SEQUENCE LISTING

<110> INSERM

<120> COMPOSITIONS AND METHODS FOR INCREASING OR ENHANCING TRANSDUCTION OF GENE THERAPY VECTORS AND FOR REMOVING OR REDUCING IMMUNOGLOBULINS

<130> BIO18024 LACROIX-DESMAZES

<160> 52

<170> PatentIn version 3.5

<210> 1
<211> 738
<212> PRT
<213> Artificial Sequence

<220>
<223> Spk1

<400> 1

Met Ala Ala Asp Gly Tyr Leu Pro Asp Trp Leu Glu Asp Asn Leu Ser
1 5 10 15

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

Lys Ala Asn Gln Gln Lys Gln Asp Asn Gly Arg Gly Leu Val Leu Pro
35 40 45

Gly Tyr Lys Tyr Leu Gly Pro Phe Asn Gly Leu Asp Lys Gly Glu Pro
50 55 60

Val Asn Ala Ala Asp Ala Ala Ala Leu Glu His Asp Lys Ala Tyr Asp
65 70 75 80

Gln Gln Leu Gln Ala Gly Asp Asn Pro Tyr Leu Arg Tyr Asn His Ala
85 90 95

Asp Ala Glu Phe Gln Glu Arg Leu Gln Glu Asp Thr Ser Phe Gly Gly
100 105 110

```
Asn Leu Gly Arg Ala Val Phe Gln Ala Lys Lys Arg Val Leu Glu Pro
        115                 120                 125

Leu Gly Leu Val Glu Ser Pro Val Lys Thr Ala Pro Gly Lys Lys Arg
    130                 135                 140

Pro Val Glu Pro Ser Pro Gln Arg Ser Pro Asp Ser Ser Thr Gly Ile
145                 150                 155                 160

Gly Lys Lys Gly Gln Gln Pro Ala Lys Lys Arg Leu Asn Phe Gly Gln
                165                 170                 175

Thr Gly Asp Ser Glu Ser Val Pro Asp Pro Gln Pro Ile Gly Glu Pro
            180                 185                 190

Pro Ala Ala Pro Ser Gly Val Gly Pro Asn Thr Met Ala Ala Gly Gly
        195                 200                 205

Gly Ala Pro Met Ala Asp Asn Asn Glu Gly Ala Asp Gly Val Gly Ser
    210                 215                 220

Ser Ser Gly Asn Trp His Cys Asp Ser Thr Trp Leu Gly Asp Arg Val
225                 230                 235                 240

Ile Thr Thr Ser Thr Arg Thr Trp Ala Leu Pro Thr Tyr Asn Asn His
                245                 250                 255

Leu Tyr Lys Gln Ile Ser Asn Gly Thr Ser Gly Gly Ser Thr Asn Asp
            260                 265                 270

Asn Thr Tyr Phe Gly Tyr Ser Thr Pro Trp Gly Tyr Phe Asp Phe Asn
        275                 280                 285

Arg Phe His Cys His Phe Ser Pro Arg Asp Trp Gln Arg Leu Ile Asn
    290                 295                 300
```

```
Asn Asn Trp Gly Phe Arg Pro Lys Arg Leu Asn Phe Lys Leu Phe Asn
305                 310                 315                 320

Ile Gln Val Lys Glu Val Thr Gln Asn Glu Gly Thr Lys Thr Ile Ala
                325                 330                 335

Asn Asn Leu Thr Ser Thr Ile Gln Val Phe Thr Asp Ser Glu Tyr Gln
            340                 345                 350

Leu Pro Tyr Val Leu Gly Ser Ala His Gln Gly Cys Leu Pro Pro Phe
        355                 360                 365

Pro Ala Asp Val Phe Met Ile Pro Gln Tyr Gly Tyr Leu Thr Leu Asn
    370                 375                 380

Asn Gly Ser Gln Ala Val Gly Arg Ser Ser Phe Tyr Cys Leu Glu Tyr
385                 390                 395                 400

Phe Pro Ser Gln Met Leu Arg Thr Gly Asn Asn Phe Glu Phe Ser Tyr
                405                 410                 415

Asn Phe Glu Asp Val Pro Phe His Ser Ser Tyr Ala His Ser Gln Ser
            420                 425                 430

Leu Asp Arg Leu Met Asn Pro Leu Ile Asp Gln Tyr Leu Tyr Tyr Leu
        435                 440                 445

Ser Arg Thr Gln Ser Thr Gly Gly Thr Ala Gly Thr Gln Gln Leu Leu
    450                 455                 460

Phe Ser Gln Ala Gly Pro Asn Asn Met Ser Ala Gln Ala Lys Asn Trp
465                 470                 475                 480

Leu Pro Gly Pro Cys Tyr Arg Gln Gln Arg Val Ser Thr Thr Leu Ser
                485                 490                 495

Gln Asn Asn Asn Ser Asn Phe Ala Trp Thr Gly Ala Thr Lys Tyr His
            500                 505                 510
```

```
Leu Asn Gly Arg Asp Ser Leu Val Asn Pro Gly Val Ala Met Ala Thr
        515                 520                 525

His Lys Asp Asp Glu Glu Arg Phe Phe Pro Ser Ser Gly Val Leu Met
    530                 535                 540

Phe Gly Lys Gln Gly Ala Gly Lys Asp Asn Val Asp Tyr Ser Ser Val
545                 550                 555                 560

Met Leu Thr Ser Glu Glu Glu Ile Lys Thr Thr Asn Pro Val Ala Thr
                565                 570                 575

Glu Gln Tyr Gly Val Val Ala Asp Asn Leu Gln Gln Gln Asn Ala Ala
            580                 585                 590

Pro Ile Val Gly Ala Val Asn Ser Gln Gly Ala Leu Pro Gly Met Val
        595                 600                 605

Trp Gln Asn Arg Asp Val Tyr Leu Gln Gly Pro Ile Trp Ala Lys Ile
    610                 615                 620

Pro His Thr Asp Gly Asn Phe His Pro Ser Pro Leu Met Gly Gly Phe
625                 630                 635                 640

Gly Leu Lys His Pro Pro Pro Gln Ile Leu Ile Lys Asn Thr Pro Val
                645                 650                 655

Pro Ala Asp Pro Pro Thr Thr Phe Asn Gln Ala Lys Leu Ala Ser Phe
            660                 665                 670

Ile Thr Gln Tyr Ser Thr Gly Gln Val Ser Val Glu Ile Glu Trp Glu
        675                 680                 685

Leu Gln Lys Glu Asn Ser Lys Arg Trp Asn Pro Glu Ile Gln Tyr Thr
    690                 695                 700
```

Ser Asn Tyr Tyr Lys Ser Thr Asn Val Asp Phe Ala Val Asn Thr Glu
705 710 715 720

Gly Thr Tyr Ser Glu Pro Arg Pro Ile Gly Thr Arg Tyr Leu Thr Arg
725 730 735

Asn Leu

<210> 2
<211> 736
<212> PRT
<213> Artificial Sequence

<220>
<223> Spk2

<400> 2

Met Ala Ala Asp Gly Tyr Leu Pro Asp Trp Leu Glu Asp Asn Leu Ser
1 5 10 15

Glu Gly Ile Arg Glu Trp Trp Ala Leu Gln Pro Gly Ala Pro Lys Pro
20 25 30

Lys Ala Asn Gln Gln His Gln Asp Asn Ala Arg Gly Leu Val Leu Pro
35 40 45

Gly Tyr Lys Tyr Leu Gly Pro Gly Asn Gly Leu Asp Lys Gly Glu Pro
50 55 60

Val Asn Ala Ala Asp Ala Ala Ala Leu Glu His Asp Lys Ala Tyr Asp
65 70 75 80

Gln Gln Leu Lys Ala Gly Asp Asn Pro Tyr Leu Lys Tyr Asn His Ala
85 90 95

Asp Ala Glu Phe Gln Glu Arg Leu Lys Glu Asp Thr Ser Phe Gly Gly
100 105 110

```
Asn Leu Gly Arg Ala Val Phe Gln Ala Lys Lys Arg Leu Leu Glu Pro
        115                 120                 125

Leu Gly Leu Val Glu Glu Ala Ala Lys Thr Ala Pro Gly Lys Lys Arg
    130                 135                 140

Pro Val Asp Gln Ser Pro Gln Glu Pro Asp Ser Ser Ser Gly Val Gly
145                 150                 155                 160

Lys Ser Gly Lys Gln Pro Ala Arg Lys Arg Leu Asn Phe Gly Gln Thr
                165                 170                 175

Gly Asp Ser Glu Ser Val Pro Asp Pro Gln Pro Leu Gly Glu Pro Pro
            180                 185                 190

Ala Ala Pro Thr Ser Leu Gly Ser Asn Thr Met Ala Ser Gly Gly Gly
        195                 200                 205

Ala Pro Met Ala Asp Asn Asn Glu Gly Ala Asp Gly Val Gly Asn Ser
    210                 215                 220

Ser Gly Asn Trp His Cys Asp Ser Gln Trp Leu Gly Asp Arg Val Ile
225                 230                 235                 240

Thr Thr Ser Thr Arg Thr Trp Ala Leu Pro Thr Tyr Asn Asn His Leu
                245                 250                 255

Tyr Lys Gln Ile Ser Ser Gln Ser Gly Ala Ser Asn Asp Asn His Tyr
            260                 265                 270

Phe Gly Tyr Ser Thr Pro Trp Gly Tyr Phe Asp Phe Asn Arg Phe His
        275                 280                 285

Cys His Phe Ser Pro Arg Asp Trp Gln Arg Leu Ile Asn Asn Asn Trp
    290                 295                 300

Gly Phe Arg Pro Lys Lys Leu Ser Phe Lys Leu Phe Asn Ile Gln Val
305                 310                 315                 320
```

```
Lys Glu Val Thr Gln Asn Asp Gly Thr Thr Thr Ile Ala Asn Asn Leu
                325                 330                 335

Thr Ser Thr Val Gln Val Phe Thr Asp Ser Glu Tyr Gln Leu Pro Tyr
            340                 345                 350

Val Leu Gly Ser Ala His Gln Gly Cys Leu Pro Pro Phe Pro Ala Asp
        355                 360                 365

Val Phe Met Val Pro Gln Tyr Gly Tyr Leu Thr Leu Asn Asn Gly Ser
    370                 375                 380

Gln Ala Val Gly Arg Ser Ser Phe Tyr Cys Leu Glu Tyr Phe Pro Ser
385                 390                 395                 400

Gln Met Leu Arg Thr Gly Asn Asn Phe Gln Phe Ser Tyr Thr Phe Glu
                405                 410                 415

Asp Val Pro Phe His Ser Ser Tyr Ala His Ser Gln Ser Leu Asp Arg
            420                 425                 430

Leu Met Asn Pro Leu Ile Asp Gln Tyr Leu Tyr Tyr Leu Asn Arg Thr
        435                 440                 445

Gln Gly Thr Thr Ser Gly Thr Thr Asn Gln Ser Arg Leu Leu Phe Ser
    450                 455                 460

Gln Ala Gly Pro Gln Ser Met Ser Leu Gln Ala Arg Asn Trp Leu Pro
465                 470                 475                 480

Gly Pro Cys Tyr Arg Gln Gln Arg Leu Ser Lys Thr Ala Asn Asp Asn
                485                 490                 495

Asn Asn Ser Asn Phe Pro Trp Thr Ala Ala Ser Lys Tyr His Leu Asn
            500                 505                 510
```

```
Gly Arg Asp Ser Leu Val Asn Pro Gly Pro Ala Met Ala Ser His Lys
        515                 520                 525

Asp Asp Glu Glu Lys Phe Phe Pro Met His Gly Asn Leu Ile Phe Gly
    530                 535                 540

Lys Glu Gly Thr Thr Ala Ser Asn Ala Glu Leu Asp Asn Val Met Ile
545                 550                 555                 560

Thr Asp Glu Glu Glu Ile Arg Thr Thr Asn Pro Val Ala Thr Glu Gln
                565                 570                 575

Tyr Gly Thr Val Ala Asn Asn Leu Gln Ser Ser Asn Thr Ala Pro Thr
            580                 585                 590

Thr Arg Thr Val Asn Asp Gln Gly Ala Leu Pro Gly Met Val Trp Gln
        595                 600                 605

Asp Arg Asp Val Tyr Leu Gln Gly Pro Ile Trp Ala Lys Ile Pro His
    610                 615                 620

Thr Asp Gly His Phe His Pro Ser Pro Leu Met Gly Gly Phe Gly Leu
625                 630                 635                 640

Lys His Pro Pro Pro Gln Ile Met Ile Lys Asn Thr Pro Val Pro Ala
                645                 650                 655

Asn Pro Pro Thr Thr Phe Ser Pro Ala Lys Phe Ala Ser Phe Ile Thr
            660                 665                 670

Gln Tyr Ser Thr Gly Gln Val Ser Val Glu Ile Glu Trp Glu Leu Gln
        675                 680                 685

Lys Glu Asn Ser Lys Arg Trp Asn Pro Glu Ile Gln Tyr Thr Ser Asn
    690                 695                 700

Tyr Asn Lys Ser Val Asn Val Asp Phe Thr Val Asp Thr Asn Gly Val
705                 710                 715                 720
```

```
Tyr Ser Glu Pro Arg Pro Ile Gly Thr Arg Tyr Leu Thr Arg Pro Leu
                725                 730                 735


<210>  3
<211>  339
<212>  PRT
<213>  Streptococcus pyogenes

<400>  3

Met Arg Lys Arg Cys Tyr Ser Thr Ser Ala Ala Val Leu Ala Ala Val
1               5                   10                  15


Thr Leu Phe Val Leu Ser Val Asp Arg Gly Val Ile Ala Asp Ser Phe
            20                  25                  30


Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro Tyr His Val
        35                  40                  45


Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn Phe Thr Gln
    50                  55                  60


Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln Gly Trp Tyr
65                  70                  75                  80


Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu Cys Gly Ala
                85                  90                  95


Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln Asn Lys Asp
            100                 105                 110


Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln Lys Ile Asn
        115                 120                 125


Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile Asp Thr Lys
    130                 135                 140


Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys Glu Lys Ala
```

```
145                 150                 155                 160

Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro Asp His Val
                165                 170                 175

Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr Asn His Gly
            180                 185                 190

Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly Gly Ile Phe
        195                 200                 205

Asp Ala Val Phe Thr Arg Gly Asp Gln Ser Lys Leu Leu Thr Ser Arg
    210                 215                 220

His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp Leu Ile Lys
225                 230                 235                 240

Lys Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His Thr Tyr Ala
                245                 250                 255

Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala Asp Phe Asp
            260                 265                 270

Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser Asp Ser Asn
        275                 280                 285

Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn Ser Ala Gly
    290                 295                 300

Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn Ile Gly Ala
305                 310                 315                 320

Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp Ser Trp Asn
                325                 330                 335

Gln Thr Asn
```

<210> 4
<211> 310
<212> PRT
<213> Streptococcus pyogenes

<400> 4

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                  10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95


Lys Ile Asn Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110


Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125


Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140


Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160


Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175
```

```
Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Lys Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300

Ser Trp Asn Gln Thr Asn
305                 310
```

<210> 5
<211> 310
<212> PRT
<213> Streptococcus pyogenes

<400> 5

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15

Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
```

```
            20                  25                  30

Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45

Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80

Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Asn Phe Arg Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110

Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125

Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Lys Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220
```

```
Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240


Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255


Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270


Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285


Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300


Ser Trp Asn Gln Thr Asn
305                 310
```

<210> 6
<211> 310
<212> PRT
<213> Streptococcus pyogenes

<400> 6

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80
```

```
Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Asn Phe Lys Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110

Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125

Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Arg Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Lys Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270
```

```
Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285


Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300


Ser Trp Asn Gln Thr Asn
305                 310


<210>  7
<211>  310
<212>  PRT
<213>  Streptococcus pyogenes

<400>  7

Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95


Lys Ile Asn Phe Arg Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110


Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125
```

```
Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Lys Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Lys Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Lys Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300

Ser Trp Asn Gln Thr Asn
305                 310
```

<210> 8

<211> 310
<212> PRT
<213> Streptococcus pyogenes

<400> 8

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                  10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Asp Gln Ile Lys Arg Tyr Leu Arg Glu His Pro Glu Lys Gln
                85                  90                  95


Lys Ile Asn Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110


Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125


Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140


Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160


Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175
```

```
Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190


Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205


Leu Ile Lys Lys Glu Leu Asp Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220


Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240


Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255


Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270


Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285


Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300


Ser Trp Asn Gln Thr Asn
305                 310


<210>  9
<211>  310
<212>  PRT
<213>  Streptococcus pyogenes

<400>  9

Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30
```

```
Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45

Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80

Asn Lys Asp Gln Ile Lys Arg Tyr Leu Lys Glu His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Asn Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110

Arg Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125

Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Lys Glu Leu Glu Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
```

225 230 235 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
245 250 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
260 265 270

Lys Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
275 280 285

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
290 295 300

Ser Trp Asn Gln Thr Asn
305 310

<210> 10
<211> 310
<212> PRT
<213> Streptococcus pyogenes

<400> 10

Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1 5 10 15

Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
20 25 30

Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
35 40 45

Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
50 55 60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65 70 75 80

```
Asn Lys Asp Gln Ile Glu Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Asn Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110

Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125

Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Glu Glu Leu Thr Lys Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Lys Asn
        275                 280                 285
```

```
Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Lys
    290                 295                 300


Ser Trp Asn Gln Thr Asn
305                 310
```

<210> 11
<211> 310
<212> PRT
<213> Streptococcus pyogenes

<400> 11

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Asp Gln Ile Lys Arg Tyr Leu Lys Glu His Pro Glu Lys Gln
                85                  90                  95


Lys Ile Asn Phe Arg Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110


Arg Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125


Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
```

```
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Ser Glu Leu Glu Asn Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Lys Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300

Ser Trp Asn Gln Thr Asn
305                 310
```

<210> 12
<211> 310
<212> PRT

<213> Streptococcus pyogenes

<400> 12

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Asp Gln Ile Lys Arg Tyr Leu Lys Glu His Pro Glu Lys Gln
                85                  90                  95


Lys Ile Asn Phe Arg Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110


Arg Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125


Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140


Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160


Asn His Gly Pro Thr Pro Val Lys Lys Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175


Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190
```

```
Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Lys Glu Leu Glu Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300

Ser Trp Asn Gln Thr Asn
305                 310
```

<210> 13
<211> 310
<212> PRT
<213> Streptococcus pyogenes

<400> 13

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15

Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30

Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
```

```
        35                  40                  45

Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80

Asn Lys Asp Gln Ile Glu Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Asn Phe Arg Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110

Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125

Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Lys Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Glu Glu Leu Thr Lys Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240
```

```
Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255


Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270


Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285


Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Lys
    290                 295                 300


Ser Trp Asn Gln Thr Asn
305                 310


<210>  14
<211>  306
<212>  PRT
<213>  Streptococcus pyogenes

<400>  14

Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15


Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95
```

```
Lys Ile Asn Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile
            100                 105                 110

Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
        115                 120                 125

Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
    130                 135                 140

Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Lys Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285
```

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
290 295 300

Ser Trp
305

<210> 15
<211> 290
<212> PRT
<213> Streptococcus pyogenes

<400> 15

Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn Phe Thr Gln Gly
1 5 10 15

Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln Gly Trp Tyr Asp
20 25 30

Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu Cys Gly Ala Ala
35 40 45

Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln Asn Lys Asp Gln
50 55 60

Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln Lys Ile Asn Phe
65 70 75 80

Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile Asp Thr Lys Asn
85 90 95

His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys Glu Lys Ala Phe
100 105 110

Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro Asp His Val Ile
115 120 125

Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr Asn His Gly Pro
130 135 140

```
Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly Gly Ile Phe Asp
145                 150                 155                 160


Ala Val Phe Thr Arg Gly Asp Gln Ser Lys Leu Leu Thr Ser Arg His
                165                 170                 175


Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp Leu Ile Lys Lys
            180                 185                 190


Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His Thr Tyr Ala Asn
        195                 200                 205


Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala Asp Phe Asp Ser
    210                 215                 220


Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser Asp Ser Asn Ala
225                 230                 235                 240


Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn Ser Ala Gly Lys
                245                 250                 255


Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn Ile Gly Ala Gln
            260                 265                 270


Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp Ser Trp Asn Gln
        275                 280                 285


Thr Asn
    290
```

<210> 16
<211> 290
<212> PRT
<213> Streptococcus pyogenes

<400> 16

```
Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn Phe Thr Gln Gly
1               5                   10                  15
```

```
Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln Gly Trp Tyr Asp
            20                  25                  30

Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu Cys Gly Ala Ala
        35                  40                  45

Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln Asn Lys Asp Gln
    50                  55                  60

Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln Lys Ile Asn Phe
65                  70                  75                  80

Lys Gly Glu Gln Met Phe Asp Val Lys Glu Ala Ile Asp Thr Lys Asn
                85                  90                  95

His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys Glu Lys Ala Phe
            100                 105                 110

Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro Asp His Val Ile
        115                 120                 125

Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr Asn His Gly Pro
    130                 135                 140

Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly Gly Ile Phe Asp
145                 150                 155                 160

Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu Thr Ser Arg His
                165                 170                 175

Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp Leu Ile Lys Lys
            180                 185                 190

Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser His Thr Tyr Ala Asn
        195                 200                 205
```

```
Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala Asp Phe Asp Ser
    210                 215                 220

Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser Asp Ser Asn Ala
225                 230                 235                 240

Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn Ser Ala Gly Lys
                245                 250                 255

Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn Ile Gly Ala Gln
            260                 265                 270

Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp Ser Trp Asn Gln
        275                 280                 285

Thr Asn
    290
```

<210> 17
<211> 290
<212> PRT
<213> Streptococcus pyogenes

<400> 17

```
Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn Phe Thr Gln Gly
1               5                   10                  15

Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln Gly Trp Tyr Asp
            20                  25                  30

Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu Cys Gly Ala Ala
        35                  40                  45

Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln Asn Lys Asp Gln
    50                  55                  60

Ile Glu Arg Tyr Leu Glu Glu His Pro Glu Lys Gln Lys Ile Asn Phe
65                  70                  75                  80
```

```
Lys Gly Glu Gln Met Phe Asp Val Lys Lys Ala Ile Asp Thr Lys Asn
                85                  90                  95

His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys Glu Lys Ala Phe
            100                 105                 110

Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro Asp His Val Ile
        115                 120                 125

Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr Asn His Gly Pro
    130                 135                 140

Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly Gly Ile Phe Asp
145                 150                 155                 160

Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu Thr Ser Arg His
                165                 170                 175

Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp Leu Ile Lys Glu
            180                 185                 190

Glu Leu Thr Lys Gly Lys Ala Leu Gly Leu Ser His Thr Tyr Ala Asn
        195                 200                 205

Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala Asp Phe Asp Ser
    210                 215                 220

Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser Asp Ser Asn Ala
225                 230                 235                 240

Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn Ser Ala Gly Lys
                245                 250                 255

Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn Ile Gly Ala Gln
            260                 265                 270

Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Lys Ser Trp Asn Gln
```

275 280 285

Thr Asn
290

<210> 18
<211> 319
<212> PRT
<213> Streptococcus pyogenes

<400> 18

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1 5 10 15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala Asn
20 25 30

Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn Gln
35 40 45

Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu Leu
50 55 60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65 70 75 80

Asn Lys Asp Gln Ile Glu Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
85 90 95

Lys Ile Asn Phe Lys Gly Glu Gln Met Phe Asp Val Lys Lys Ala Ile
100 105 110

Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe Lys
115 120 125

Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe Pro
130 135 140

```
Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160

Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175

Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190

Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser Asp
        195                 200                 205

Leu Ile Lys Glu Glu Leu Thr Lys Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp Asn
        275                 280                 285

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Lys
    290                 295                 300

Ser Trp Asn Gln Thr Asn Gly Gly Gly His His His His His His
305                 310                 315
```

<210> 19
<211> 586
<212> PRT
<213> Streptococcus agalactiae

<400> 19

```
Asn Gln Asn Asn Ile Gln Glu Thr Asn Leu Val Glu Lys Asn Ser Glu
1               5                  10                  15

Asp Lys Phe Ile Gln Glu Leu Asn Arg Tyr Lys Thr Glu Ile Pro Asn
            20                  25                  30

Phe Lys Gly Phe Asn Val Trp Ile Leu Gly Asp Lys Gly Tyr Tyr Lys
        35                  40                  45

Asn Leu Ile Asn Leu Glu Glu Ile Lys Asn Ile Gln Ala Thr Leu Lys
    50                  55                  60

Lys Glu Arg Asn Glu Glu Tyr Val Phe Val Lys Leu Asn Gly Lys Ile
65                  70                  75                  80

Ala His Asp Thr Thr Val Phe Leu Met Asn Lys Lys His Lys Leu Leu
                85                  90                  95

Lys Asn Ile Glu Glu Phe Lys Thr Ile Thr Gln Lys Arg Leu Thr Glu
            100                 105                 110

Arg Gly Lys Phe Pro Tyr Asp Thr Val His Ser Thr Phe Glu Ile Lys
        115                 120                 125

Asp Glu Asn Phe Ile Met Glu Arg Leu Lys Ser Ser Gly Leu Ser Met
    130                 135                 140

Gly Lys Pro Val Asp Tyr Met Gly Val Asn Gly Ile Pro Ile Tyr Thr
145                 150                 155                 160

Lys Thr Leu Ser Ile Asp Asn Lys Phe Ala Phe Glu Asn Asn Ser Lys
                165                 170                 175

Asp Ser Ser Tyr Ser Ser Asn Ile Asn Ile Ser Glu Asp Lys Ile Lys
            180                 185                 190

Glu Asn Asp Gln Lys Ile Leu Asp Leu Ile Val Lys Ser Gly Ala Asn
```

```
        195                 200                 205

Asn Gln Asn Leu Thr Asp Glu Glu Lys Val Ile Ala Phe Thr Lys Tyr
    210                 215                 220

Ile Gly Glu Ile Thr Asn Tyr Asp Asn Glu Ala Tyr Arg Ala Arg Asn
225                 230                 235                 240

Val Asp Thr Glu Tyr Tyr Arg Ala Ser Asp Leu Phe Ser Val Thr Glu
                245                 250                 255

Arg Lys Leu Ala Met Cys Val Gly Tyr Ser Val Thr Ala Ala Arg Ala
            260                 265                 270

Phe Asn Ile Met Gly Ile Pro Ser Tyr Val Val Ser Gly Lys Ser Pro
        275                 280                 285

Gln Gly Ile Ser His Ala Ala Val Arg Ala Tyr Tyr Asn Arg Ser Trp
    290                 295                 300

His Ile Ile Asp Ile Thr Ala Ser Thr Tyr Trp Lys Asn Gly Asn Tyr
305                 310                 315                 320

Lys Thr Thr Tyr Ser Asp Phe Ile Lys Glu Tyr Cys Ile Asp Gly Tyr
                325                 330                 335

Asp Val Tyr Asp Pro Ala Lys Thr Asn Asn Arg Phe Lys Val Lys Tyr
            340                 345                 350

Met Glu Ser Asn Glu Ala Phe Glu Asn Trp Ile His Asn Asn Gly Ser
        355                 360                 365

Lys Ser Met Leu Phe Ile Asn Glu Ser Ala Ala Leu Lys Asp Lys Lys
    370                 375                 380

Pro Lys Asp Asp Phe Val Pro Val Thr Glu Lys Glu Lys Asn Glu Leu
385                 390                 395                 400
```

```
Ile Asp Lys Tyr Lys Lys Leu Leu Ser Gln Ile Pro Glu Asn Thr Gln
                405                 410                 415

Asn Pro Gly Glu Lys Asn Ile Arg Asp Tyr Leu Lys Asn Glu Tyr Glu
            420                 425                 430

Glu Ile Leu Lys Lys Asp Asn Leu Phe Glu His Glu His Ala Glu Phe
        435                 440                 445

Lys Glu Ser Leu Asn Leu Asn Glu Ser Phe Tyr Leu Gln Leu Lys Lys
    450                 455                 460

Glu Glu Lys Lys Pro Ser Asp Asn Leu Lys Lys Glu Glu Lys Pro Arg
465                 470                 475                 480

Glu Asn Ser Val Lys Glu Arg Glu Thr Pro Ala Glu Asn Asn Asp Phe
                485                 490                 495

Val Ser Val Thr Glu Lys Asn Asn Leu Ile Asp Lys Tyr Lys Glu Leu
            500                 505                 510

Leu Ser Lys Ile Pro Glu Asn Thr Gln Asn Pro Gly Glu Lys Asn Ile
        515                 520                 525

Arg Asn Tyr Leu Glu Lys Glu Tyr Glu Glu Leu Leu Gln Lys Asp Lys
    530                 535                 540

Leu Phe Lys His Glu Tyr Thr Glu Phe Thr Lys Ser Leu Asn Leu Asn
545                 550                 555                 560

Glu Thr Phe Tyr Ser Gln Leu Lys Glu Gly Glu Met Lys Leu Ser Glu
                565                 570                 575

Asn Pro Glu Lys Gly Glu Thr Asn Thr Asn
            580                 585
```

<210> 20

<211> 497
<212> PRT
<213> Streptococcus pseudoporcinus

<400> 20

Arg Glu Asn Glu Asn Val Arg Gln Leu Gln Ser Glu Asn Lys Gln Met
1 5 10 15

Lys Ala Val Asn Leu Gln Glu Phe Ser Glu Lys Leu Lys Gly Glu Ile
20 25 30

Ala Glu Asn Gln Gln Phe His Ile Phe Lys Leu Gly Leu Asn Asn Tyr
35 40 45

Tyr Ile Gly Gly Val Arg Ile Asn Glu Leu Ser Asp Leu Ala Lys Asn
50 55 60

His Asp Phe Ile Met Ile Asp Asn Arg Ala Thr His Asn Lys Tyr Gly
65 70 75 80

Val Pro His Ile Ile Ile Met Asn Lys Asp Asp Val Ile Val His Asn
85 90 95

Gln Glu Asp Tyr Asn Lys Glu Met Ala Glu Leu Thr Phe Ala Gly Asp
100 105 110

Lys Pro Ile Gln Ser Asp Ser Tyr Leu Pro Gln Lys Lys Arg Ile His
115 120 125

Ala Leu Phe Glu Ile Gly Leu Asp Ser Asn Arg Arg Gln Leu Leu Asn
130 135 140

Ala Ala Gly Leu Lys Thr Pro Glu Asn Ser Val Ile Glu Leu Asp Thr
145 150 155 160

Phe Lys Ile Tyr Ser His Gly Leu Ala Val Asp Asn Lys Tyr Tyr Asp
165 170 175

```
Glu Tyr Ser His Phe Asn Asn Asn Thr Asn Val Asn Ile Thr Lys Gln
            180                 185                 190

Arg Phe Thr Glu Asn Asp Asn Leu Ile His Asn Leu Ile Thr Thr Ser
        195                 200                 205

Thr Ala Lys Asp Gln Pro Thr Asp Arg Asp Lys Val Lys Thr Phe Val
    210                 215                 220

Met Tyr Val Ala Asn His Thr Ile Tyr Asp Trp Asn Ala Ala Asn Asn
225                 230                 235                 240

Ala Val Ser Asn Ile Ser Asp Val Asn Tyr Tyr Leu Gly Ser Asp Leu
                245                 250                 255

Phe Ser Ile Thr Glu Arg Lys Lys Ala Met Cys Val Gly Phe Ser Thr
            260                 265                 270

Thr Ala Ala Arg Ala Phe Asn Met Leu Gly Ile Pro Ala Tyr Val Val
        275                 280                 285

Glu Gly Lys Asn Ala Gln Gly Val Asp His Ala Thr Ala Arg Val Tyr
    290                 295                 300

Tyr Asn Gly Lys Trp His Thr Ile Asp Gly Thr Gly Phe Ile Asn Gly
305                 310                 315                 320

Asn Arg Thr Arg Ser Thr Leu Tyr Thr Glu Ser His Phe Arg Ser Val
                325                 330                 335

Gly Glu Asp Ser Tyr Gln Leu Val Gly Leu Asn Glu Asp Ile Pro Phe
            340                 345                 350

Asp Arg Asn Tyr Met Lys Ile Asp Lys Val Tyr Glu Glu Trp Ala Pro
        355                 360                 365

Lys Gln Lys Thr Ala Asp Leu Leu Leu Val Asn Lys Asp Lys Ser Leu
    370                 375                 380
```

```
Val Gly Leu Asp Arg Val Ala Tyr Val Glu Pro Val Tyr Val Asp Lys
385                 390                 395                 400


Asn Arg Gln Asp Ala Leu Thr Gln Ile Tyr Lys Lys Leu Lys Glu Thr
                405                 410                 415


Met Glu Ser Ser Ser Lys Lys Asn Pro Ser Ser Gly Gly Phe Ser Ser
            420                 425                 430


Leu Leu Gly Ser Ala Ser Ser Asp Ile Ala Lys Leu Glu Gly Ser Ser
        435                 440                 445


Gln Leu Thr Gln Glu Glu Tyr Asp Lys Ile His Arg Ser Met Thr Ser
    450                 455                 460


Ile Leu Thr Phe Phe Ala Gln Leu Asp Lys Asp Ala Ala Glu Ala Phe
465                 470                 475                 480


Glu Lys Gly Asn Asp Tyr Lys Asn Tyr Leu Ala Thr Thr Lys His Ala
                485                 490                 495


Gln
```

<210> 21
<211> 349
<212> PRT
<213> Streptococcus equi

<400> 21

```
Met Lys Thr Ile Ala Tyr Pro Asn Lys Pro His Ser Leu Ser Ala Gly
1               5                   10                  15


Leu Leu Thr Ala Ile Ala Ile Phe Ser Leu Ala Ser Ser Asn Ile Thr
            20                  25                  30


Tyr Ala Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu
```

```
        35                  40                  45

Val Pro His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu
    50                  55                  60

Thr Pro Glu Gln Phe Arg Tyr Asn Asn Glu Asp Val Ile His Ala Pro
65                  70                  75                  80

Tyr Leu Ala His Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly
                85                  90                  95

Lys Asp Asn Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His
            100                 105                 110

Trp Trp Phe Asp Gln Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys
        115                 120                 125

His Pro Glu Lys Gln Lys Ile Ile Phe Asn Asn Gln Glu Leu Phe Asp
    130                 135                 140

Leu Lys Ala Ala Ile Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu
145                 150                 155                 160

Phe Asn Tyr Phe Arg Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln
                165                 170                 175

Leu Gly Val Met Pro Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr
            180                 185                 190

Tyr Leu Asn Val Phe Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr
        195                 200                 205

Gln Asp Lys Asp Lys Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg
    210                 215                 220

Gly Asp Gln Thr Thr Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys
225                 230                 235                 240
```

```
Gly Leu Asn Asp Ile Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly
                245                 250                 255


Arg Ala Leu Ala Leu Ser His Thr Tyr Ala Asn Val Ser Ile Ser His
            260                 265                 270


Val Ile Asn Leu Trp Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu
        275                 280                 285


Ala Ile Tyr Val Thr Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys
    290                 295                 300


Lys Tyr Phe Val Gly Ile Asn Ala His Gly His Val Ala Ile Ser Ala
305                 310                 315                 320


Lys Lys Ile Glu Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe
                325                 330                 335


Thr Leu Ser Ser Gly Lys Asp Ile Trp Gln Lys Leu Ser
            340                 345


<210>  22
<211>  315
<212>  PRT
<213>  Streptococcus equi

<400>  22

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30


Glu Gln Phe Arg Tyr Asn Asn Glu Asp Val Ile His Ala Pro Tyr Leu
        35                  40                  45


Ala His Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp
    50                  55                  60
```

```
Asn Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp
65                  70                  75                  80

Phe Asp Gln Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro
                85                  90                  95

Glu Lys Gln Lys Ile Ile Phe Asn Asn Gln Glu Leu Phe Asp Leu Lys
            100                 105                 110

Ala Ala Ile Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn
        115                 120                 125

Tyr Phe Arg Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly
    130                 135                 140

Val Met Pro Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu
145                 150                 155                 160

Asn Val Phe Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp
                165                 170                 175

Lys Asp Lys Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp
            180                 185                 190

Gln Thr Thr Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu
        195                 200                 205

Asn Asp Ile Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala
    210                 215                 220

Leu Ala Leu Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile
225                 230                 235                 240

Asn Leu Trp Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile
                245                 250                 255
```

```
Tyr Val Thr Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr
            260                 265                 270


Phe Val Gly Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys
        275                 280                 285


Ile Glu Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu
    290                 295                 300


Ser Ser Gly Lys Asp Ile Trp Gln Lys Leu Ser
305                 310                 315
```

<210> 23
<211> 313
<212> PRT
<213> Artificial Sequence

<220>
<223> IdeS/Z hybrid

<400> 23

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30


Glu Gln Phe Arg Tyr Asn Asn Glu Asp Val Phe His Ala Pro Tyr Val
        35                  40                  45


Ala Asn Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp
    50                  55                  60


Asn Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp
65                  70                  75                  80


Phe Asp Gln Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro
                85                  90                  95
```

```
Glu Lys Gln Lys Ile Asn Phe Asn Gly Asp Asn Met Phe Asp Val Lys
            100                 105                 110

Lys Ala Ile Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Asn
        115                 120                 125

Tyr Phe Lys Glu Lys Ala Phe Pro Gly Leu Ser Ala Arg Arg Ile Gly
    130                 135                 140

Val Phe Pro Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu
145                 150                 155                 160

Ser Leu Thr Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp
                165                 170                 175

Pro Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser
            180                 185                 190

Lys Leu Leu Thr Ser Arg His Asp Phe Lys Asn Lys Asn Leu Asn Asp
        195                 200                 205

Ile Ser Thr Ile Ile Lys Gln Glu Leu Thr Lys Gly Lys Ala Leu Gly
    210                 215                 220

Leu Ser His Thr Tyr Ala Asn Val Ser Ile Asn His Val Ile Asn Leu
225                 230                 235                 240

Trp Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val
                245                 250                 255

Thr Asp Ser Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val
            260                 265                 270

Gly Val Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu
        275                 280                 285

Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr
    290                 295                 300
```

Gly Gln Asp Ser Trp Gln Lys Leu Ser
305 310

<210> 24
<211> 315
<212> PRT
<213> Streptococcus equi

<400> 24

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1 5 10 15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
20 25 30

Glu Gln Phe Arg Tyr Asn Asn Glu Asp Val Ile His Ala Pro Tyr Leu
35 40 45

Ala Asn Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp
50 55 60

Asn Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp
65 70 75 80

Phe Asp Gln Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro
85 90 95

Glu Lys Gln Lys Ile Ile Phe Arg Asn Gln Glu Leu Phe Asp Leu Lys
100 105 110

Glu Ala Ile Arg Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Glu
115 120 125

Tyr Phe Arg Asp Lys Ala Phe Pro Tyr Leu Ser Ala Arg Gln Leu Gly
130 135 140

Val Met Pro Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu

```
145                 150                 155                 160

Asn Val Phe Lys Thr Gln Ser Thr Asp Val Lys Arg Pro Tyr Gln Asp
                165                 170                 175

Lys Asp Lys Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn
            180                 185                 190

Gln Thr Thr Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu
        195                 200                 205

Asn Asp Ile Ser Thr Ile Ile Lys Glu Glu Leu Thr Lys Gly Arg Ala
    210                 215                 220

Leu Ala Leu Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile
225                 230                 235                 240

Asn Leu Trp Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile
                245                 250                 255

Tyr Val Thr Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr
            260                 265                 270

Phe Val Gly Ile Asn Lys His Gly His Val Ala Ile Ser Ala Lys Lys
        275                 280                 285

Ile Glu Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu
    290                 295                 300

Ser Ser Gly Lys Asp Ile Trp Gln Lys Leu Asn
305                 310                 315
```

<210> 25
<211> 315
<212> PRT
<213> Streptococcus equi

<400> 25

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30

Glu Gln Phe Arg Tyr Asn Asn Glu Asp Val Ile His Ala Pro Tyr Leu
        35                  40                  45

Ala His Gln Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp
    50                  55                  60

Asn Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp
65                  70                  75                  80

Phe Asp Gln Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro
                85                  90                  95

Glu Lys Gln Lys Ile Ile Phe Asn Asn Glu Glu Leu Phe Asp Leu Lys
            100                 105                 110

Ala Ala Ile Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn
        115                 120                 125

Tyr Phe Lys Glu Lys Ala Phe Pro Asn Leu Ser Thr Arg Gln Leu Gly
    130                 135                 140

Val Met Pro Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu
145                 150                 155                 160

Asn Val Phe Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp
                165                 170                 175

Lys Asp Lys Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn
            180                 185                 190

Gln Thr Thr Leu Leu Thr Ala Arg His Asp Phe Lys Glu Lys Gly Leu
        195                 200                 205
```

```
Lys Asp Ile Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala
    210                 215                 220

Leu Ala Leu Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile
225                 230                 235                 240

Asn Leu Trp Gly Ala Asp Phe Asp Ala Glu Gly Asn Leu Lys Ala Ile
                245                 250                 255

Tyr Val Thr Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr
            260                 265                 270

Phe Val Gly Ile Asn Ala His Gly Lys Val Ala Ile Ser Ala Lys Lys
        275                 280                 285

Ile Glu Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu
    290                 295                 300

Ser Ser Gly Lys Asp Ile Trp Gln Gln Leu Ser
305                 310                 315
```

<210> 26
<211> 315
<212> PRT
<213> Streptococcus equi

<400> 26

```
Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr Pro
1               5                   10                  15

Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30

Glu Gln Phe Arg Tyr Asn Asn Glu Asp Val Ile His Ala Pro Tyr Leu
        35                  40                  45

Ala His Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp
```

```
    50                  55                  60

Asn Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp
65                  70                  75                  80

Phe Asp Gln Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro
                85                  90                  95

Glu Lys Gln Lys Ile Ile Phe Asn Asn Gln Glu Leu Phe Asp Leu Lys
            100                 105                 110

Ala Ala Ile Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn
        115                 120                 125

Tyr Phe Arg Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly
    130                 135                 140

Val Met Pro Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu
145                 150                 155                 160

Asn Val Phe Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp
                165                 170                 175

Lys Asp Lys Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp
            180                 185                 190

Gln Thr Thr Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu
        195                 200                 205

Asn Asp Ile Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala
    210                 215                 220

Leu Ala Leu Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile
225                 230                 235                 240

Asn Leu Trp Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile
                245                 250                 255
```

```
Tyr Val Thr Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr
            260                 265                 270


Phe Val Gly Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys
        275                 280                 285


Ile Glu Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu
    290                 295                 300


Ser Ser Gly Lys Asp Ile Trp Gln Lys Leu Ser
305                 310                 315


<210>  27
<211>  295
<212>  PRT
<213>  Streptococcus equi

<400>  27

Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro Glu Gln Phe Arg
1               5                   10                  15


Tyr Asn Asn Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln Gly
            20                  25                  30


Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu Cys
        35                  40                  45


Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln Asn
    50                  55                  60


Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln Lys
65                  70                  75                  80


Ile Ile Phe Asn Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile Asp
                85                  90                  95


Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg Asp
            100                 105                 110
```

```
Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met Pro Asp
        115                 120                 125

Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe Lys
    130                 135                 140

Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys Arg
145                 150                 155                 160

Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Thr Thr Leu
                165                 170                 175

Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile Ser
            180                 185                 190

Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu Ser
        195                 200                 205

His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp Gly
    210                 215                 220

Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr Asp
225                 230                 235                 240

Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Ile
                245                 250                 255

Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly Glu
            260                 265                 270

Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly Lys
        275                 280                 285

Asp Ile Trp Gln Lys Leu Ser
    290                 295
```

<210> 28
<211> 314
<212> PRT
<213> Streptococcus equi

<400> 28

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30


Glu Gln Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala
        35                  40                  45


His Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn
    50                  55                  60


Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe
65                  70                  75                  80


Asp Gln Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu
                85                  90                  95


Lys Gln Lys Ile Ile Phe Asn Asn Gln Glu Leu Phe Asp Leu Lys Ala
            100                 105                 110


Ala Ile Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr
        115                 120                 125


Phe Arg Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val
    130                 135                 140


Met Pro Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn
145                 150                 155                 160


Val Phe Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys
                165                 170                 175
```

```
Asp Lys Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln
            180                 185                 190


Thr Thr Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn
        195                 200                 205


Asp Ile Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu
    210                 215                 220


Ala Leu Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn
225                 230                 235                 240


Leu Trp Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr
                245                 250                 255


Val Thr Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe
            260                 265                 270


Val Gly Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile
        275                 280                 285


Glu Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser
    290                 295                 300


Ser Gly Lys Asp Ile Trp Gln Lys Leu Ser
305                 310
```

<210> 29
<211> 312
<212> PRT
<213> Streptococcus equi

<400> 29

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30
```

```
Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln
        35                  40                  45

Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu
    50                  55                  60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80

Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Ile Phe Asn Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile
            100                 105                 110

Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg
        115                 120                 125

Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met Pro
    130                 135                 140

Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe
145                 150                 155                 160

Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Thr Thr
            180                 185                 190

Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile
        195                 200                 205

Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu
    210                 215                 220
```

```
Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp
225                 230                 235                 240


Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255


Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270


Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285


Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly
    290                 295                 300


Lys Asp Ile Trp Gln Lys Leu Ser
305                 310
```

<210> 30
<211> 313
<212> PRT
<213> Streptococcus equi

<400> 30

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30


Phe Arg Tyr Asn Asn Glu Asp Val Ile His Ala Pro Tyr Leu Ala His
        35                  40                  45


Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu
    50                  55                  60


Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp
65                  70                  75                  80
```

```
Gln Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys
                85                  90                  95

Gln Lys Ile Ile Phe Asn Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala
            100                 105                 110

Ile Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe
        115                 120                 125

Arg Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met
    130                 135                 140

Pro Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val
145                 150                 155                 160

Phe Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp
                165                 170                 175

Lys Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Thr
            180                 185                 190

Thr Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp
        195                 200                 205

Ile Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala
    210                 215                 220

Leu Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu
225                 230                 235                 240

Trp Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val
                245                 250                 255

Thr Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val
            260                 265                 270

Gly Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu
```

```
        275                 280                 285

Gly Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser
    290                 295                 300

Gly Lys Asp Ile Trp Gln Lys Leu Ser
305                 310
```

<210> 31
<211> 312
<212> PRT
<213> Streptococcus equi

<400> 31

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30

Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln
        35                  40                  45

Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu
    50                  55                  60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80

Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Ile Ile Asn Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile
            100                 105                 110

Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg
        115                 120                 125
```

```
Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met Pro
    130                 135                 140

Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe
145                 150                 155                 160

Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Thr Thr
            180                 185                 190

Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile
        195                 200                 205

Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp
225                 230                 235                 240

Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255

Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270

Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285

Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly
    290                 295                 300

Lys Asp Ile Trp Gln Lys Leu Ser
305                 310
```

<210> 32
<211> 312

<212> PRT
<213> Streptococcus equi

<400> 32

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                  10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln
                85                  90                  95


Lys Ile Ile Phe Arg Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile
            100                 105                 110


Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg
        115                 120                 125


Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met Pro
    130                 135                 140


Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe
145                 150                 155                 160


Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys
                165                 170                 175


Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Thr Thr
```

```
            180                 185                 190

Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile
        195                 200                 205

Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp
225                 230                 235                 240

Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255

Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270

Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285

Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly
    290                 295                 300

Lys Asp Ile Trp Gln Lys Leu Ser
305                 310


<210>  33
<211>  312
<212>  PRT
<213>  Streptococcus equi

<400>  33

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30
```

```
Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln
        35                  40                  45

Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu
    50                  55                  60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80

Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Ile Ile Arg Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile
            100                 105                 110

Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg
        115                 120                 125

Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met Pro
    130                 135                 140

Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe
145                 150                 155                 160

Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Thr Thr
            180                 185                 190

Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile
        195                 200                 205

Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp
225                 230                 235                 240
```

```
Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255


Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270


Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285


Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly
    290                 295                 300


Lys Asp Ile Trp Gln Lys Leu Ser
305                 310
```

<210> 34
<211> 312
<212> PRT
<213> Streptococcus equi

<400> 34

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln
```

```
                85                  90                  95

Lys Ile Ile Phe Arg Asn Gln Glu Leu Phe Asp Leu Lys Glu Ala Ile
            100                 105                 110

Arg Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Glu Tyr Phe Arg
        115                 120                 125

Asp Lys Ala Phe Pro Tyr Leu Ser Ala Arg Gln Leu Gly Val Met Pro
    130                 135                 140

Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe
145                 150                 155                 160

Lys Thr Gln Ser Thr Asp Val Lys Arg Pro Tyr Gln Asp Lys Asp Lys
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Thr Thr
            180                 185                 190

Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile
        195                 200                 205

Ser Thr Ile Ile Lys Glu Glu Leu Thr Lys Gly Arg Ala Leu Ala Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp
225                 230                 235                 240

Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255

Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270

Ile Asn Lys His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285
```

```
Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly
    290                 295                 300


Lys Asp Ile Trp Gln Lys Leu Asn
305                 310


<210>  35
<211>  292
<212>  PRT
<213>  Streptococcus equi

<400>  35

Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln Phe Thr Gln Gly
1               5                   10                  15


Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln Gly Trp Tyr Asp
            20                  25                  30


Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu Cys Gly Ala Ala
        35                  40                  45


Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln Asn Lys Thr Glu
    50                  55                  60


Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln Lys Ile Ile Phe
65                  70                  75                  80


Arg Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile Asp Thr Lys Asp
                85                  90                  95


Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg Asp Lys Ala Phe
            100                 105                 110


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


Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe Lys Thr Gln Ser
    130                 135                 140
```

```
Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys Arg Gly Gly Ile
145                 150                 155                 160


Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Thr Thr Leu Leu Thr Ala
                165                 170                 175


Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile Ser Thr Ile Ile
            180                 185                 190


Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu Ser His Thr Tyr
        195                 200                 205


Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp Gly Ala Asp Phe
    210                 215                 220


Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr Asp Ser Asp Ala
225                 230                 235                 240


Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Ile Asn Ala His
                245                 250                 255


Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly Glu Asn Ile Gly
            260                 265                 270


Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly Lys Asp Ile Trp
        275                 280                 285


Gln Lys Leu Ser
    290


<210>  36
<211>  312
<212>  PRT
<213>  Streptococcus equi

<400>  36

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
```

```
1               5                   10                  15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30

Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln
        35                  40                  45

Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Ala Asp Asn Leu Leu
    50                  55                  60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80

Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln
                85                  90                  95

Lys Ile Ile Phe Arg Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile
            100                 105                 110

Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg
        115                 120                 125

Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met Pro
    130                 135                 140

Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe
145                 150                 155                 160

Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Thr Thr
            180                 185                 190

Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile
        195                 200                 205
```

```
Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp
225                 230                 235                 240

Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255

Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270

Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285

Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly
    290                 295                 300

Lys Asp Ile Trp Gln Lys Leu Ser
305                 310
```

<210> 37
<211> 292
<212> PRT
<213> Streptococcus equi

<400> 37

```
Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln Phe Thr Gln Gly
1               5                   10                  15

Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln Gly Trp Tyr Asp
            20                  25                  30

Ile Thr Lys Ala Phe Asp Gly Ala Asp Asn Leu Leu Cys Gly Ala Ala
        35                  40                  45

Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln Asn Lys Thr Glu
    50                  55                  60
```

```
Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln Lys Ile Ile Phe
65                  70                  75                  80

Arg Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile Asp Thr Lys Asp
                85                  90                  95

Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg Asp Lys Ala Phe
            100                 105                 110

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

Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe Lys Thr Gln Ser
    130                 135                 140

Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys Arg Gly Gly Ile
145                 150                 155                 160

Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Thr Thr Leu Leu Thr Ala
                165                 170                 175

Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile Ser Thr Ile Ile
            180                 185                 190

Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu Ser His Thr Tyr
        195                 200                 205

Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp Gly Ala Asp Phe
    210                 215                 220

Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr Asp Ser Asp Ala
225                 230                 235                 240

Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Ile Asn Ala His
                245                 250                 255
```

Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly Glu Asn Ile Gly
            260   265   270

Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly Lys Asp Ile Trp
        275   280   285

Gln Lys Leu Ser
    290

<210> 38
<211> 312
<212> PRT
<213> Streptococcus equi

<400> 38

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1   5   10   15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20   25   30

Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Leu Ala His Gln
        35   40   45

Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu
    50   55   60

Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65   70   75   80

Asn Lys Thr Glu Ile Glu Ala Tyr Leu Ser Lys His Pro Glu Lys Gln
                85   90   95

Lys Ile Ile Phe Arg Asn Gln Glu Leu Phe Asp Leu Lys Ala Ala Ile
            100   105   110

Asp Thr Lys Asp Ser Gln Thr Asn Ser Gln Leu Phe Asn Tyr Phe Arg
        115   120   125

```
Asp Lys Ala Phe Pro Asn Leu Ser Ala Arg Gln Leu Gly Val Met Pro
    130                 135                 140

Asp Leu Val Leu Asp Met Phe Ile Asn Gly Tyr Tyr Leu Asn Val Phe
145                 150                 155                 160

Lys Thr Gln Ser Thr Asp Val Asn Arg Pro Tyr Gln Asp Lys Asp Lys
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Thr Thr
            180                 185                 190

Leu Leu Thr Ala Arg His Asp Leu Lys Asn Lys Gly Leu Asn Asp Ile
        195                 200                 205

Ser Thr Ile Ile Lys Gln Glu Leu Thr Glu Gly Arg Ala Leu Ala Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Ser Ile Ser His Val Ile Asn Leu Trp
225                 230                 235                 240

Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255

Asp Ser Asp Ala Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270

Ile Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285

Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Ser Gly
    290                 295                 300

Lys Asp Ile Trp Gln Lys Leu Ser
305                 310
```

<210> 39

<211> 312
<212> PRT
<213> Streptococcus equi

<400> 39

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                  10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30


Glu Gln Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala
        35                  40                  45


Asn Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn
    50                  55                  60


Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe
65                  70                  75                  80


Asp Gln Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu
                85                  90                  95


Lys Gln Lys Ile Asn Phe Asn Gly Glu Asn Met Phe Asp Val Lys Lys
            100                 105                 110


Ala Ile Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Asn Tyr
        115                 120                 125


Phe Lys Glu Lys Ala Phe Pro Tyr Leu Ser Ala Lys His Leu Gly Val
    130                 135                 140


Phe Pro Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser
145                 150                 155                 160


Leu Thr Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro
                165                 170                 175
```

```
Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys
            180                 185                 190


Leu Leu Thr Ser Arg His Asp Phe Lys Asn Lys Asn Leu Asn Asp Ile
        195                 200                 205


Ser Thr Ile Ile Lys Gln Glu Leu Thr Lys Gly Lys Ala Leu Gly Leu
    210                 215                 220


Ser His Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp
225                 230                 235                 240


Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
                245                 250                 255


Asp Ser Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270


Val Asn Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285


Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly
    290                 295                 300


Gln Asp Ser Trp Gln Lys Leu Ser
305                 310


<210>  40
<211>  312
<212>  PRT
<213>  Streptococcus equi

<400>  40

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30
```

```
Glu Gln Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala
        35                  40                  45

Asn Gln Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn
    50                  55                  60

Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe
65                  70                  75                  80

Asp Gln Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu
                85                  90                  95

Lys Gln Lys Ile Asn Phe Arg Gly Glu Asn Met Phe Asp Val Lys Glu
            100                 105                 110

Ala Ile Arg Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr
        115                 120                 125

Phe Lys Glu Lys Ala Phe Pro Tyr Leu Ser Ala Lys His Leu Gly Val
    130                 135                 140

Phe Pro Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser
145                 150                 155                 160

Leu Thr Asn His Gly Pro Thr Pro Val Lys Lys Gly Ser Lys Asp Pro
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys
            180                 185                 190

Leu Leu Thr Ser Arg His Asp Phe Lys Asn Lys Asn Leu Asn Asp Ile
        195                 200                 205

Ser Thr Ile Ile Lys Ser Glu Leu Thr Asn Gly Lys Ala Leu Gly Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp
```

225 230 235 240

Gly Ala Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr
245 250 255

Asp Ser Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
260 265 270

Val Asn Lys His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
275 280 285

Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly
290 295 300

Gln Asp Ser Trp Gln Lys Leu Asn
305 310

<210> 41
<211> 312
<212> PRT
<213> Streptococcus equi

<400> 41

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1 5 10 15

His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
20 25 30

Glu Gln Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala
35 40 45

Asn Gln Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp
50 55 60

Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe
65 70 75 80

```
Asp Gln Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu
                85                  90                  95

Lys Gln Lys Ile Asn Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu
            100                 105                 110

Ala Ile Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr
        115                 120                 125

Phe Lys Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val
    130                 135                 140

Phe Pro Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser
145                 150                 155                 160

Leu Thr Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys
            180                 185                 190

Leu Leu Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile
        195                 200                 205

Ser Asp Leu Ile Lys Gln Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp
225                 230                 235                 240

Gly Ala Asp Phe Asp Ala Glu Gly Asn Leu Lys Ala Ile Tyr Val Thr
                245                 250                 255

Asp Ser Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270

Val Asn Ala Ala Gly Lys Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285
```

```
Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly
    290                 295                 300


Gln Asp Ser Trp Asn Gln Thr Ser
305                 310


<210>  42
<211>  312
<212>  PRT
<213>  Streptococcus equi

<400>  42

Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Leu Thr Pro
            20                  25                  30


Glu Gln Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala
        35                  40                  45


Asn Gln Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp
    50                  55                  60


Leu Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe
65                  70                  75                  80


Asp Gln Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu
                85                  90                  95


Lys Gln Lys Ile Asn Phe Arg Gly Glu Gln Met Phe Asp Val Lys Glu
            100                 105                 110


Ala Ile Arg Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr
        115                 120                 125


Phe Lys Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val
```

```
    130                 135                 140

Phe Pro Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser
145                 150                 155                 160

Leu Thr Asn His Gly Pro Thr Pro Val Lys Lys Gly Ser Lys Asp Pro
                165                 170                 175

Arg Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys
            180                 185                 190

Leu Leu Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile
        195                 200                 205

Ser Asp Leu Ile Lys Glu Glu Leu Thr Lys Gly Lys Ala Leu Gly Leu
    210                 215                 220

Ser His Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp
225                 230                 235                 240

Gly Ala Asp Phe Asp Ala Glu Gly Asn Leu Lys Ala Ile Tyr Val Thr
                245                 250                 255

Asp Ser Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly
            260                 265                 270

Val Asn Lys Ala Gly Lys Val Ala Ile Ser Ala Lys Lys Ile Glu Gly
        275                 280                 285

Glu Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly
    290                 295                 300

Gln Asp Ser Trp Asn Gln Thr Asn
305                 310


<210>  43
<211>  310
<212>  PRT
```

<213> Streptococcus equi

<400> 43

```
Asp Asp Tyr Gln Arg Asn Ala Thr Glu Ala Tyr Ala Lys Glu Val Pro
1               5                   10                  15


His Gln Ile Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Glu Gln
            20                  25                  30


Phe Thr Gln Gly Glu Asp Val Ile His Ala Pro Tyr Val Ala Asn Gln
        35                  40                  45


Gly Trp Tyr Asp Ile Thr Lys Ala Phe Asp Gly Lys Asp Asn Leu Leu
    50                  55                  60


Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp Gln
65                  70                  75                  80


Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys Gln
                85                  90                  95


Lys Ile Asn Phe Arg Gly Glu Gln Met Phe Asp Val Lys Lys Ala Ile
            100                 105                 110


Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Asn Tyr Phe Lys
        115                 120                 125


Glu Lys Ala Phe Pro Gly Leu Ser Ala Arg Arg Ile Gly Val Phe Pro
    130                 135                 140


Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu Thr
145                 150                 155                 160


Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg Gly
                165                 170                 175


Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asn Gln Ser Lys Leu Leu
            180                 185                 190
```

```
Thr Ser Arg His Asp Phe Lys Asn Lys Asn Leu Asn Asp Ile Ser Thr
        195                 200                 205

Ile Ile Lys Gln Glu Leu Thr Lys Gly Lys Ala Leu Gly Leu Ser His
    210                 215                 220

Thr Tyr Ala Asn Val Ser Ile Asn His Val Ile Asn Leu Trp Gly Ala
225                 230                 235                 240

Asp Phe Asn Ala Glu Gly Asn Leu Glu Ala Ile Tyr Val Thr Asp Ser
                245                 250                 255

Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val Asn
            260                 265                 270

Ala His Gly His Val Ala Ile Ser Ala Lys Lys Ile Glu Gly Glu Asn
        275                 280                 285

Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln Asp
    290                 295                 300

Ser Trp Gln Lys Leu Ser
305                 310
```

<210> 44
<211> 843
<212> PRT
<213> Streptococcus pyogenes

<400> 44

```
Met Asp Lys His Leu Leu Val Lys Arg Thr Leu Gly Cys Val Cys Ala
1               5                   10                  15

Ala Thr Leu Met Gly Ala Ala Leu Ala Thr His His Asp Ser Leu Asn
            20                  25                  30

Thr Val Lys Ala Glu Glu Lys Thr Val Gln Thr Gly Lys Thr Asp Gln
```

```
        35                  40                  45

Gln Val Gly Ala Lys Leu Val Gln Glu Ile Arg Glu Gly Lys Arg Gly
    50                  55                  60

Pro Leu Tyr Ala Gly Tyr Phe Arg Thr Trp His Asp Arg Ala Ser Thr
65                  70                  75                  80

Gly Ile Asp Gly Lys Gln Gln His Pro Glu Asn Thr Met Ala Glu Val
                85                  90                  95

Pro Lys Glu Val Asp Ile Leu Phe Val Phe His Asp His Thr Ala Ser
            100                 105                 110

Asp Ser Pro Phe Trp Ser Glu Leu Lys Asp Ser Tyr Val His Lys Leu
        115                 120                 125

His Gln Gln Gly Thr Ala Leu Val Gln Thr Ile Gly Val Asn Glu Leu
    130                 135                 140

Asn Gly Arg Thr Gly Leu Ser Lys Asp Tyr Pro Asp Thr Pro Glu Gly
145                 150                 155                 160

Asn Lys Ala Leu Ala Ala Ala Ile Val Lys Ala Phe Val Thr Asp Arg
                165                 170                 175

Gly Val Asp Gly Leu Asp Ile Asp Ile Glu His Glu Phe Thr Asn Lys
            180                 185                 190

Arg Thr Pro Glu Glu Asp Ala Arg Ala Leu Asn Val Phe Lys Glu Ile
        195                 200                 205

Ala Gln Leu Ile Gly Lys Asn Gly Ser Asp Lys Ser Lys Leu Leu Ile
    210                 215                 220

Met Asp Thr Thr Leu Ser Val Glu Asn Asn Pro Ile Phe Lys Gly Ile
225                 230                 235                 240
```

```
Ala Glu Asp Leu Asp Tyr Leu Leu Arg Gln Tyr Tyr Gly Ser Gln Gly
                245                 250                 255

Gly Glu Ala Glu Val Asp Thr Ile Asn Ser Asp Trp Asn Gln Tyr Gln
            260                 265                 270

Asn Tyr Ile Asp Ala Ser Gln Phe Met Ile Gly Phe Ser Phe Phe Glu
        275                 280                 285

Glu Ser Ala Ser Lys Gly Asn Leu Trp Phe Asp Val Asn Glu Tyr Asp
    290                 295                 300

Pro Asn Asn Pro Glu Lys Gly Lys Asp Ile Glu Gly Thr Arg Ala Lys
305                 310                 315                 320

Lys Tyr Ala Glu Trp Gln Pro Ser Thr Gly Gly Leu Lys Ala Gly Ile
                325                 330                 335

Phe Ser Tyr Ala Ile Asp Arg Asp Gly Val Ala His Val Pro Ser Thr
            340                 345                 350

Tyr Lys Asn Arg Thr Ser Thr Asn Leu Gln Arg His Glu Val Asp Asn
        355                 360                 365

Ile Ser His Thr Asp Tyr Thr Val Ser Arg Lys Leu Lys Thr Leu Met
    370                 375                 380

Thr Glu Asp Lys Arg Tyr Asp Val Ile Asp Gln Lys Asp Ile Pro Asp
385                 390                 395                 400

Pro Ala Leu Arg Glu Gln Ile Ile Gln Gln Val Gly Gln Tyr Lys Gly
                405                 410                 415

Asp Leu Glu Arg Tyr Asn Lys Thr Leu Val Leu Thr Gly Asp Lys Ile
            420                 425                 430

Gln Asn Leu Lys Gly Leu Glu Lys Leu Ser Lys Leu Gln Lys Leu Glu
```

```
        435                 440                 445

Leu Arg Gln Leu Ser Asn Val Lys Glu Ile Thr Pro Glu Leu Leu Pro
    450                 455                 460

Glu Ser Met Lys Lys Asp Ala Glu Leu Val Met Val Gly Met Thr Gly
465                 470                 475                 480

Leu Glu Lys Leu Asn Leu Ser Gly Leu Asn Arg Gln Thr Leu Asp Gly
                485                 490                 495

Ile Asp Val Asn Ser Ile Thr His Leu Thr Ser Phe Asp Ile Ser His
            500                 505                 510

Asn Ser Leu Asp Leu Ser Glu Lys Ser Glu Asp Arg Lys Leu Leu Met
        515                 520                 525

Thr Leu Met Glu Gln Val Ser Asn His Gln Lys Ile Thr Val Lys Asn
    530                 535                 540

Thr Ala Phe Glu Asn Gln Lys Pro Lys Gly Tyr Tyr Pro Gln Thr Tyr
545                 550                 555                 560

Asp Thr Lys Glu Gly His Tyr Asp Val Asp Asn Ala Glu His Asp Ile
                565                 570                 575

Leu Thr Asp Phe Val Phe Gly Thr Val Thr Lys Arg Asn Thr Phe Ile
            580                 585                 590

Gly Asp Glu Glu Ala Phe Ala Ile Tyr Lys Glu Gly Ala Val Asp Gly
        595                 600                 605

Arg Gln Tyr Val Ser Lys Asp Tyr Thr Tyr Glu Ala Phe Arg Lys Asp
    610                 615                 620

Tyr Lys Gly Tyr Lys Val His Leu Thr Ala Ser Asn Leu Gly Glu Thr
625                 630                 635                 640
```

```
Val Thr Ser Lys Val Thr Ala Thr Thr Asp Glu Thr Tyr Leu Val Asp
                645                 650                 655

Val Ser Asp Gly Glu Lys Val Val His His Met Lys Leu Asn Ile Gly
            660                 665                 670

Ser Gly Ala Ile Met Met Glu Asn Leu Ala Lys Gly Ala Lys Val Ile
        675                 680                 685

Gly Thr Ser Gly Asp Phe Glu Gln Ala Lys Lys Ile Phe Asp Gly Glu
    690                 695                 700

Lys Ser Asp Arg Phe Phe Thr Trp Gly Gln Thr Asn Trp Ile Ala Phe
705                 710                 715                 720

Asp Leu Gly Glu Ile Asn Leu Ala Lys Glu Trp Arg Leu Phe Asn Ala
                725                 730                 735

Glu Thr Asn Thr Glu Ile Lys Thr Asp Ser Ser Leu Asn Val Ala Lys
            740                 745                 750

Gly Arg Leu Gln Ile Leu Lys Asp Thr Thr Ile Asp Leu Glu Lys Met
        755                 760                 765

Asp Ile Lys Asn Arg Lys Glu Tyr Leu Ser Asn Asp Glu Asn Trp Thr
    770                 775                 780

Asp Val Ala Gln Met Asp Asp Ala Lys Ala Ile Phe Asn Ser Lys Leu
785                 790                 795                 800

Ser Asn Val Leu Ser Arg Tyr Trp Arg Phe Cys Val Asp Gly Gly Ala
                805                 810                 815

Ser Ser Tyr Tyr Pro Gln Tyr Thr Glu Leu Gln Ile Leu Gly Gln Arg
            820                 825                 830

Leu Ser Asn Asp Val Ala Asn Thr Leu Lys Asp
```

835 840

<210> 45
<211> 959
<212> PRT
<213> Streptococcus pyogenes

<400> 45

Glu Glu Lys Thr Val Gln Val Gln Lys Gly Leu Pro Ser Ile Asp Ser
1 5 10 15

Leu His Tyr Leu Ser Glu Asn Ser Lys Lys Glu Phe Lys Glu Glu Leu
20 25 30

Ser Lys Ala Gly Gln Glu Ser Gln Lys Val Lys Glu Ile Leu Ala Lys
35 40 45

Ala Gln Gln Ala Asp Lys Gln Ala Gln Glu Leu Ala Lys Met Lys Ile
50 55 60

Pro Glu Lys Ile Pro Met Lys Pro Leu His Gly Pro Leu Tyr Gly Gly
65 70 75 80

Tyr Phe Arg Thr Trp His Asp Lys Thr Ser Asp Pro Thr Glu Lys Asp
85 90 95

Lys Val Asn Ser Met Gly Glu Leu Pro Lys Glu Val Asp Leu Ala Phe
100 105 110

Ile Phe His Asp Trp Thr Lys Asp Tyr Ser Leu Phe Trp Lys Glu Leu
115 120 125

Ala Thr Lys His Val Pro Lys Leu Asn Lys Gln Gly Thr Arg Val Ile
130 135 140

Arg Thr Ile Pro Trp Arg Phe Leu Ala Gly Gly Asp Asn Ser Gly Ile
145 150 155 160

```
Ala Glu Asp Thr Ser Lys Tyr Pro Asn Thr Pro Glu Gly Asn Lys Ala
                165                 170                 175

Leu Ala Lys Ala Ile Val Asp Glu Tyr Val Tyr Lys Tyr Asn Leu Asp
            180                 185                 190

Gly Leu Asp Val Asp Val Glu His Asp Ser Ile Pro Lys Val Asp Lys
        195                 200                 205

Lys Glu Asp Thr Ala Gly Val Glu Arg Ser Ile Gln Val Phe Glu Glu
    210                 215                 220

Ile Gly Lys Leu Ile Gly Pro Lys Gly Val Asp Lys Ser Arg Leu Phe
225                 230                 235                 240

Ile Met Asp Ser Thr Tyr Met Ala Asp Lys Asn Pro Leu Ile Glu Arg
                245                 250                 255

Gly Ala Pro Tyr Ile Asn Leu Leu Leu Val Gln Val Tyr Gly Ser Gln
            260                 265                 270

Gly Glu Lys Gly Gly Trp Glu Pro Val Ser Asn Arg Pro Glu Lys Thr
        275                 280                 285

Met Glu Glu Arg Trp Gln Gly Tyr Ser Lys Tyr Ile Arg Pro Glu Gln
    290                 295                 300

Tyr Met Ile Gly Phe Ser Phe Tyr Glu Glu Asn Ala Gln Glu Gly Asn
305                 310                 315                 320

Leu Trp Tyr Asp Ile Asn Ser Arg Lys Asp Glu Asp Lys Ala Asn Gly
                325                 330                 335

Ile Asn Thr Asp Ile Thr Gly Thr Arg Ala Glu Arg Tyr Ala Arg Trp
            340                 345                 350

Gln Pro Lys Thr Gly Gly Val Lys Gly Gly Ile Phe Ser Tyr Ala Ile
        355                 360                 365
```

```
Asp Arg Asp Gly Val Ala His Gln Pro Lys Lys Tyr Ala Lys Gln Lys
    370                 375                 380

Glu Phe Lys Asp Ala Thr Asp Asn Ile Phe His Ser Asp Tyr Ser Val
385                 390                 395                 400

Ser Lys Ala Leu Lys Thr Val Met Leu Lys Asp Lys Ser Tyr Asp Leu
                405                 410                 415

Ile Asp Glu Lys Asp Phe Pro Asp Lys Ala Leu Arg Glu Ala Val Met
            420                 425                 430

Ala Gln Val Gly Thr Arg Lys Gly Asp Leu Glu Arg Phe Asn Gly Thr
        435                 440                 445

Leu Arg Leu Asp Asn Pro Ala Ile Gln Ser Leu Glu Gly Leu Asn Lys
    450                 455                 460

Phe Lys Lys Leu Ala Gln Leu Asp Leu Ile Gly Leu Ser Arg Ile Thr
465                 470                 475                 480

Lys Leu Asp Arg Ser Val Leu Pro Ala Asn Met Lys Pro Gly Lys Asp
                485                 490                 495

Thr Leu Glu Thr Val Leu Glu Thr Tyr Lys Lys Asp Asn Lys Glu Glu
            500                 505                 510

Pro Ala Thr Ile Pro Pro Val Ser Leu Lys Val Ser Gly Leu Thr Gly
        515                 520                 525

Leu Lys Glu Leu Asp Leu Ser Gly Phe Asp Arg Glu Thr Leu Ala Gly
    530                 535                 540

Leu Asp Ala Ala Thr Leu Thr Ser Leu Glu Lys Val Asp Ile Ser Gly
545                 550                 555                 560
```

```
Asn Lys Leu Asp Leu Ala Pro Gly Thr Glu Asn Arg Gln Ile Phe Asp
                565                 570                 575

Thr Met Leu Ser Thr Ile Ser Asn His Val Gly Ser Asn Glu Gln Thr
            580                 585                 590

Val Lys Phe Asp Lys Gln Lys Pro Thr Gly His Tyr Pro Asp Thr Tyr
        595                 600                 605

Gly Lys Thr Ser Leu Arg Leu Pro Val Ala Asn Glu Lys Val Asp Leu
    610                 615                 620

Gln Ser Gln Leu Leu Phe Gly Thr Val Thr Asn Gln Gly Thr Leu Ile
625                 630                 635                 640

Asn Ser Glu Ala Asp Tyr Lys Ala Tyr Gln Asn His Lys Ile Ala Gly
                645                 650                 655

Arg Ser Phe Val Asp Ser Asn Tyr His Tyr Asn Asn Phe Lys Val Ser
            660                 665                 670

Tyr Glu Asn Tyr Thr Val Lys Val Thr Asp Ser Thr Leu Gly Thr Thr
        675                 680                 685

Thr Asp Lys Thr Leu Ala Thr Asp Lys Glu Glu Thr Tyr Lys Val Asp
    690                 695                 700

Phe Phe Ser Pro Ala Asp Lys Thr Lys Ala Val His Thr Ala Lys Val
705                 710                 715                 720

Ile Val Gly Asp Glu Lys Thr Met Met Val Asn Leu Ala Glu Gly Ala
                725                 730                 735

Thr Val Ile Gly Gly Ser Ala Asp Pro Val Asn Ala Arg Lys Val Phe
            740                 745                 750

Asp Gly Gln Leu Gly Ser Glu Thr Asp Asn Ile Ser Leu Gly Trp Asp
        755                 760                 765
```

```
Ser Lys Gln Ser Ile Ile Phe Lys Leu Lys Glu Asp Gly Leu Ile Lys
    770                 775                 780

His Trp Arg Phe Phe Asn Asp Ser Ala Arg Asn Pro Glu Thr Thr Asn
785                 790                 795                 800

Lys Pro Ile Gln Glu Ala Ser Leu Gln Ile Phe Asn Ile Lys Asp Tyr
                805                 810                 815

Asn Leu Asp Asn Leu Leu Glu Asn Pro Asn Lys Phe Asp Asp Glu Lys
            820                 825                 830

Tyr Trp Ile Thr Val Asp Thr Tyr Ser Ala Gln Gly Glu Arg Ala Thr
        835                 840                 845

Ala Phe Ser Asn Thr Leu Asn Asn Ile Thr Ser Lys Tyr Trp Arg Val
    850                 855                 860

Val Phe Asp Thr Lys Gly Asp Arg Tyr Ser Ser Pro Val Val Pro Glu
865                 870                 875                 880

Leu Gln Ile Leu Gly Tyr Pro Leu Pro Asn Ala Asp Thr Ile Met Lys
                885                 890                 895

Thr Val Thr Thr Ala Lys Glu Leu Ser Gln Gln Lys Asp Lys Phe Ser
            900                 905                 910

Gln Lys Met Leu Asp Glu Leu Lys Ile Lys Glu Met Ala Leu Glu Thr
        915                 920                 925

Ser Leu Asn Ser Lys Ile Phe Asp Val Thr Ala Ile Asn Ala Asn Ala
    930                 935                 940

Gly Val Leu Lys Asp Cys Ile Glu Lys Arg Gln Leu Leu Lys Lys
945                 950                 955
```

<210> 46
<211> 995
<212> PRT
<213> Streptococcus pyogenes

<400> 46

```
Met Asp Lys His Leu Leu Val Lys Arg Thr Leu Gly Cys Val Cys Ala
1               5                  10                  15


Ala Thr Leu Met Gly Ala Ala Leu Ala Thr His His Asp Ser Leu Asn
            20                  25                  30


Thr Val Lys Ala Glu Glu Lys Thr Val Gln Val Gln Lys Gly Leu Pro
        35                  40                  45


Ser Ile Asp Ser Leu His Tyr Leu Ser Glu Asn Ser Lys Lys Glu Phe
    50                  55                  60


Lys Glu Glu Leu Ser Lys Ala Gly Gln Glu Ser Gln Lys Val Lys Glu
65                  70                  75                  80


Ile Leu Ala Lys Ala Gln Gln Ala Asp Lys Gln Ala Gln Glu Leu Ala
                85                  90                  95


Lys Met Lys Ile Pro Glu Lys Ile Pro Met Lys Pro Leu His Gly Pro
            100                 105                 110


Leu Tyr Gly Gly Tyr Phe Arg Thr Trp His Asp Lys Thr Ser Asp Pro
        115                 120                 125


Thr Glu Lys Asp Lys Val Asn Ser Met Gly Glu Leu Pro Lys Glu Val
    130                 135                 140


Asp Leu Ala Phe Ile Phe His Asp Trp Thr Lys Asp Tyr Ser Leu Phe
145                 150                 155                 160


Trp Lys Glu Leu Ala Thr Lys His Val Pro Lys Leu Asn Lys Gln Gly
                165                 170                 175
```

```
Thr Arg Val Ile Arg Thr Ile Pro Trp Arg Phe Leu Ala Gly Gly Asp
            180                 185                 190

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

Gly Asn Lys Ala Leu Ala Lys Ala Ile Val Asp Glu Tyr Val Tyr Lys
    210                 215                 220

Tyr Asn Leu Asp Gly Leu Asp Val Asp Val Glu His Asp Ser Ile Pro
225                 230                 235                 240

Lys Val Asp Lys Lys Glu Asp Thr Ala Gly Val Glu Arg Ser Ile Gln
                245                 250                 255

Val Phe Glu Glu Ile Gly Lys Leu Ile Gly Pro Lys Gly Val Asp Lys
            260                 265                 270

Ser Arg Leu Phe Ile Met Asp Ser Thr Tyr Met Ala Asp Lys Asn Pro
        275                 280                 285

Leu Ile Glu Arg Gly Ala Pro Tyr Ile Asn Leu Leu Leu Val Gln Val
    290                 295                 300

Tyr Gly Ser Gln Gly Glu Lys Gly Gly Trp Glu Pro Val Ser Asn Arg
305                 310                 315                 320

Pro Glu Lys Thr Met Glu Glu Arg Trp Gln Gly Tyr Ser Lys Tyr Ile
                325                 330                 335

Arg Pro Glu Gln Tyr Met Ile Gly Phe Ser Phe Tyr Glu Glu Asn Ala
            340                 345                 350

Gln Glu Gly Asn Leu Trp Tyr Asp Ile Asn Ser Arg Lys Asp Glu Asp
        355                 360                 365

Lys Ala Asn Gly Ile Asn Thr Asp Ile Thr Gly Thr Arg Ala Glu Arg
```

```
    370                 375                 380

Tyr Ala Arg Trp Gln Pro Lys Thr Gly Gly Val Lys Gly Gly Ile Phe
385                 390                 395                 400

Ser Tyr Ala Ile Asp Arg Asp Gly Val Ala His Gln Pro Lys Lys Tyr
                405                 410                 415

Ala Lys Gln Lys Glu Phe Lys Asp Ala Thr Asp Asn Ile Phe His Ser
            420                 425                 430

Asp Tyr Ser Val Ser Lys Ala Leu Lys Thr Val Met Leu Lys Asp Lys
        435                 440                 445

Ser Tyr Asp Leu Ile Asp Glu Lys Asp Phe Pro Asp Lys Ala Leu Arg
    450                 455                 460

Glu Ala Val Met Ala Gln Val Gly Thr Arg Lys Gly Asp Leu Glu Arg
465                 470                 475                 480

Phe Asn Gly Thr Leu Arg Leu Asp Asn Pro Ala Ile Gln Ser Leu Glu
                485                 490                 495

Gly Leu Asn Lys Phe Lys Lys Leu Ala Gln Leu Asp Leu Ile Gly Leu
            500                 505                 510

Ser Arg Ile Thr Lys Leu Asp Arg Ser Val Leu Pro Ala Asn Met Lys
        515                 520                 525

Pro Gly Lys Asp Thr Leu Glu Thr Val Leu Glu Thr Tyr Lys Lys Asp
    530                 535                 540

Asn Lys Glu Glu Pro Ala Thr Ile Pro Pro Val Ser Leu Lys Val Ser
545                 550                 555                 560

Gly Leu Thr Gly Leu Lys Glu Leu Asp Leu Ser Gly Phe Asp Arg Glu
                565                 570                 575
```

```
Thr Leu Ala Gly Leu Asp Ala Ala Thr Leu Thr Ser Leu Glu Lys Val
            580                 585                 590

Asp Ile Ser Gly Asn Lys Leu Asp Leu Ala Pro Gly Thr Glu Asn Arg
        595                 600                 605

Gln Ile Phe Asp Thr Met Leu Ser Thr Ile Ser Asn His Val Gly Ser
    610                 615                 620

Asn Glu Gln Thr Val Lys Phe Asp Lys Gln Lys Pro Thr Gly His Tyr
625                 630                 635                 640

Pro Asp Thr Tyr Gly Lys Thr Ser Leu Arg Leu Pro Val Ala Asn Glu
                645                 650                 655

Lys Val Asp Leu Gln Ser Gln Leu Leu Phe Gly Thr Val Thr Asn Gln
            660                 665                 670

Gly Thr Leu Ile Asn Ser Glu Ala Asp Tyr Lys Ala Tyr Gln Asn His
        675                 680                 685

Lys Ile Ala Gly Arg Ser Phe Val Asp Ser Asn Tyr His Tyr Asn Asn
    690                 695                 700

Phe Lys Val Ser Tyr Glu Asn Tyr Thr Val Lys Val Thr Asp Ser Thr
705                 710                 715                 720

Leu Gly Thr Thr Thr Asp Lys Thr Leu Ala Thr Asp Lys Glu Glu Thr
                725                 730                 735

Tyr Lys Val Asp Phe Phe Ser Pro Ala Asp Lys Thr Lys Ala Val His
            740                 745                 750

Thr Ala Lys Val Ile Val Gly Asp Glu Lys Thr Met Met Val Asn Leu
        755                 760                 765

Ala Glu Gly Ala Thr Val Ile Gly Gly Ser Ala Asp Pro Val Asn Ala
```

```
    770                 775                 780

Arg Lys Val Phe Asp Gly Gln Leu Gly Ser Glu Thr Asp Asn Ile Ser
785                 790                 795                 800

Leu Gly Trp Asp Ser Lys Gln Ser Ile Ile Phe Lys Leu Lys Glu Asp
                805                 810                 815

Gly Leu Ile Lys His Trp Arg Phe Phe Asn Asp Ser Ala Arg Asn Pro
            820                 825                 830

Glu Thr Thr Asn Lys Pro Ile Gln Glu Ala Ser Leu Gln Ile Phe Asn
        835                 840                 845

Ile Lys Asp Tyr Asn Leu Asp Asn Leu Leu Glu Asn Pro Asn Lys Phe
    850                 855                 860

Asp Asp Glu Lys Tyr Trp Ile Thr Val Asp Thr Tyr Ser Ala Gln Gly
865                 870                 875                 880

Glu Arg Ala Thr Ala Phe Ser Asn Thr Leu Asn Asn Ile Thr Ser Lys
                885                 890                 895

Tyr Trp Arg Val Val Phe Asp Thr Lys Gly Asp Arg Tyr Ser Ser Pro
            900                 905                 910

Val Val Pro Glu Leu Gln Ile Leu Gly Tyr Pro Leu Pro Asn Ala Asp
        915                 920                 925

Thr Ile Met Lys Thr Val Thr Thr Ala Lys Glu Leu Ser Gln Gln Lys
    930                 935                 940

Asp Lys Phe Ser Gln Lys Met Leu Asp Glu Leu Lys Ile Lys Glu Met
945                 950                 955                 960

Ala Leu Glu Thr Ser Leu Asn Ser Lys Ile Phe Asp Val Thr Ala Ile
                965                 970                 975
```

```
Asn Ala Asn Ala Gly Val Leu Lys Asp Cys Ile Glu Lys Arg Gln Leu
            980                 985                 990


Leu Lys Lys
        995
```

<210> 47
<211> 995
<212> PRT
<213> Streptococcus pyogenes

<400> 47

```
Met Asp Lys His Leu Leu Val Lys Arg Thr Leu Gly Cys Val Cys Ala
1               5                   10                  15


Ala Thr Leu Met Gly Ala Ala Leu Ala Thr His His Asp Ser Leu Asn
            20                  25                  30


Thr Val Lys Ala Glu Glu Lys Thr Val Gln Val Gln Lys Gly Leu Pro
        35                  40                  45


Ser Ile Asp Ser Leu His Tyr Leu Ser Glu Asn Ser Lys Lys Glu Phe
    50                  55                  60


Lys Glu Glu Leu Ser Lys Ala Gly Gln Glu Ser Gln Lys Val Lys Glu
65                  70                  75                  80


Ile Leu Ala Lys Ala Gln Gln Ala Asp Lys Gln Ala Gln Glu Leu Ala
                85                  90                  95


Lys Met Lys Ile Pro Glu Lys Ile Pro Met Lys Pro Leu His Gly Pro
            100                 105                 110


Leu Tyr Gly Gly Tyr Phe Arg Thr Trp His Asp Lys Thr Ser Asp Pro
        115                 120                 125


Thr Glu Lys Asp Lys Val Asn Ser Met Gly Glu Leu Pro Lys Glu Val
    130                 135                 140
```

```
Asp Leu Ala Phe Ile Phe His Asp Trp Thr Lys Asp Tyr Ser Leu Phe
145                 150                 155                 160

Trp Lys Glu Leu Ala Thr Lys His Val Pro Lys Leu Asn Lys Gln Gly
                165                 170                 175

Thr Arg Val Ile Arg Thr Ile Pro Trp Arg Phe Leu Ala Gly Gly Asp
            180                 185                 190

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

Gly Asn Lys Ala Leu Ala Lys Ala Ile Val Asp Glu Tyr Val Tyr Lys
    210                 215                 220

Tyr Asn Leu Asp Gly Leu Asp Val Asp Val Glu His Asp Ser Ile Pro
225                 230                 235                 240

Lys Val Asp Lys Lys Glu Asp Thr Ala Gly Val Glu Arg Ser Ile Gln
                245                 250                 255

Val Phe Glu Glu Ile Gly Lys Leu Ile Gly Pro Lys Gly Val Asp Lys
            260                 265                 270

Ser Arg Leu Phe Ile Met Asp Ser Thr Tyr Met Ala Asp Lys Asn Pro
        275                 280                 285

Leu Ile Glu Arg Gly Ala Pro Tyr Ile Asn Leu Leu Leu Val Gln Val
    290                 295                 300

Tyr Gly Ser Gln Gly Glu Lys Gly Gly Trp Glu Pro Val Ser Asn Arg
305                 310                 315                 320

Pro Glu Lys Thr Met Glu Glu Arg Trp Gln Gly Tyr Ser Lys Tyr Ile
                325                 330                 335
```

```
Arg Pro Glu Gln Tyr Met Ile Gly Phe Ser Phe Tyr Glu Glu Asn Ala
            340                 345                 350

Gln Glu Gly Asn Leu Trp Tyr Asp Ile Asn Ser Arg Lys Asp Glu Asp
        355                 360                 365

Lys Ala Asn Gly Ile Asn Thr Asp Ile Thr Gly Thr Arg Ala Glu Arg
    370                 375                 380

Tyr Ala Arg Trp Gln Pro Lys Thr Gly Gly Val Lys Gly Gly Ile Phe
385                 390                 395                 400

Ser Tyr Ala Ile Asp Arg Asp Gly Val Ala His Gln Pro Lys Lys Tyr
                405                 410                 415

Ala Lys Gln Lys Glu Phe Lys Asp Ala Thr Asp Asn Ile Phe His Ser
            420                 425                 430

Asp Tyr Ser Val Ser Lys Ala Leu Lys Thr Val Met Leu Lys Asp Lys
        435                 440                 445

Ser Tyr Asp Leu Ile Asp Glu Lys Asp Phe Pro Asp Lys Ala Leu Arg
    450                 455                 460

Glu Ala Val Met Ala Gln Val Gly Thr Arg Lys Gly Asp Leu Glu Arg
465                 470                 475                 480

Phe Asn Gly Thr Leu Arg Leu Asp Asn Pro Ala Ile Gln Ser Leu Glu
                485                 490                 495

Gly Leu Asn Lys Phe Lys Lys Leu Ala Gln Leu Asp Leu Ile Gly Leu
            500                 505                 510

Ser Arg Ile Thr Lys Leu Asp Arg Ser Val Leu Pro Ala Asn Met Lys
        515                 520                 525

Pro Gly Lys Asp Thr Leu Glu Thr Val Leu Glu Thr Tyr Lys Lys Asp
    530                 535                 540
```

```
Asn Lys Glu Glu Pro Ala Thr Ile Pro Pro Val Ser Leu Lys Val Ser
545                 550                 555                 560

Gly Leu Thr Gly Leu Lys Glu Leu Asp Leu Ser Gly Phe Asp Arg Glu
                565                 570                 575

Thr Leu Ala Gly Leu Asp Ala Ala Thr Leu Thr Ser Leu Glu Lys Val
            580                 585                 590

Asp Ile Ser Gly Asn Lys Leu Asp Leu Ala Pro Gly Thr Glu Asn Arg
        595                 600                 605

Gln Ile Phe Asp Thr Met Leu Ser Thr Ile Ser Asn His Val Gly Ser
    610                 615                 620

Asn Glu Gln Thr Val Lys Phe Asp Lys Gln Lys Pro Thr Gly His Tyr
625                 630                 635                 640

Pro Asp Thr Tyr Gly Lys Thr Ser Leu Arg Leu Pro Val Ala Asn Glu
                645                 650                 655

Lys Val Asp Leu Gln Ser Gln Leu Leu Phe Gly Thr Val Thr Asn Gln
            660                 665                 670

Gly Thr Leu Ile Asn Ser Glu Ala Asp Tyr Lys Ala Tyr Gln Asn His
        675                 680                 685

Lys Ile Ala Gly Arg Ser Phe Val Asp Ser Asn Tyr His Tyr Asn Asn
    690                 695                 700

Phe Lys Val Ser Tyr Glu Asn Tyr Thr Val Lys Val Thr Asp Ser Thr
705                 710                 715                 720

Leu Gly Thr Thr Thr Asp Lys Thr Leu Ala Thr Asp Lys Glu Glu Thr
                725                 730                 735
```

```
Tyr Lys Val Asp Phe Phe Ser Pro Ala Asp Lys Thr Lys Ala Val His
            740                 745                 750

Thr Ala Lys Val Ile Val Gly Asp Glu Lys Thr Met Met Val Asn Leu
        755                 760                 765

Ala Glu Gly Ala Thr Val Ile Gly Gly Ser Ala Asp Pro Val Asn Ala
    770                 775                 780

Arg Lys Val Phe Asp Gly Gln Leu Gly Ser Glu Thr Asp Asn Ile Ser
785                 790                 795                 800

Leu Gly Trp Asp Ser Lys Gln Ser Ile Ile Phe Lys Leu Lys Glu Asp
                805                 810                 815

Gly Leu Ile Lys His Trp Arg Phe Phe Asn Asp Ser Ala Arg Asn Pro
            820                 825                 830

Glu Thr Thr Asn Lys Pro Ile Gln Glu Ala Ser Leu Gln Ile Phe Asn
        835                 840                 845

Ile Lys Asp Tyr Asn Leu Asp Asn Leu Leu Glu Asn Pro Asn Lys Phe
    850                 855                 860

Asp Asp Glu Lys Tyr Trp Ile Thr Val Asp Thr Tyr Ser Ala Gln Gly
865                 870                 875                 880

Glu Arg Ala Thr Ala Phe Ser Asn Thr Leu Asn Asn Ile Thr Ser Lys
                885                 890                 895

Tyr Trp Arg Val Val Phe Asp Thr Lys Gly Asp Arg Tyr Ser Ser Pro
            900                 905                 910

Val Val Pro Glu Leu Gln Ile Leu Gly Tyr Pro Leu Pro Asn Ala Asp
        915                 920                 925

Thr Ile Met Lys Thr Val Thr Thr Ala Lys Glu Leu Ser Gln Gln Lys
    930                 935                 940
```

```
Asp Lys Phe Ser Gln Lys Met Leu Asp Glu Leu Lys Ile Lys Glu Met
945                 950                 955                 960


Ala Leu Glu Thr Ser Leu Asn Ser Lys Ile Phe Asp Val Thr Ala Ile
                965                 970                 975


Asn Ala Asn Ala Gly Val Leu Lys Asp Cys Ile Glu Lys Arg Gln Leu
            980                 985                 990


Leu Lys Lys
        995
```

<210> 48
<211> 311
<212> PRT
<213> Streptococcus pyogenes

<400> 48

```
Met Asp Ser Phe Ser Ala Asn Gln Glu Ile Arg Tyr Ser Glu Val Thr
1               5                   10                  15


Pro Tyr His Val Thr Ser Val Trp Thr Lys Gly Val Thr Pro Pro Ala
            20                  25                  30


Asn Phe Thr Gln Gly Glu Asp Val Phe His Ala Pro Tyr Val Ala Asn
        35                  40                  45


Gln Gly Trp Tyr Asp Ile Thr Lys Thr Phe Asn Gly Lys Asp Asp Leu
    50                  55                  60


Leu Cys Gly Ala Ala Thr Ala Gly Asn Met Leu His Trp Trp Phe Asp
65                  70                  75                  80


Gln Asn Lys Asp Gln Ile Lys Arg Tyr Leu Glu Glu His Pro Glu Lys
                85                  90                  95


Gln Lys Ile Asn Phe Asn Gly Glu Gln Met Phe Asp Val Lys Glu Ala
```

```
            100                 105                 110

Ile Asp Thr Lys Asn His Gln Leu Asp Ser Lys Leu Phe Glu Tyr Phe
        115                 120                 125

Lys Glu Lys Ala Phe Pro Tyr Leu Ser Thr Lys His Leu Gly Val Phe
    130                 135                 140

Pro Asp His Val Ile Asp Met Phe Ile Asn Gly Tyr Arg Leu Ser Leu
145                 150                 155                 160

Thr Asn His Gly Pro Thr Pro Val Lys Glu Gly Ser Lys Asp Pro Arg
                165                 170                 175

Gly Gly Ile Phe Asp Ala Val Phe Thr Arg Gly Asp Gln Ser Lys Leu
            180                 185                 190

Leu Thr Ser Arg His Asp Phe Lys Glu Lys Asn Leu Lys Glu Ile Ser
        195                 200                 205

Asp Leu Ile Lys Lys Glu Leu Thr Glu Gly Lys Ala Leu Gly Leu Ser
    210                 215                 220

His Thr Tyr Ala Asn Val Arg Ile Asn His Val Ile Asn Leu Trp Gly
225                 230                 235                 240

Ala Asp Phe Asp Ser Asn Gly Asn Leu Lys Ala Ile Tyr Val Thr Asp
                245                 250                 255

Ser Asp Ser Asn Ala Ser Ile Gly Met Lys Lys Tyr Phe Val Gly Val
            260                 265                 270

Asn Ser Ala Gly Lys Val Ala Ile Ser Ala Lys Glu Ile Lys Glu Asp
        275                 280                 285

Asn Ile Gly Ala Gln Val Leu Gly Leu Phe Thr Leu Ser Thr Gly Gln
    290                 295                 300
```

Asp Ser Trp Asn Gln Thr Asn
305 310

<210> 49
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> Signal sequence

<400> 49

Met Arg Lys Arg Cys Tyr Ser Thr Ser Ala Ala Val Leu Ala Ala Val
1 5 10 15

Thr Leu Phe Val Leu Ser Val Asp Arg Gly Val Ile Ala
20 25

<210> 50
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> Signal sequence

<400> 50

Met Arg Lys Arg Cys Tyr Ser Thr Ser Ala Ala Val Leu Ala Ala Val
1 5 10 15

Thr Leu Phe Ala Leu Ser Val Asp Arg Gly Val Ile Ala
20 25

<210> 51
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> Signal sequence

<400> 51

Met Arg Lys Arg Cys Tyr Ser Thr Ser Ala Val Val Leu Ala Ala Val
1 5 10 15

Thr Leu Phe Ala Leu Ser Val Asp Arg Gly Val Ile Ala
            20 25

<210> 52
<211> 933
<212> DNA
<213> Streptococcus pyogenes

<400> 52
gatagttttt ctgctaatca agagattaga tattcggaag taacacctta tcacgttact 60

tccgtttgga ccaaaggagt tactcctcca gcaaacttca ctcaaggtga agatgttttt 120

cacgctcctt atgttgctaa ccaaggatgg tatgatatta ccaaaacatt caatggaaaa 180

gacgatcttc tttgcggggc tgccacagca gggaatatgc ttcactggtg gttcgatcaa 240

aacaaagacc aaattaaacg ttatttggaa gagcatccag aaaagcaaaa aataaacttc 300

aatggcgaac agatgtttga cgtaaaagaa gctatcgaca ctaaaaacca ccagctagat 360

agtaaattat ttgaatattt taaagaaaaa gctttccctt atctatctac taaacaccta 420

ggagttttcc ctgatcatgt aattgatatg ttcattaacg gctaccgcct tagtctaact 480

aaccacggtc caacgccagt aaaagaaggt agtaaagatc cccgaggtgg tatttttgac 540

gccgtattta caagaggtga tcaaagtaag ctattgacaa gtcgtcatga ttttaaagaa 600

aaaaatctca aagaaatcag tgatctcatt aagaaagagt taaccgaagg caaggctcta 660

ggcctatcac acacctacgc taacgtacgc atcaaccatg ttataaacct gtggggagct 720

gactttgatt ctaacgggaa ccttaaagct atttatgtaa cagactctga tagtaatgca 780

tctattggta tgaagaaata ctttgttggt gttaattccg ctggaaaagt agctatttct 840

gctaaagaaa taaaagaaga taatattggt gctcaagtac tagggttatt tacactttca 900

acagggcaag atagttggaa tcagaccaat taa 933