser Gly Gly Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr
1 5 10 15

Ser Glu Ser Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser
20 25 30

Ser Gly Gly Ser Ser Gly Gly Ser
35 40

<210> 687
<211> 64
<212> PRT
<213> Artificial Sequence

<220>

<223> Synthetic Polypeptide

<400> 687

Ser Gly Gly Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr
1 5 10 15

Ser Glu Ser Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser
20 25 30

Ser Gly Gly Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr
35 40 45

Ser Glu Ser Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser
50 55 60

<210> 688
<211> 92
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 688

Pro Gly Ser Pro Ala Gly Ser Pro Thr Ser Thr Glu Glu Gly Thr Ser
1 5 10 15

Glu Ser Ala Thr Pro Glu Ser Gly Pro Gly Thr Ser Thr Glu Pro Ser
20 25 30

Glu Gly Ser Ala Pro Gly Ser Pro Ala Gly Ser Pro Thr Ser Thr Glu
35 40 45

Glu Gly Thr Ser Thr Glu Pro Ser Glu Gly Ser Ala Pro Gly Thr Ser
50 55 60

Thr Glu Pro Ser Glu Gly Ser Ala Pro Gly Thr Ser Glu Ser Ala Thr
65 70 75 80

Pro Glu Ser Gly Pro Gly Ser Glu Pro Ala Thr Ser
85 90

<210> 689
<211> 579
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 689

```
Gly Thr Thr Gly Leu Glu Ser Leu Ser Leu Gly Asp Arg Gly Ala Ala
1               5                  10                  15


Pro Thr Val Thr Ser Ser Glu Arg Leu Val Pro Asp Pro Pro Asn Asp
            20                  25                  30


Leu Arg Lys Glu Asp Val Ala Met Glu Leu Glu Arg Val Gly Glu Asp
        35                  40                  45


Glu Glu Gln Met Met Ile Lys Arg Ser Ser Glu Cys Asn Pro Leu Leu
    50                  55                  60


Gln Glu Pro Ile Ala Ser Ala Gln Phe Gly Ala Thr Ala Gly Thr Glu
65                  70                  75                  80


Cys Arg Lys Ser Val Pro Cys Gly Trp Glu Arg Val Val Lys Gln Arg
                85                  90                  95


Leu Phe Gly Lys Thr Ala Gly Arg Phe Asp Val Tyr Phe Ile Ser Pro
            100                 105                 110


Gln Gly Leu Lys Phe Arg Ser Lys Ser Ser Leu Ala Asn Tyr Leu His
        115                 120                 125


Lys Asn Gly Glu Thr Ser Leu Lys Pro Glu Asp Phe Asp Phe Thr Val
    130                 135                 140


Leu Ser Lys Arg Gly Ile Lys Ser Arg Tyr Lys Asp Cys Ser Met Ala
145                 150                 155                 160
```

```
Ala Leu Thr Ser His Leu Gln Asn Gln Ser Asn Asn Ser Asn Trp Asn
                165                 170                 175

Leu Arg Thr Arg Ser Lys Cys Lys Lys Asp Val Phe Met Pro Pro Ser
            180                 185                 190

Ser Ser Ser Glu Leu Gln Glu Ser Arg Gly Leu Ser Asn Phe Thr Ser
        195                 200                 205

Thr His Leu Leu Leu Lys Glu Asp Glu Gly Val Asp Asp Val Asn Phe
    210                 215                 220

Arg Lys Val Arg Lys Pro Lys Gly Lys Val Thr Ile Leu Lys Gly Ile
225                 230                 235                 240

Pro Ile Lys Lys Thr Lys Lys Gly Cys Arg Lys Ser Cys Ser Gly Phe
                245                 250                 255

Val Gln Ser Asp Ser Lys Arg Glu Ser Val Cys Asn Lys Ala Asp Ala
            260                 265                 270

Glu Ser Glu Pro Val Ala Gln Lys Ser Gln Leu Asp Arg Thr Val Cys
        275                 280                 285

Ile Ser Asp Ala Gly Ala Cys Gly Glu Thr Leu Ser Val Thr Ser Glu
    290                 295                 300

Glu Asn Ser Leu Val Lys Lys Lys Glu Arg Ser Leu Ser Ser Gly Ser
305                 310                 315                 320

Asn Phe Cys Ser Glu Gln Lys Thr Ser Gly Ile Ile Asn Lys Phe Cys
                325                 330                 335

Ser Ala Lys Asp Ser Glu His Asn Glu Lys Tyr Glu Asp Thr Phe Leu
            340                 345                 350

Glu Ser Glu Glu Ile Gly Thr Lys Val Glu Val Val Glu Arg Lys Glu
        355                 360                 365
```

```
His Leu His Thr Asp Ile Leu Lys Arg Gly Ser Glu Met Asp Asn Asn
    370                 375                 380

Cys Ser Pro Thr Arg Lys Asp Phe Thr Gly Glu Lys Ile Phe Gln Glu
385                 390                 395                 400

Asp Thr Ile Pro Arg Thr Gln Ile Glu Arg Arg Lys Thr Ser Leu Tyr
                405                 410                 415

Phe Ser Ser Lys Tyr Asn Lys Glu Ala Leu Ser Pro Pro Arg Arg Lys
            420                 425                 430

Ala Phe Lys Lys Trp Thr Pro Pro Arg Ser Pro Phe Asn Leu Val Gln
        435                 440                 445

Glu Thr Leu Phe His Asp Pro Trp Lys Leu Leu Ile Ala Thr Ile Phe
    450                 455                 460

Leu Asn Arg Thr Ser Gly Lys Met Ala Ile Pro Val Leu Trp Lys Phe
465                 470                 475                 480

Leu Glu Lys Tyr Pro Ser Ala Glu Val Ala Arg Thr Ala Asp Trp Arg
                485                 490                 495

Asp Val Ser Glu Leu Leu Lys Pro Leu Gly Leu Tyr Asp Leu Arg Ala
            500                 505                 510

Lys Thr Ile Val Lys Phe Ser Asp Glu Tyr Leu Thr Lys Gln Trp Lys
        515                 520                 525

Tyr Pro Ile Glu Leu His Gly Ile Gly Lys Tyr Gly Asn Asp Ser Tyr
    530                 535                 540

Arg Ile Phe Cys Val Asn Glu Trp Lys Gln Val His Pro Glu Asp His
545                 550                 555                 560

Lys Leu Asn Lys Tyr His Asp Trp Leu Trp Glu Asn His Glu Lys Leu
                565                 570                 575
```

Ser Leu Ser

<210> 690
<211> 409
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 690

```
Glu Ala Glu Asn Ala Gly Ser Tyr Ser Leu Gln Gln Ala Gln Ala Phe
1               5                   10                  15

Tyr Thr Phe Pro Phe Gln Gln Leu Met Ala Glu Ala Pro Asn Met Ala
            20                  25                  30

Val Val Asn Glu Gln Gln Met Pro Glu Glu Val Pro Ala Pro Ala Pro
        35                  40                  45

Ala Gln Glu Pro Val Gln Glu Ala Pro Lys Gly Arg Lys Arg Lys Pro
    50                  55                  60

Arg Thr Thr Glu Pro Lys Gln Pro Val Glu Pro Lys Lys Pro Val Glu
65                  70                  75                  80

Ser Lys Lys Ser Gly Lys Ser Ala Lys Ser Lys Glu Lys Gln Glu Lys
                85                  90                  95

Ile Thr Asp Thr Phe Lys Val Lys Arg Lys Val Asp Arg Phe Asn Gly
            100                 105                 110

Val Ser Glu Ala Glu Leu Leu Thr Lys Thr Leu Pro Asp Ile Leu Thr
        115                 120                 125

Phe Asn Leu Asp Ile Val Ile Ile Gly Ile Asn Pro Gly Leu Met Ala
    130                 135                 140

Ala Tyr Lys Gly His His Tyr Pro Gly Pro Gly Asn His Phe Trp Lys
145                 150                 155                 160
```

```
Cys Leu Phe Met Ser Gly Leu Ser Glu Val Gln Leu Asn His Met Asp
                165                 170                 175

Asp His Thr Leu Pro Gly Lys Tyr Gly Ile Gly Phe Thr Asn Met Val
            180                 185                 190

Glu Arg Thr Thr Pro Gly Ser Lys Asp Leu Ser Ser Lys Glu Phe Arg
        195                 200                 205

Glu Gly Gly Arg Ile Leu Val Gln Lys Leu Gln Lys Tyr Gln Pro Arg
    210                 215                 220

Ile Ala Val Phe Asn Gly Lys Cys Ile Tyr Glu Ile Phe Ser Lys Glu
225                 230                 235                 240

Val Phe Gly Val Lys Val Lys Asn Leu Glu Phe Gly Leu Gln Pro His
                245                 250                 255

Lys Ile Pro Asp Thr Glu Thr Leu Cys Tyr Val Met Pro Ser Ser Ser
            260                 265                 270

Ala Arg Cys Ala Gln Phe Pro Arg Ala Gln Asp Lys Val His Tyr Tyr
        275                 280                 285

Ile Lys Leu Lys Asp Leu Arg Asp Gln Leu Lys Gly Ile Glu Arg Asn
    290                 295                 300

Met Asp Val Gln Glu Val Gln Tyr Thr Phe Asp Leu Gln Leu Ala Gln
305                 310                 315                 320

Glu Asp Ala Lys Lys Met Ala Val Lys Glu Glu Lys Tyr Asp Pro Gly
                325                 330                 335

Tyr Glu Ala Ala Tyr Gly Gly Ala Tyr Gly Glu Asn Pro Cys Ser Ser
            340                 345                 350

Glu Pro Cys Gly Phe Ser Ser Asn Gly Leu Ile Glu Ser Val Glu Leu
        355                 360                 365
```

```
Arg Gly Glu Ser Ala Phe Ser Gly Ile Pro Asn Gly Gln Trp Met Thr
    370                 375                 380

Gln Ser Phe Thr Asp Gln Ile Pro Ser Phe Ser Asn His Cys Gly Thr
385                 390                 395                 400

Gln Glu Gln Glu Glu Glu Ser His Ala
                405
```

<210> 691
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 691

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110
```

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Leu Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320
```

```
Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525
```

```
Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735
```

```
Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940
```

```
Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960


Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975


Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990


Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005


Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020


Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035


Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050


Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065


Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080


Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095


Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110


Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125


Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140
```

```
Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335
```

```
Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530
```

```
Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725
```

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1730 1735 1740

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1745 1750 1755

Ser Gln Leu Gly Gly Asp Ser Gly Gly Ser Pro Lys Lys Lys Arg
1760 1765 1770

Lys Val
1775

<210> 692
<211> 1767
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 692

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
85 90 95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
100 105 110

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Arg Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320
```

```
Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly
385                 390                 395                 400

Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro
                405                 410                 415

Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys
            420                 425                 430

Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu
        435                 440                 445

Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys
    450                 455                 460

Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys
465                 470                 475                 480

Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu
                485                 490                 495

Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp
            500                 505                 510

Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys
        515                 520                 525
```

```
Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu
    530                 535                 540

Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly
545                 550                 555                 560

Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu
                565                 570                 575

Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser
            580                 585                 590

Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg
        595                 600                 605

Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly
    610                 615                 620

Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe
625                 630                 635                 640

Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys
                645                 650                 655

Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp
            660                 665                 670

Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile
        675                 680                 685

Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro
    690                 695                 700

Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu
705                 710                 715                 720

Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys
                725                 730                 735
```

```
Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp
            740                 745                 750

Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu
        755                 760                 765

Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu
    770                 775                 780

Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His
785                 790                 795                 800

Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp
                805                 810                 815

Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu
            820                 825                 830

Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser
        835                 840                 845

Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp
    850                 855                 860

Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile
865                 870                 875                 880

Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu
                885                 890                 895

Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu
            900                 905                 910

Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu
        915                 920                 925

Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn
    930                 935                 940
```

```
Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile
945                 950                 955                 960

Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn
                965                 970                 975

Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys
            980                 985                 990

Asp Phe Leu Asp Asn Glu Glu Asn  Glu Asp Ile Leu Glu  Asp Ile Val
        995                 1000                1005

Leu Thr  Leu Thr Leu Phe Glu  Asp Arg Glu Met Ile  Glu Glu Arg
    1010                1015                1020

Leu Lys  Thr Tyr Ala His Leu  Phe Asp Asp Lys Val  Met Lys Gln
    1025                1030                1035

Leu Lys  Arg Arg Arg Tyr Thr  Gly Trp Gly Arg Leu  Ser Arg Lys
    1040                1045                1050

Leu Ile  Asn Gly Ile Arg Asp  Lys Gln Ser Gly Lys  Thr Ile Leu
    1055                1060                1065

Asp Phe  Leu Lys Ser Asp Gly  Phe Ala Asn Arg Asn  Phe Met Gln
    1070                1075                1080

Leu Ile  His Asp Asp Ser Leu  Thr Phe Lys Glu Asp  Ile Gln Lys
    1085                1090                1095

Ala Gln  Val Ser Gly Gln Gly  Asp Ser Leu His Glu  His Ile Ala
    1100                1105                1110

Asn Leu  Ala Gly Ser Pro Ala  Ile Lys Lys Gly Ile  Leu Gln Thr
    1115                1120                1125

Val Lys  Val Val Asp Glu Leu  Val Lys Val Met Gly  Arg His Lys
    1130                1135                1140
```

```
Pro Glu  Asn Ile Val Ile Glu  Met Ala Arg Glu Asn  Gln Thr Thr
    1145                1150                1155

Gln Lys  Gly Gln Lys Asn Ser  Arg Glu Arg Met Lys  Arg Ile Glu
    1160                1165                1170

Glu Gly  Ile Lys Glu Leu Gly  Ser Gln Ile Leu Lys  Glu His Pro
    1175                1180                1185

Val Glu  Asn Thr Gln Leu Gln  Asn Glu Lys Leu Tyr  Leu Tyr Tyr
    1190                1195                1200

Leu Gln  Asn Gly Arg Asp Met  Tyr Val Asp Gln Glu  Leu Asp Ile
    1205                1210                1215

Asn Arg  Leu Ser Asp Tyr Asp  Val Asp His Ile Val  Pro Gln Ser
    1220                1225                1230

Phe Leu  Lys Asp Asp Ser Ile  Asp Asn Lys Val Leu  Thr Arg Ser
    1235                1240                1245

Asp Lys  Asn Arg Gly Lys Ser  Asp Asn Val Pro Ser  Glu Glu Val
    1250                1255                1260

Val Lys  Lys Met Lys Asn Tyr  Trp Arg Gln Leu Leu  Asn Ala Lys
    1265                1270                1275

Leu Ile  Thr Gln Arg Lys Phe  Asp Asn Leu Thr Lys  Ala Glu Arg
    1280                1285                1290

Gly Gly  Leu Ser Glu Leu Asp  Lys Ala Gly Phe Ile  Lys Arg Gln
    1295                1300                1305

Leu Val  Glu Thr Arg Gln Ile  Thr Lys His Val Ala  Gln Ile Leu
    1310                1315                1320

Asp Ser  Arg Met Asn Thr Lys  Tyr Asp Glu Asn Asp  Lys Leu Ile
    1325                1330                1335
```

```
Arg Glu  Val Lys Val Ile Thr  Leu Lys Ser Lys Leu  Val Ser Asp
    1340                1345                1350

Phe Arg  Lys Asp Phe Gln Phe  Tyr Lys Val Arg Glu  Ile Asn Asn
    1355                1360                1365

Tyr His  His Ala His Asp Ala  Tyr Leu Asn Ala Val  Val Gly Thr
    1370                1375                1380

Ala Leu  Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
    1385                1390                1395

Gly Asp  Tyr Lys Val Tyr Asp  Val Arg Lys Met Ile  Ala Lys Ser
    1400                1405                1410

Glu Gln  Glu Ile Gly Lys Ala  Thr Ala Lys Tyr Phe  Phe Tyr Ser
    1415                1420                1425

Asn Ile  Met Asn Phe Phe Lys  Thr Glu Ile Thr Leu  Ala Asn Gly
    1430                1435                1440

Glu Ile  Arg Lys Arg Pro Leu  Ile Glu Thr Asn Gly  Glu Thr Gly
    1445                1450                1455

Glu Ile  Val Trp Asp Lys Gly  Arg Asp Phe Ala Thr  Val Arg Lys
    1460                1465                1470

Val Leu  Ser Met Pro Gln Val  Asn Ile Val Lys Lys  Thr Glu Val
    1475                1480                1485

Gln Thr  Gly Gly Phe Ser Lys  Glu Ser Ile Leu Pro  Lys Arg Asn
    1490                1495                1500

Ser Asp  Lys Leu Ile Ala Arg  Lys Lys Asp Trp Asp  Pro Lys Lys
    1505                1510                1515

Tyr Gly  Gly Phe Asp Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val
    1520                1525                1530
```

```
Val Ala  Lys Val Glu Lys Gly  Lys Ser Lys Lys Leu  Lys Ser Val
    1535                1540                1545

Lys Glu  Leu Leu Gly Ile Thr  Ile Met Glu Arg Ser  Ser Phe Glu
    1550                1555                1560

Lys Asn  Pro Ile Asp Phe Leu  Glu Ala Lys Gly Tyr  Lys Glu Val
    1565                1570                1575

Lys Lys  Asp Leu Ile Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu
    1580                1585                1590

Leu Glu  Asn Gly Arg Lys Arg  Met Leu Ala Ser Ala  Gly Glu Leu
    1595                1600                1605

Gln Lys  Gly Asn Glu Leu Ala  Leu Pro Ser Lys Tyr  Val Asn Phe
    1610                1615                1620

Leu Tyr  Leu Ala Ser His Tyr  Glu Lys Leu Lys Gly  Ser Pro Glu
    1625                1630                1635

Asp Asn  Glu Gln Lys Gln Leu  Phe Val Glu Gln His  Lys His Tyr
    1640                1645                1650

Leu Asp  Glu Ile Ile Glu Gln  Ile Ser Glu Phe Ser  Lys Arg Val
    1655                1660                1665

Ile Leu  Ala Asp Ala Asn Leu  Asp Lys Val Leu Ser  Ala Tyr Asn
    1670                1675                1680

Lys His  Arg Asp Lys Pro Ile  Arg Glu Gln Ala Glu  Asn Ile Ile
    1685                1690                1695

His Leu  Phe Thr Leu Thr Asn  Leu Gly Ala Pro Ala  Ala Phe Lys
    1700                1705                1710

Tyr Phe  Asp Thr Thr Ile Asp  Arg Lys Arg Tyr Thr  Ser Thr Lys
    1715                1720                1725
```

```
Glu Val  Leu Asp Ala Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1730                1735                1740


Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu Gly Gly  Asp Ser Gly
    1745                1750                1755


Gly Ser  Pro Lys Lys Lys Arg  Lys Val
    1760                1765


<210>  693
<211>  1775
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  693

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95


Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110
```

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val His Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Pro Ile Gly Arg His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320
```

```
Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Ser Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Lys Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525
```

```
Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735
```

```
Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940
```

```
Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960


Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975


Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990


Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005


Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020


Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035


Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050


Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065


Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080


Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095


Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110


Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125


Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140
```

```
Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335
```

```
Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530
```

```
Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725
```

Arg Lys Arg Tyr Thr Ser Thr Lys Glu Val Leu Asp Ala Thr Leu
1730 1735 1740

Ile His Gln Ser Ile Thr Gly Leu Tyr Glu Thr Arg Ile Asp Leu
1745 1750 1755

Ser Gln Leu Gly Gly Asp Ser Gly Gly Ser Pro Lys Lys Lys Arg
1760 1765 1770

Lys Val
1775

<210> 694
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
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<400> 694

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1 5 10 15

Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
20 25 30

Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
35 40 45

Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
50 55 60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65 70 75 80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
85 90 95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
100 105 110

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Pro Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320
```

```
Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525
```

```
Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735
```

```
Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940
```

```
Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080

Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095

Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110

Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125

Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140
```

```
Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335
```

```
Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530
```

```
Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725
```

```
Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 695
<211> 1767
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 695

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95
```

```
Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Pro Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300
```

```
Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly
385                 390                 395                 400

Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro
                405                 410                 415

Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys
            420                 425                 430

Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu
        435                 440                 445

Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys
    450                 455                 460

Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys
465                 470                 475                 480

Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu
                485                 490                 495

Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp
            500                 505                 510
```

```
Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys
        515                 520                 525

Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu
    530                 535                 540

Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly
545                 550                 555                 560

Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu
                565                 570                 575

Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser
            580                 585                 590

Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg
        595                 600                 605

Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly
    610                 615                 620

Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe
625                 630                 635                 640

Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys
                645                 650                 655

Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp
            660                 665                 670

Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile
        675                 680                 685

Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro
    690                 695                 700

Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu
705                 710                 715                 720
```

```
Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys
                725                 730                 735

Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp
            740                 745                 750

Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu
        755                 760                 765

Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu
    770                 775                 780

Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His
785                 790                 795                 800

Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp
                805                 810                 815

Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu
            820                 825                 830

Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser
        835                 840                 845

Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp
    850                 855                 860

Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile
865                 870                 875                 880

Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu
                885                 890                 895

Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu
            900                 905                 910

Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu
        915                 920                 925
```

```
Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn
    930                 935                 940

Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile
945                 950                 955                 960

Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn
                965                 970                 975

Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys
            980                 985                 990

Asp Phe Leu Asp Asn Glu Glu Asn  Glu Asp Ile Leu Glu  Asp Ile Val
        995                 1000                1005

Leu Thr  Leu Thr Leu Phe Glu  Asp Arg Glu Met Ile  Glu Glu Arg
    1010                1015                1020

Leu Lys  Thr Tyr Ala His Leu  Phe Asp Asp Lys Val  Met Lys Gln
    1025                1030                1035

Leu Lys  Arg Arg Arg Tyr Thr  Gly Trp Gly Arg Leu  Ser Arg Lys
    1040                1045                1050

Leu Ile  Asn Gly Ile Arg Asp  Lys Gln Ser Gly Lys  Thr Ile Leu
    1055                1060                1065

Asp Phe  Leu Lys Ser Asp Gly  Phe Ala Asn Arg Asn  Phe Met Gln
    1070                1075                1080

Leu Ile  His Asp Asp Ser Leu  Thr Phe Lys Glu Asp  Ile Gln Lys
    1085                1090                1095

Ala Gln  Val Ser Gly Gln Gly  Asp Ser Leu His Glu  His Ile Ala
    1100                1105                1110

Asn Leu  Ala Gly Ser Pro Ala  Ile Lys Lys Gly Ile  Leu Gln Thr
    1115                1120                1125
```

```
Val Lys  Val Val Asp Glu Leu  Val Lys Val Met Gly  Arg His Lys
    1130                1135                1140

Pro Glu  Asn Ile Val Ile Glu  Met Ala Arg Glu Asn  Gln Thr Thr
    1145                1150                1155

Gln Lys  Gly Gln Lys Asn Ser  Arg Glu Arg Met Lys  Arg Ile Glu
    1160                1165                1170

Glu Gly  Ile Lys Glu Leu Gly  Ser Gln Ile Leu Lys  Glu His Pro
    1175                1180                1185

Val Glu  Asn Thr Gln Leu Gln  Asn Glu Lys Leu Tyr  Leu Tyr Tyr
    1190                1195                1200

Leu Gln  Asn Gly Arg Asp Met  Tyr Val Asp Gln Glu  Leu Asp Ile
    1205                1210                1215

Asn Arg  Leu Ser Asp Tyr Asp  Val Asp His Ile Val  Pro Gln Ser
    1220                1225                1230

Phe Leu  Lys Asp Asp Ser Ile  Asp Asn Lys Val Leu  Thr Arg Ser
    1235                1240                1245

Asp Lys  Asn Arg Gly Lys Ser  Asp Asn Val Pro Ser  Glu Glu Val
    1250                1255                1260

Val Lys  Lys Met Lys Asn Tyr  Trp Arg Gln Leu Leu  Asn Ala Lys
    1265                1270                1275

Leu Ile  Thr Gln Arg Lys Phe  Asp Asn Leu Thr Lys  Ala Glu Arg
    1280                1285                1290

Gly Gly  Leu Ser Glu Leu Asp  Lys Ala Gly Phe Ile  Lys Arg Gln
    1295                1300                1305

Leu Val  Glu Thr Arg Gln Ile  Thr Lys His Val Ala  Gln Ile Leu
    1310                1315                1320
```

```
Asp Ser  Arg Met Asn Thr Lys  Tyr Asp Glu Asn Asp  Lys Leu Ile
    1325                1330                1335

Arg Glu  Val Lys Val Ile Thr  Leu Lys Ser Lys Leu  Val Ser Asp
    1340                1345                1350

Phe Arg  Lys Asp Phe Gln Phe  Tyr Lys Val Arg Glu  Ile Asn Asn
    1355                1360                1365

Tyr His  His Ala His Asp Ala  Tyr Leu Asn Ala Val  Val Gly Thr
    1370                1375                1380

Ala Leu  Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
    1385                1390                1395

Gly Asp  Tyr Lys Val Tyr Asp  Val Arg Lys Met Ile  Ala Lys Ser
    1400                1405                1410

Glu Gln  Glu Ile Gly Lys Ala  Thr Ala Lys Tyr Phe  Phe Tyr Ser
    1415                1420                1425

Asn Ile  Met Asn Phe Phe Lys  Thr Glu Ile Thr Leu  Ala Asn Gly
    1430                1435                1440

Glu Ile  Arg Lys Arg Pro Leu  Ile Glu Thr Asn Gly  Glu Thr Gly
    1445                1450                1455

Glu Ile  Val Trp Asp Lys Gly  Arg Asp Phe Ala Thr  Val Arg Lys
    1460                1465                1470

Val Leu  Ser Met Pro Gln Val  Asn Ile Val Lys Lys  Thr Glu Val
    1475                1480                1485

Gln Thr  Gly Gly Phe Ser Lys  Glu Ser Ile Leu Pro  Lys Arg Asn
    1490                1495                1500

Ser Asp  Lys Leu Ile Ala Arg  Lys Lys Asp Trp Asp  Pro Lys Lys
    1505                1510                1515
```

```
Tyr Gly  Gly Phe Asp Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val
    1520                1525                1530

Val Ala  Lys Val Glu Lys Gly  Lys Ser Lys Lys Leu  Lys Ser Val
    1535                1540                1545

Lys Glu  Leu Leu Gly Ile Thr  Ile Met Glu Arg Ser  Ser Phe Glu
    1550                1555                1560

Lys Asn  Pro Ile Asp Phe Leu  Glu Ala Lys Gly Tyr  Lys Glu Val
    1565                1570                1575

Lys Lys  Asp Leu Ile Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu
    1580                1585                1590

Leu Glu  Asn Gly Arg Lys Arg  Met Leu Ala Ser Ala  Gly Glu Leu
    1595                1600                1605

Gln Lys  Gly Asn Glu Leu Ala  Leu Pro Ser Lys Tyr  Val Asn Phe
    1610                1615                1620

Leu Tyr  Leu Ala Ser His Tyr  Glu Lys Leu Lys Gly  Ser Pro Glu
    1625                1630                1635

Asp Asn  Glu Gln Lys Gln Leu  Phe Val Glu Gln His  Lys His Tyr
    1640                1645                1650

Leu Asp  Glu Ile Ile Glu Gln  Ile Ser Glu Phe Ser  Lys Arg Val
    1655                1660                1665

Ile Leu  Ala Asp Ala Asn Leu  Asp Lys Val Leu Ser  Ala Tyr Asn
    1670                1675                1680

Lys His  Arg Asp Lys Pro Ile  Arg Glu Gln Ala Glu  Asn Ile Ile
    1685                1690                1695

His Leu  Phe Thr Leu Thr Asn  Leu Gly Ala Pro Ala  Ala Phe Lys
    1700                1705                1710
```

```
Tyr Phe  Asp Thr Thr Ile Asp  Arg Lys Arg Tyr Thr  Ser Thr Lys
    1715                1720                1725


Glu Val  Leu Asp Ala Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1730                1735                1740


Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu Gly Gly  Asp Ser Gly
    1745                1750                1755


Gly Ser  Pro Lys Lys Lys Arg  Lys Val
    1760                1765
```

<210> 696
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 696

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95


Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110
```

```
Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ser Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320
```

```
Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525
```

```
Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735
```

```
Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940
```

```
Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080

Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095

Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110

Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125

Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140
```

```
Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335
```

```
Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530
```

```
Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710

Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725
```

```
Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 697
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 697

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95
```

```
Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ser Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300
```

```
Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Asn Ala Leu Leu Cys Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510
```

```
Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525

Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720
```

```
Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735

Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925
```

```
Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940

Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080

Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095

Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110

Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125
```

```
Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140

Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320
```

```
Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335

Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515
```

```
Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710
```

```
Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 698
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 698

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80


Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95
```

```
Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300
```

```
Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510
```

```
Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525

Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720
```

```
Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735

Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925
```

```
Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940

Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080

Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095

Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110

Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125
```

```
Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140

Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320
```

```
Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335

Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515
```

```
Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695

Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710
```

```
Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 699
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 699

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80
```

```
Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285
```

```
Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Asn Ala Leu Leu Cys Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495
```

```
Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525

Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700
```

```
Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735

Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910
```

```
Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925


Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940


Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960


Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975


Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990


Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005


Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020


Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035


Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050


Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065


Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080


Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095


Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110
```

```
Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125


Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140


Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155


Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170


Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185


Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200


Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215


Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230


Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245


Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260


Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275


Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290


Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305
```

```
Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335

Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500
```

```
Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695
```

```
Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 700
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 700

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60


Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80
```

```
Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Arg Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285
```

```
Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495
```

```
Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525

Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700
```

```
Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735

Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910
```

```
Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940

Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080

Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095

Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110
```

```
Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125

Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140

Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305
```

```
Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335

Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500
```

```
Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680

Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695
```

```
Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 701
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 701

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Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60
```

```
Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Leu Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270
```

```
Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Asn Ala Leu Leu Cys Tyr Phe Phe Arg Met Arg Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480
```

```
Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525

Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685
```

```
Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735

Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895
```

```
Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940

Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080

Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095
```

```
Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110

Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125

Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140

Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290
```

```
Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335

Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485
```

```
Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680
```

```
Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 702
<211> 1775
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 702

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                   10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60
```

```
Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Leu Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270
```

```
Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Asn Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460

Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480
```

```
Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525

Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670

Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685
```

```
Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735

Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880

Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
                885                 890                 895
```

```
Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
            900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
        915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
    930                 935                 940

Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
                965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
            980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
        995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
    1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
    1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
    1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
    1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
    1070                1075                1080

Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095
```

```
Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110

Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125

Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140

Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275

Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290
```

```
Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335

Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470

Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                1480                1485
```

```
Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                1495                1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                1510                1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                1525                1530

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                1540                1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                1555                1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                1570                1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                1585                1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                1600                1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                1615                1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                1630                1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                1645                1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                1660                1665

Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680
```

```
Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775


<210>  703
<211>  1775
<212>  PRT
<213>  Artificial Sequence

<220>
<223>  Synthetic Polypeptide

<400>  703

Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                  10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45
```

```
Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Arg Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255
```

```
Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Ser Gly Gly Ser Ser Gly Gly Ser Asp Lys Lys
385                 390                 395                 400

Tyr Ser Ile Gly Leu Ala Ile Gly Thr Asn Ser Val Gly Trp Ala Val
                405                 410                 415

Ile Thr Asp Glu Tyr Lys Val Pro Ser Lys Lys Phe Lys Val Leu Gly
            420                 425                 430

Asn Thr Asp Arg His Ser Ile Lys Lys Asn Leu Ile Gly Ala Leu Leu
        435                 440                 445

Phe Asp Ser Gly Glu Thr Ala Glu Ala Thr Arg Leu Lys Arg Thr Ala
    450                 455                 460
```

```
Arg Arg Arg Tyr Thr Arg Arg Lys Asn Arg Ile Cys Tyr Leu Gln Glu
465                 470                 475                 480

Ile Phe Ser Asn Glu Met Ala Lys Val Asp Asp Ser Phe Phe His Arg
                485                 490                 495

Leu Glu Glu Ser Phe Leu Val Glu Glu Asp Lys Lys His Glu Arg His
            500                 505                 510

Pro Ile Phe Gly Asn Ile Val Asp Glu Val Ala Tyr His Glu Lys Tyr
        515                 520                 525

Pro Thr Ile Tyr His Leu Arg Lys Lys Leu Val Asp Ser Thr Asp Lys
    530                 535                 540

Ala Asp Leu Arg Leu Ile Tyr Leu Ala Leu Ala His Met Ile Lys Phe
545                 550                 555                 560

Arg Gly His Phe Leu Ile Glu Gly Asp Leu Asn Pro Asp Asn Ser Asp
                565                 570                 575

Val Asp Lys Leu Phe Ile Gln Leu Val Gln Thr Tyr Asn Gln Leu Phe
            580                 585                 590

Glu Glu Asn Pro Ile Asn Ala Ser Gly Val Asp Ala Lys Ala Ile Leu
        595                 600                 605

Ser Ala Arg Leu Ser Lys Ser Arg Arg Leu Glu Asn Leu Ile Ala Gln
    610                 615                 620

Leu Pro Gly Glu Lys Lys Asn Gly Leu Phe Gly Asn Leu Ile Ala Leu
625                 630                 635                 640

Ser Leu Gly Leu Thr Pro Asn Phe Lys Ser Asn Phe Asp Leu Ala Glu
                645                 650                 655

Asp Ala Lys Leu Gln Leu Ser Lys Asp Thr Tyr Asp Asp Asp Leu Asp
            660                 665                 670
```

```
Asn Leu Leu Ala Gln Ile Gly Asp Gln Tyr Ala Asp Leu Phe Leu Ala
        675                 680                 685

Ala Lys Asn Leu Ser Asp Ala Ile Leu Leu Ser Asp Ile Leu Arg Val
    690                 695                 700

Asn Thr Glu Ile Thr Lys Ala Pro Leu Ser Ala Ser Met Ile Lys Arg
705                 710                 715                 720

Tyr Asp Glu His His Gln Asp Leu Thr Leu Leu Lys Ala Leu Val Arg
                725                 730                 735

Gln Gln Leu Pro Glu Lys Tyr Lys Glu Ile Phe Phe Asp Gln Ser Lys
            740                 745                 750

Asn Gly Tyr Ala Gly Tyr Ile Asp Gly Gly Ala Ser Gln Glu Glu Phe
        755                 760                 765

Tyr Lys Phe Ile Lys Pro Ile Leu Glu Lys Met Asp Gly Thr Glu Glu
    770                 775                 780

Leu Leu Val Lys Leu Asn Arg Glu Asp Leu Leu Arg Lys Gln Arg Thr
785                 790                 795                 800

Phe Asp Asn Gly Ser Ile Pro His Gln Ile His Leu Gly Glu Leu His
                805                 810                 815

Ala Ile Leu Arg Arg Gln Glu Asp Phe Tyr Pro Phe Leu Lys Asp Asn
            820                 825                 830

Arg Glu Lys Ile Glu Lys Ile Leu Thr Phe Arg Ile Pro Tyr Tyr Val
        835                 840                 845

Gly Pro Leu Ala Arg Gly Asn Ser Arg Phe Ala Trp Met Thr Arg Lys
    850                 855                 860

Ser Glu Glu Thr Ile Thr Pro Trp Asn Phe Glu Glu Val Val Asp Lys
865                 870                 875                 880
```

```
Gly Ala Ser Ala Gln Ser Phe Ile Glu Arg Met Thr Asn Phe Asp Lys
               885                 890                 895

Asn Leu Pro Asn Glu Lys Val Leu Pro Lys His Ser Leu Leu Tyr Glu
           900                 905                 910

Tyr Phe Thr Val Tyr Asn Glu Leu Thr Lys Val Lys Tyr Val Thr Glu
       915                 920                 925

Gly Met Arg Lys Pro Ala Phe Leu Ser Gly Glu Gln Lys Lys Ala Ile
   930                 935                 940

Val Asp Leu Leu Phe Lys Thr Asn Arg Lys Val Thr Val Lys Gln Leu
945                 950                 955                 960

Lys Glu Asp Tyr Phe Lys Lys Ile Glu Cys Phe Asp Ser Val Glu Ile
               965                 970                 975

Ser Gly Val Glu Asp Arg Phe Asn Ala Ser Leu Gly Thr Tyr His Asp
           980                 985                 990

Leu Leu Lys Ile Ile Lys Asp Lys  Asp Phe Leu Asp Asn  Glu Glu Asn
       995                 1000                1005

Glu Asp  Ile Leu Glu Asp Ile  Val Leu Thr Leu Thr  Leu Phe Glu
   1010                1015                1020

Asp Arg  Glu Met Ile Glu Glu  Arg Leu Lys Thr Tyr  Ala His Leu
   1025                1030                1035

Phe Asp  Asp Lys Val Met Lys  Gln Leu Lys Arg Arg  Arg Tyr Thr
   1040                1045                1050

Gly Trp  Gly Arg Leu Ser Arg  Lys Leu Ile Asn Gly  Ile Arg Asp
   1055                1060                1065

Lys Gln  Ser Gly Lys Thr Ile  Leu Asp Phe Leu Lys  Ser Asp Gly
   1070                1075                1080
```

```
Phe Ala  Asn Arg Asn Phe Met  Gln Leu Ile His Asp  Asp Ser Leu
    1085                1090                1095

Thr Phe  Lys Glu Asp Ile Gln  Lys Ala Gln Val Ser  Gly Gln Gly
    1100                1105                1110

Asp Ser  Leu His Glu His Ile  Ala Asn Leu Ala Gly  Ser Pro Ala
    1115                1120                1125

Ile Lys  Lys Gly Ile Leu Gln  Thr Val Lys Val Val  Asp Glu Leu
    1130                1135                1140

Val Lys  Val Met Gly Arg His  Lys Pro Glu Asn Ile  Val Ile Glu
    1145                1150                1155

Met Ala  Arg Glu Asn Gln Thr  Thr Gln Lys Gly Gln  Lys Asn Ser
    1160                1165                1170

Arg Glu  Arg Met Lys Arg Ile  Glu Glu Gly Ile Lys  Glu Leu Gly
    1175                1180                1185

Ser Gln  Ile Leu Lys Glu His  Pro Val Glu Asn Thr  Gln Leu Gln
    1190                1195                1200

Asn Glu  Lys Leu Tyr Leu Tyr  Tyr Leu Gln Asn Gly  Arg Asp Met
    1205                1210                1215

Tyr Val  Asp Gln Glu Leu Asp  Ile Asn Arg Leu Ser  Asp Tyr Asp
    1220                1225                1230

Val Asp  His Ile Val Pro Gln  Ser Phe Leu Lys Asp  Asp Ser Ile
    1235                1240                1245

Asp Asn  Lys Val Leu Thr Arg  Ser Asp Lys Asn Arg  Gly Lys Ser
    1250                1255                1260

Asp Asn  Val Pro Ser Glu Glu  Val Val Lys Lys Met  Lys Asn Tyr
    1265                1270                1275
```

```
Trp Arg  Gln Leu Leu Asn Ala  Lys Leu Ile Thr Gln  Arg Lys Phe
    1280                1285                1290

Asp Asn  Leu Thr Lys Ala Glu  Arg Gly Gly Leu Ser  Glu Leu Asp
    1295                1300                1305

Lys Ala  Gly Phe Ile Lys Arg  Gln Leu Val Glu Thr  Arg Gln Ile
    1310                1315                1320

Thr Lys  His Val Ala Gln Ile  Leu Asp Ser Arg Met  Asn Thr Lys
    1325                1330                1335

Tyr Asp  Glu Asn Asp Lys Leu  Ile Arg Glu Val Lys  Val Ile Thr
    1340                1345                1350

Leu Lys  Ser Lys Leu Val Ser  Asp Phe Arg Lys Asp  Phe Gln Phe
    1355                1360                1365

Tyr Lys  Val Arg Glu Ile Asn  Asn Tyr His His Ala  His Asp Ala
    1370                1375                1380

Tyr Leu  Asn Ala Val Val Gly  Thr Ala Leu Ile Lys  Lys Tyr Pro
    1385                1390                1395

Lys Leu  Glu Ser Glu Phe Val  Tyr Gly Asp Tyr Lys  Val Tyr Asp
    1400                1405                1410

Val Arg  Lys Met Ile Ala Lys  Ser Glu Gln Glu Ile  Gly Lys Ala
    1415                1420                1425

Thr Ala  Lys Tyr Phe Phe Tyr  Ser Asn Ile Met Asn  Phe Phe Lys
    1430                1435                1440

Thr Glu  Ile Thr Leu Ala Asn  Gly Glu Ile Arg Lys  Arg Pro Leu
    1445                1450                1455

Ile Glu  Thr Asn Gly Glu Thr  Gly Glu Ile Val Trp  Asp Lys Gly
    1460                1465                1470
```

```
Arg Asp  Phe Ala Thr Val Arg  Lys Val Leu Ser Met  Pro Gln Val
    1475                 1480                 1485

Asn Ile  Val Lys Lys Thr Glu  Val Gln Thr Gly Gly  Phe Ser Lys
    1490                 1495                 1500

Glu Ser  Ile Leu Pro Lys Arg  Asn Ser Asp Lys Leu  Ile Ala Arg
    1505                 1510                 1515

Lys Lys  Asp Trp Asp Pro Lys  Lys Tyr Gly Gly Phe  Asp Ser Pro
    1520                 1525                 1530

Thr Val  Ala Tyr Ser Val Leu  Val Val Ala Lys Val  Glu Lys Gly
    1535                 1540                 1545

Lys Ser  Lys Lys Leu Lys Ser  Val Lys Glu Leu Leu  Gly Ile Thr
    1550                 1555                 1560

Ile Met  Glu Arg Ser Ser Phe  Glu Lys Asn Pro Ile  Asp Phe Leu
    1565                 1570                 1575

Glu Ala  Lys Gly Tyr Lys Glu  Val Lys Lys Asp Leu  Ile Ile Lys
    1580                 1585                 1590

Leu Pro  Lys Tyr Ser Leu Phe  Glu Leu Glu Asn Gly  Arg Lys Arg
    1595                 1600                 1605

Met Leu  Ala Ser Ala Gly Glu  Leu Gln Lys Gly Asn  Glu Leu Ala
    1610                 1615                 1620

Leu Pro  Ser Lys Tyr Val Asn  Phe Leu Tyr Leu Ala  Ser His Tyr
    1625                 1630                 1635

Glu Lys  Leu Lys Gly Ser Pro  Glu Asp Asn Glu Gln  Lys Gln Leu
    1640                 1645                 1650

Phe Val  Glu Gln His Lys His  Tyr Leu Asp Glu Ile  Ile Glu Gln
    1655                 1660                 1665
```

```
Ile Ser  Glu Phe Ser Lys Arg  Val Ile Leu Ala Asp  Ala Asn Leu
    1670                1675                1680


Asp Lys  Val Leu Ser Ala Tyr  Asn Lys His Arg Asp  Lys Pro Ile
    1685                1690                1695


Arg Glu  Gln Ala Glu Asn Ile  Ile His Leu Phe Thr  Leu Thr Asn
    1700                1705                1710


Leu Gly  Ala Pro Ala Ala Phe  Lys Tyr Phe Asp Thr  Thr Ile Asp
    1715                1720                1725


Arg Lys  Arg Tyr Thr Ser Thr  Lys Glu Val Leu Asp  Ala Thr Leu
    1730                1735                1740


Ile His  Gln Ser Ile Thr Gly  Leu Tyr Glu Thr Arg  Ile Asp Leu
    1745                1750                1755


Ser Gln  Leu Gly Gly Asp Ser  Gly Gly Ser Pro Lys  Lys Lys Arg
    1760                1765                1770


Lys Val
    1775
```

<210> 704
<211> 1767
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 704

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                  10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45
```

```
Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255
```

```
Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly
385                 390                 395                 400

Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro
                405                 410                 415

Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys
            420                 425                 430

Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu
        435                 440                 445

Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys
    450                 455                 460
```

```
Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys
465                 470                 475                 480

Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu
                485                 490                 495

Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp
            500                 505                 510

Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys
        515                 520                 525

Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu
    530                 535                 540

Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly
545                 550                 555                 560

Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu
                565                 570                 575

Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser
            580                 585                 590

Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg
        595                 600                 605

Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly
    610                 615                 620

Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe
625                 630                 635                 640

Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys
                645                 650                 655

Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp
            660                 665                 670
```

```
Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile
        675                 680                 685

Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro
    690                 695                 700

Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu
705                 710                 715                 720

Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys
                725                 730                 735

Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp
            740                 745                 750

Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu
        755                 760                 765

Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu
    770                 775                 780

Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His
785                 790                 795                 800

Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp
                805                 810                 815

Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu
            820                 825                 830

Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser
        835                 840                 845

Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp
    850                 855                 860

Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile
865                 870                 875                 880
```

```
Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu
                885                 890                 895

Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu
            900                 905                 910

Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu
        915                 920                 925

Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn
    930                 935                 940

Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile
945                 950                 955                 960

Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn
                965                 970                 975

Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys
            980                 985                 990

Asp Phe Leu Asp Asn Glu Glu Asn  Glu Asp Ile Leu Glu  Asp Ile Val
        995                 1000                1005

Leu Thr  Leu Thr Leu Phe Glu  Asp Arg Glu Met Ile  Glu Glu Arg
    1010                1015                1020

Leu Lys  Thr Tyr Ala His Leu  Phe Asp Asp Lys Val  Met Lys Gln
    1025                1030                1035

Leu Lys  Arg Arg Arg Tyr Thr  Gly Trp Gly Arg Leu  Ser Arg Lys
    1040                1045                1050

Leu Ile  Asn Gly Ile Arg Asp  Lys Gln Ser Gly Lys  Thr Ile Leu
    1055                1060                1065

Asp Phe  Leu Lys Ser Asp Gly  Phe Ala Asn Arg Asn  Phe Met Gln
    1070                1075                1080
```

```
Leu Ile  His Asp Asp Ser Leu  Thr Phe Lys Glu Asp  Ile Gln Lys
    1085                1090                1095

Ala Gln  Val Ser Gly Gln Gly  Asp Ser Leu His Glu  His Ile Ala
    1100                1105                1110

Asn Leu  Ala Gly Ser Pro Ala  Ile Lys Lys Gly Ile  Leu Gln Thr
    1115                1120                1125

Val Lys  Val Val Asp Glu Leu  Val Lys Val Met Gly  Arg His Lys
    1130                1135                1140

Pro Glu  Asn Ile Val Ile Glu  Met Ala Arg Glu Asn  Gln Thr Thr
    1145                1150                1155

Gln Lys  Gly Gln Lys Asn Ser  Arg Glu Arg Met Lys  Arg Ile Glu
    1160                1165                1170

Glu Gly  Ile Lys Glu Leu Gly  Ser Gln Ile Leu Lys  Glu His Pro
    1175                1180                1185

Val Glu  Asn Thr Gln Leu Gln  Asn Glu Lys Leu Tyr  Leu Tyr Tyr
    1190                1195                1200

Leu Gln  Asn Gly Arg Asp Met  Tyr Val Asp Gln Glu  Leu Asp Ile
    1205                1210                1215

Asn Arg  Leu Ser Asp Tyr Asp  Val Asp His Ile Val  Pro Gln Ser
    1220                1225                1230

Phe Leu  Lys Asp Asp Ser Ile  Asp Asn Lys Val Leu  Thr Arg Ser
    1235                1240                1245

Asp Lys  Asn Arg Gly Lys Ser  Asp Asn Val Pro Ser  Glu Glu Val
    1250                1255                1260

Val Lys  Lys Met Lys Asn Tyr  Trp Arg Gln Leu Leu  Asn Ala Lys
    1265                1270                1275
```

```
Leu Ile  Thr Gln Arg Lys Phe  Asp Asn Leu Thr Lys  Ala Glu Arg
    1280                1285                1290

Gly Gly  Leu Ser Glu Leu Asp  Lys Ala Gly Phe Ile  Lys Arg Gln
    1295                1300                1305

Leu Val  Glu Thr Arg Gln Ile  Thr Lys His Val Ala  Gln Ile Leu
    1310                1315                1320

Asp Ser  Arg Met Asn Thr Lys  Tyr Asp Glu Asn Asp  Lys Leu Ile
    1325                1330                1335

Arg Glu  Val Lys Val Ile Thr  Leu Lys Ser Lys Leu  Val Ser Asp
    1340                1345                1350

Phe Arg  Lys Asp Phe Gln Phe  Tyr Lys Val Arg Glu  Ile Asn Asn
    1355                1360                1365

Tyr His  His Ala His Asp Ala  Tyr Leu Asn Ala Val  Val Gly Thr
    1370                1375                1380

Ala Leu  Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
    1385                1390                1395

Gly Asp  Tyr Lys Val Tyr Asp  Val Arg Lys Met Ile  Ala Lys Ser
    1400                1405                1410

Glu Gln  Glu Ile Gly Lys Ala  Thr Ala Lys Tyr Phe  Phe Tyr Ser
    1415                1420                1425

Asn Ile  Met Asn Phe Phe Lys  Thr Glu Ile Thr Leu  Ala Asn Gly
    1430                1435                1440

Glu Ile  Arg Lys Arg Pro Leu  Ile Glu Thr Asn Gly  Glu Thr Gly
    1445                1450                1455

Glu Ile  Val Trp Asp Lys Gly  Arg Asp Phe Ala Thr  Val Arg Lys
    1460                1465                1470
```

```
Val Leu  Ser Met Pro Gln Val  Asn Ile Val Lys Lys  Thr Glu Val
    1475                1480                1485

Gln Thr  Gly Gly Phe Ser Lys  Glu Ser Ile Leu Pro  Lys Arg Asn
    1490                1495                1500

Ser Asp  Lys Leu Ile Ala Arg  Lys Lys Asp Trp Asp  Pro Lys Lys
    1505                1510                1515

Tyr Gly  Gly Phe Asp Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val
    1520                1525                1530

Val Ala  Lys Val Glu Lys Gly  Lys Ser Lys Lys Leu  Lys Ser Val
    1535                1540                1545

Lys Glu  Leu Leu Gly Ile Thr  Ile Met Glu Arg Ser  Ser Phe Glu
    1550                1555                1560

Lys Asn  Pro Ile Asp Phe Leu  Glu Ala Lys Gly Tyr  Lys Glu Val
    1565                1570                1575

Lys Lys  Asp Leu Ile Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu
    1580                1585                1590

Leu Glu  Asn Gly Arg Lys Arg  Met Leu Ala Ser Ala  Gly Glu Leu
    1595                1600                1605

Gln Lys  Gly Asn Glu Leu Ala  Leu Pro Ser Lys Tyr  Val Asn Phe
    1610                1615                1620

Leu Tyr  Leu Ala Ser His Tyr  Glu Lys Leu Lys Gly  Ser Pro Glu
    1625                1630                1635

Asp Asn  Glu Gln Lys Gln Leu  Phe Val Glu Gln His  Lys His Tyr
    1640                1645                1650

Leu Asp  Glu Ile Ile Glu Gln  Ile Ser Glu Phe Ser  Lys Arg Val
    1655                1660                1665
```

```
Ile Leu  Ala Asp Ala Asn Leu  Asp Lys Val Leu Ser  Ala Tyr Asn
    1670                1675                1680


Lys His  Arg Asp Lys Pro Ile  Arg Glu Gln Ala Glu  Asn Ile Ile
    1685                1690                1695


His Leu  Phe Thr Leu Thr Asn  Leu Gly Ala Pro Ala  Ala Phe Lys
    1700                1705                1710


Tyr Phe  Asp Thr Thr Ile Asp  Arg Lys Arg Tyr Thr  Ser Thr Lys
    1715                1720                1725


Glu Val  Leu Asp Ala Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1730                1735                1740


Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu Gly Gly  Asp Ser Gly
    1745                1750                1755


Gly Ser  Pro Lys Lys Lys Arg  Lys Val
    1760                1765
```

<210> 705
<211> 1767
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic Polypeptide

<400> 705

```
Met Ser Glu Val Glu Phe Ser His Glu Tyr Trp Met Arg His Ala Leu
1               5                  10                  15


Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45
```

```
Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60

Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255
```

```
Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270

Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Asn Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly
385                 390                 395                 400

Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro
                405                 410                 415

Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys
            420                 425                 430

Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu
        435                 440                 445

Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys
    450                 455                 460
```

```
Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys
465                 470                 475                 480

Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu
                485                 490                 495

Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp
            500                 505                 510

Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys
        515                 520                 525

Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu
    530                 535                 540

Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly
545                 550                 555                 560

Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu
                565                 570                 575

Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser
            580                 585                 590

Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg
        595                 600                 605

Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly
    610                 615                 620

Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe
625                 630                 635                 640

Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys
                645                 650                 655

Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp
            660                 665                 670
```

```
Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile
        675                 680                 685

Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro
    690                 695                 700

Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu
705                 710                 715                 720

Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys
                725                 730                 735

Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp
            740                 745                 750

Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu
        755                 760                 765

Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu
    770                 775                 780

Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His
785                 790                 795                 800

Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp
                805                 810                 815

Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu
            820                 825                 830

Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser
        835                 840                 845

Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp
    850                 855                 860

Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile
865                 870                 875                 880
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Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu
                885                 890                 895

Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu
            900                 905                 910

Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu
        915                 920                 925

Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn
    930                 935                 940

Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile
945                 950                 955                 960

Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn
                965                 970                 975

Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys
            980                 985                 990

Asp Phe Leu Asp Asn Glu Glu Asn  Glu Asp Ile Leu Glu  Asp Ile Val
        995                 1000                1005

Leu Thr  Leu Thr Leu Phe Glu  Asp Arg Glu Met Ile  Glu Glu Arg
    1010                1015                1020

Leu Lys  Thr Tyr Ala His Leu  Phe Asp Asp Lys Val  Met Lys Gln
    1025                1030                1035

Leu Lys  Arg Arg Arg Tyr Thr  Gly Trp Gly Arg Leu  Ser Arg Lys
    1040                1045                1050

Leu Ile  Asn Gly Ile Arg Asp  Lys Gln Ser Gly Lys  Thr Ile Leu
    1055                1060                1065

Asp Phe  Leu Lys Ser Asp Gly  Phe Ala Asn Arg Asn  Phe Met Gln
    1070                1075                1080
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Leu Ile  His Asp Asp Ser Leu  Thr Phe Lys Glu Asp  Ile Gln Lys
    1085                1090                1095

Ala Gln  Val Ser Gly Gln Gly  Asp Ser Leu His Glu  His Ile Ala
    1100                1105                1110

Asn Leu  Ala Gly Ser Pro Ala  Ile Lys Lys Gly Ile  Leu Gln Thr
    1115                1120                1125

Val Lys  Val Val Asp Glu Leu  Val Lys Val Met Gly  Arg His Lys
    1130                1135                1140

Pro Glu  Asn Ile Val Ile Glu  Met Ala Arg Glu Asn  Gln Thr Thr
    1145                1150                1155

Gln Lys  Gly Gln Lys Asn Ser  Arg Glu Arg Met Lys  Arg Ile Glu
    1160                1165                1170

Glu Gly  Ile Lys Glu Leu Gly  Ser Gln Ile Leu Lys  Glu His Pro
    1175                1180                1185

Val Glu  Asn Thr Gln Leu Gln  Asn Glu Lys Leu Tyr  Leu Tyr Tyr
    1190                1195                1200

Leu Gln  Asn Gly Arg Asp Met  Tyr Val Asp Gln Glu  Leu Asp Ile
    1205                1210                1215

Asn Arg  Leu Ser Asp Tyr Asp  Val Asp His Ile Val  Pro Gln Ser
    1220                1225                1230

Phe Leu  Lys Asp Asp Ser Ile  Asp Asn Lys Val Leu  Thr Arg Ser
    1235                1240                1245

Asp Lys  Asn Arg Gly Lys Ser  Asp Asn Val Pro Ser  Glu Glu Val
    1250                1255                1260

Val Lys  Lys Met Lys Asn Tyr  Trp Arg Gln Leu Leu  Asn Ala Lys
    1265                1270                1275
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Leu Ile  Thr Gln Arg Lys Phe  Asp Asn Leu Thr Lys  Ala Glu Arg
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Gly Gly  Leu Ser Glu Leu Asp  Lys Ala Gly Phe Ile  Lys Arg Gln
    1295                1300                1305

Leu Val  Glu Thr Arg Gln Ile  Thr Lys His Val Ala  Gln Ile Leu
    1310                1315                1320

Asp Ser  Arg Met Asn Thr Lys  Tyr Asp Glu Asn Asp  Lys Leu Ile
    1325                1330                1335

Arg Glu  Val Lys Val Ile Thr  Leu Lys Ser Lys Leu  Val Ser Asp
    1340                1345                1350

Phe Arg  Lys Asp Phe Gln Phe  Tyr Lys Val Arg Glu  Ile Asn Asn
    1355                1360                1365

Tyr His  His Ala His Asp Ala  Tyr Leu Asn Ala Val  Val Gly Thr
    1370                1375                1380

Ala Leu  Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
    1385                1390                1395

Gly Asp  Tyr Lys Val Tyr Asp  Val Arg Lys Met Ile  Ala Lys Ser
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Glu Gln  Glu Ile Gly Lys Ala  Thr Ala Lys Tyr Phe  Phe Tyr Ser
    1415                1420                1425

Asn Ile  Met Asn Phe Phe Lys  Thr Glu Ile Thr Leu  Ala Asn Gly
    1430                1435                1440

Glu Ile  Arg Lys Arg Pro Leu  Ile Glu Thr Asn Gly  Glu Thr Gly
    1445                1450                1455

Glu Ile  Val Trp Asp Lys Gly  Arg Asp Phe Ala Thr  Val Arg Lys
    1460                1465                1470
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Val Leu  Ser Met Pro Gln Val  Asn Ile Val Lys Lys  Thr Glu Val
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Gln Thr  Gly Gly Phe Ser Lys  Glu Ser Ile Leu Pro  Lys Arg Asn
    1490                1495                1500

Ser Asp  Lys Leu Ile Ala Arg  Lys Lys Asp Trp Asp  Pro Lys Lys
    1505                1510                1515

Tyr Gly  Gly Phe Asp Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val
    1520                1525                1530

Val Ala  Lys Val Glu Lys Gly  Lys Ser Lys Lys Leu  Lys Ser Val
    1535                1540                1545

Lys Glu  Leu Leu Gly Ile Thr  Ile Met Glu Arg Ser  Ser Phe Glu
    1550                1555                1560

Lys Asn  Pro Ile Asp Phe Leu  Glu Ala Lys Gly Tyr  Lys Glu Val
    1565                1570                1575

Lys Lys  Asp Leu Ile Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu
    1580                1585                1590

Leu Glu  Asn Gly Arg Lys Arg  Met Leu Ala Ser Ala  Gly Glu Leu
    1595                1600                1605

Gln Lys  Gly Asn Glu Leu Ala  Leu Pro Ser Lys Tyr  Val Asn Phe
    1610                1615                1620

Leu Tyr  Leu Ala Ser His Tyr  Glu Lys Leu Lys Gly  Ser Pro Glu
    1625                1630                1635

Asp Asn  Glu Gln Lys Gln Leu  Phe Val Glu Gln His  Lys His Tyr
    1640                1645                1650

Leu Asp  Glu Ile Ile Glu Gln  Ile Ser Glu Phe Ser  Lys Arg Val
    1655                1660                1665
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Ile Leu  Ala Asp Ala Asn Leu  Asp Lys Val Leu Ser  Ala Tyr Asn
    1670                1675                1680


Lys His  Arg Asp Lys Pro Ile  Arg Glu Gln Ala Glu  Asn Ile Ile
    1685                1690                1695


His Leu  Phe Thr Leu Thr Asn  Leu Gly Ala Pro Ala  Ala Phe Lys
    1700                1705                1710


Tyr Phe  Asp Thr Thr Ile Asp  Arg Lys Arg Tyr Thr  Ser Thr Lys
    1715                1720                1725


Glu Val  Leu Asp Ala Thr Leu  Ile His Gln Ser Ile  Thr Gly Leu
    1730                1735                1740


Tyr Glu  Thr Arg Ile Asp Leu  Ser Gln Leu Gly Gly  Asp Ser Gly
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Gly Ser  Pro Lys Lys Lys Arg  Lys Val
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Thr Leu Ala Lys Arg Ala Trp Asp Glu Arg Glu Val Pro Val Gly Ala
            20                  25                  30


Val Leu Val His Asn Asn Arg Val Ile Gly Glu Gly Trp Asn Arg Pro
        35                  40                  45


Ile Gly Arg His Asp Pro Thr Ala His Ala Glu Ile Met Ala Leu Arg
    50                  55                  60
```

```
Gln Gly Gly Leu Val Met Gln Asn Tyr Arg Leu Ile Asp Ala Thr Leu
65                  70                  75                  80

Tyr Val Thr Leu Glu Pro Cys Val Met Cys Ala Gly Ala Met Ile His
                85                  90                  95

Ser Arg Ile Gly Arg Val Val Phe Gly Ala Arg Asp Ala Lys Thr Gly
            100                 105                 110

Ala Ala Gly Ser Leu Met Asp Val Leu His His Pro Gly Met Asn His
        115                 120                 125

Arg Val Glu Ile Thr Glu Gly Ile Leu Ala Asp Glu Cys Ala Ala Leu
    130                 135                 140

Leu Ser Asp Phe Phe Arg Met Arg Arg Gln Glu Ile Lys Ala Gln Lys
145                 150                 155                 160

Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly Ser Ser Gly Gly Ser Ser
                165                 170                 175

Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser Ala Thr Pro Glu Ser Ser
            180                 185                 190

Gly Gly Ser Ser Gly Gly Ser Ser Glu Val Glu Phe Ser His Glu Tyr
        195                 200                 205

Trp Met Arg His Ala Leu Thr Leu Ala Lys Arg Ala Leu Asp Glu Arg
    210                 215                 220

Glu Val Pro Val Gly Ala Val Leu Val Leu Asn Asn Arg Val Ile Gly
225                 230                 235                 240

Glu Gly Trp Asn Arg Ala Ile Gly Leu His Asp Pro Thr Ala His Ala
                245                 250                 255

Glu Ile Met Ala Leu Arg Gln Gly Gly Leu Val Met Gln Asn Tyr Arg
            260                 265                 270
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Leu Ile Asp Ala Thr Leu Tyr Val Thr Phe Glu Pro Cys Val Met Cys
        275                 280                 285

Ala Gly Ala Met Ile His Ser Arg Ile Gly Arg Val Val Phe Gly Val
    290                 295                 300

Arg Asn Ala Lys Thr Gly Ala Ala Gly Ser Leu Met Asp Val Leu His
305                 310                 315                 320

Tyr Pro Gly Met Asn His Arg Val Glu Ile Thr Glu Gly Ile Leu Ala
                325                 330                 335

Asp Glu Cys Ala Ala Leu Leu Cys Tyr Phe Phe Arg Met Pro Arg Gln
            340                 345                 350

Val Phe Asn Ala Gln Lys Lys Ala Gln Ser Ser Thr Asp Ser Gly Gly
        355                 360                 365

Ser Ser Gly Gly Ser Ser Gly Ser Glu Thr Pro Gly Thr Ser Glu Ser
    370                 375                 380

Ala Thr Pro Glu Ser Asp Lys Lys Tyr Ser Ile Gly Leu Ala Ile Gly
385                 390                 395                 400

Thr Asn Ser Val Gly Trp Ala Val Ile Thr Asp Glu Tyr Lys Val Pro
                405                 410                 415

Ser Lys Lys Phe Lys Val Leu Gly Asn Thr Asp Arg His Ser Ile Lys
            420                 425                 430

Lys Asn Leu Ile Gly Ala Leu Leu Phe Asp Ser Gly Glu Thr Ala Glu
        435                 440                 445

Ala Thr Arg Leu Lys Arg Thr Ala Arg Arg Arg Tyr Thr Arg Arg Lys
    450                 455                 460

Asn Arg Ile Cys Tyr Leu Gln Glu Ile Phe Ser Asn Glu Met Ala Lys
465                 470                 475                 480
```

```
Val Asp Asp Ser Phe Phe His Arg Leu Glu Glu Ser Phe Leu Val Glu
                485                 490                 495

Glu Asp Lys Lys His Glu Arg His Pro Ile Phe Gly Asn Ile Val Asp
            500                 505                 510

Glu Val Ala Tyr His Glu Lys Tyr Pro Thr Ile Tyr His Leu Arg Lys
        515                 520                 525

Lys Leu Val Asp Ser Thr Asp Lys Ala Asp Leu Arg Leu Ile Tyr Leu
    530                 535                 540

Ala Leu Ala His Met Ile Lys Phe Arg Gly His Phe Leu Ile Glu Gly
545                 550                 555                 560

Asp Leu Asn Pro Asp Asn Ser Asp Val Asp Lys Leu Phe Ile Gln Leu
                565                 570                 575

Val Gln Thr Tyr Asn Gln Leu Phe Glu Glu Asn Pro Ile Asn Ala Ser
            580                 585                 590

Gly Val Asp Ala Lys Ala Ile Leu Ser Ala Arg Leu Ser Lys Ser Arg
        595                 600                 605

Arg Leu Glu Asn Leu Ile Ala Gln Leu Pro Gly Glu Lys Lys Asn Gly
    610                 615                 620

Leu Phe Gly Asn Leu Ile Ala Leu Ser Leu Gly Leu Thr Pro Asn Phe
625                 630                 635                 640

Lys Ser Asn Phe Asp Leu Ala Glu Asp Ala Lys Leu Gln Leu Ser Lys
                645                 650                 655

Asp Thr Tyr Asp Asp Asp Leu Asp Asn Leu Leu Ala Gln Ile Gly Asp
            660                 665                 670

Gln Tyr Ala Asp Leu Phe Leu Ala Ala Lys Asn Leu Ser Asp Ala Ile
        675                 680                 685
```

```
Leu Leu Ser Asp Ile Leu Arg Val Asn Thr Glu Ile Thr Lys Ala Pro
    690                 695                 700

Leu Ser Ala Ser Met Ile Lys Arg Tyr Asp Glu His His Gln Asp Leu
705                 710                 715                 720

Thr Leu Leu Lys Ala Leu Val Arg Gln Gln Leu Pro Glu Lys Tyr Lys
                725                 730                 735

Glu Ile Phe Phe Asp Gln Ser Lys Asn Gly Tyr Ala Gly Tyr Ile Asp
            740                 745                 750

Gly Gly Ala Ser Gln Glu Glu Phe Tyr Lys Phe Ile Lys Pro Ile Leu
        755                 760                 765

Glu Lys Met Asp Gly Thr Glu Glu Leu Leu Val Lys Leu Asn Arg Glu
    770                 775                 780

Asp Leu Leu Arg Lys Gln Arg Thr Phe Asp Asn Gly Ser Ile Pro His
785                 790                 795                 800

Gln Ile His Leu Gly Glu Leu His Ala Ile Leu Arg Arg Gln Glu Asp
                805                 810                 815

Phe Tyr Pro Phe Leu Lys Asp Asn Arg Glu Lys Ile Glu Lys Ile Leu
            820                 825                 830

Thr Phe Arg Ile Pro Tyr Tyr Val Gly Pro Leu Ala Arg Gly Asn Ser
        835                 840                 845

Arg Phe Ala Trp Met Thr Arg Lys Ser Glu Glu Thr Ile Thr Pro Trp
    850                 855                 860

Asn Phe Glu Glu Val Val Asp Lys Gly Ala Ser Ala Gln Ser Phe Ile
865                 870                 875                 880

Glu Arg Met Thr Asn Phe Asp Lys Asn Leu Pro Asn Glu Lys Val Leu
                885                 890                 895
```

```
Pro Lys His Ser Leu Leu Tyr Glu Tyr Phe Thr Val Tyr Asn Glu Leu
            900                 905                 910

Thr Lys Val Lys Tyr Val Thr Glu Gly Met Arg Lys Pro Ala Phe Leu
        915                 920                 925

Ser Gly Glu Gln Lys Lys Ala Ile Val Asp Leu Leu Phe Lys Thr Asn
    930                 935                 940

Arg Lys Val Thr Val Lys Gln Leu Lys Glu Asp Tyr Phe Lys Lys Ile
945                 950                 955                 960

Glu Cys Phe Asp Ser Val Glu Ile Ser Gly Val Glu Asp Arg Phe Asn
                965                 970                 975

Ala Ser Leu Gly Thr Tyr His Asp Leu Leu Lys Ile Ile Lys Asp Lys
            980                 985                 990

Asp Phe Leu Asp Asn Glu Glu Asn  Glu Asp Ile Leu Glu  Asp Ile Val
        995                 1000                1005

Leu Thr  Leu Thr Leu Phe Glu  Asp Arg Glu Met Ile  Glu Glu Arg
    1010                1015                1020

Leu Lys  Thr Tyr Ala His Leu  Phe Asp Asp Lys Val  Met Lys Gln
    1025                1030                1035

Leu Lys  Arg Arg Arg Tyr Thr  Gly Trp Gly Arg Leu  Ser Arg Lys
    1040                1045                1050

Leu Ile  Asn Gly Ile Arg Asp  Lys Gln Ser Gly Lys  Thr Ile Leu
    1055                1060                1065

Asp Phe  Leu Lys Ser Asp Gly  Phe Ala Asn Arg Asn  Phe Met Gln
    1070                1075                1080

Leu Ile  His Asp Asp Ser Leu  Thr Phe Lys Glu Asp  Ile Gln Lys
    1085                1090                1095
```

```
Ala Gln  Val Ser Gly Gln Gly  Asp Ser Leu His Glu  His Ile Ala
    1100                1105                1110

Asn Leu  Ala Gly Ser Pro Ala  Ile Lys Lys Gly Ile  Leu Gln Thr
    1115                1120                1125

Val Lys  Val Val Asp Glu Leu  Val Lys Val Met Gly  Arg His Lys
    1130                1135                1140

Pro Glu  Asn Ile Val Ile Glu  Met Ala Arg Glu Asn  Gln Thr Thr
    1145                1150                1155

Gln Lys  Gly Gln Lys Asn Ser  Arg Glu Arg Met Lys  Arg Ile Glu
    1160                1165                1170

Glu Gly  Ile Lys Glu Leu Gly  Ser Gln Ile Leu Lys  Glu His Pro
    1175                1180                1185

Val Glu  Asn Thr Gln Leu Gln  Asn Glu Lys Leu Tyr  Leu Tyr Tyr
    1190                1195                1200

Leu Gln  Asn Gly Arg Asp Met  Tyr Val Asp Gln Glu  Leu Asp Ile
    1205                1210                1215

Asn Arg  Leu Ser Asp Tyr Asp  Val Asp His Ile Val  Pro Gln Ser
    1220                1225                1230

Phe Leu  Lys Asp Asp Ser Ile  Asp Asn Lys Val Leu  Thr Arg Ser
    1235                1240                1245

Asp Lys  Asn Arg Gly Lys Ser  Asp Asn Val Pro Ser  Glu Glu Val
    1250                1255                1260

Val Lys  Lys Met Lys Asn Tyr  Trp Arg Gln Leu Leu  Asn Ala Lys
    1265                1270                1275

Leu Ile  Thr Gln Arg Lys Phe  Asp Asn Leu Thr Lys  Ala Glu Arg
    1280                1285                1290
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Gly Gly  Leu Ser Glu Leu Asp  Lys Ala Gly Phe Ile  Lys Arg Gln
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Leu Val  Glu Thr Arg Gln Ile  Thr Lys His Val Ala  Gln Ile Leu
    1310                1315                1320

Asp Ser  Arg Met Asn Thr Lys  Tyr Asp Glu Asn Asp  Lys Leu Ile
    1325                1330                1335

Arg Glu  Val Lys Val Ile Thr  Leu Lys Ser Lys Leu  Val Ser Asp
    1340                1345                1350

Phe Arg  Lys Asp Phe Gln Phe  Tyr Lys Val Arg Glu  Ile Asn Asn
    1355                1360                1365

Tyr His  His Ala His Asp Ala  Tyr Leu Asn Ala Val  Val Gly Thr
    1370                1375                1380

Ala Leu  Ile Lys Lys Tyr Pro  Lys Leu Glu Ser Glu  Phe Val Tyr
    1385                1390                1395

Gly Asp  Tyr Lys Val Tyr Asp  Val Arg Lys Met Ile  Ala Lys Ser
    1400                1405                1410

Glu Gln  Glu Ile Gly Lys Ala  Thr Ala Lys Tyr Phe  Phe Tyr Ser
    1415                1420                1425

Asn Ile  Met Asn Phe Phe Lys  Thr Glu Ile Thr Leu  Ala Asn Gly
    1430                1435                1440

Glu Ile  Arg Lys Arg Pro Leu  Ile Glu Thr Asn Gly  Glu Thr Gly
    1445                1450                1455

Glu Ile  Val Trp Asp Lys Gly  Arg Asp Phe Ala Thr  Val Arg Lys
    1460                1465                1470

Val Leu  Ser Met Pro Gln Val  Asn Ile Val Lys Lys  Thr Glu Val
    1475                1480                1485
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Gln Thr  Gly Gly Phe Ser Lys  Glu Ser Ile Leu Pro  Lys Arg Asn
    1490                1495                1500

Ser Asp  Lys Leu Ile Ala Arg  Lys Lys Asp Trp Asp  Pro Lys Lys
    1505                1510                1515

Tyr Gly  Gly Phe Asp Ser Pro  Thr Val Ala Tyr Ser  Val Leu Val
    1520                1525                1530

Val Ala  Lys Val Glu Lys Gly  Lys Ser Lys Lys Leu  Lys Ser Val
    1535                1540                1545

Lys Glu  Leu Leu Gly Ile Thr  Ile Met Glu Arg Ser  Ser Phe Glu
    1550                1555                1560

Lys Asn  Pro Ile Asp Phe Leu  Glu Ala Lys Gly Tyr  Lys Glu Val
    1565                1570                1575

Lys Lys  Asp Leu Ile Ile Lys  Leu Pro Lys Tyr Ser  Leu Phe Glu
    1580                1585                1590

Leu Glu  Asn Gly Arg Lys Arg  Met Leu Ala Ser Ala  Gly Glu Leu
    1595                1600                1605

Gln Lys  Gly Asn Glu Leu Ala  Leu Pro Ser Lys Tyr  Val Asn Phe
    1610                1615                1620

Leu Tyr  Leu Ala Ser His Tyr  Glu Lys Leu Lys Gly  Ser Pro Glu
    1625                1630                1635

Asp Asn  Glu Gln Lys Gln Leu  Phe Val Glu Gln His  Lys His Tyr
    1640                1645                1650

Leu Asp  Glu Ile Ile Glu Gln  Ile Ser Glu Phe Ser  Lys Arg Val
    1655                1660                1665

Ile Leu  Ala Asp Ala Asn Leu  Asp Lys Val Leu Ser  Ala Tyr Asn
    1670                1675                1680
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Lys His Arg Asp Lys Pro Ile Arg Glu Gln Ala Glu Asn Ile Ile
1685 1690 1695

His Leu Phe Thr Leu Thr Asn Leu Gly Ala Pro Ala Ala Phe Lys
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Tyr Phe Asp Thr Thr Ile Asp Arg Lys Arg Tyr Thr Ser Thr Lys
1715 1720 1725

Glu Val Leu Asp Ala Thr Leu Ile His Gln Ser Ile Thr Gly Leu
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Tyr Glu Thr Arg Ile Asp Leu Ser Gln Leu Gly Gly Asp Ser Gly
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Gly Ser Pro Lys Lys Lys Arg Lys Val
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<210> 732
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