SEQUENCE LISTING

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<120> HUMAN METAPNEUMOVIRUS COMBINATION VACCINE

<130> PAT053/PCT2

<140> PCT/EP2022/059492
<141> 2022-04-07

<150> EP21167609
<151> 2021-04-09

<160> 57

<170> PatentIn version 3.5

<210> 1
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<213> Human metapneumovirus

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Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60


Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110


Ala Thr Ala Ala Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile
```

```
        115                 120                 125

Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Lys Thr
    130                 135                 140

Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160

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

Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Phe Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Gly Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335
```

```
Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile
465                 470                 475                 480

Leu Ser Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Ile Ala Val Leu Gly Ser Thr Met Ile Leu Val Ser Val Phe Ile
            500                 505                 510

Ile Ile Lys Lys Thr Lys Lys Pro Thr Gly Ala Pro Pro Glu Leu Ser
        515                 520                 525

Gly Val Thr Asn Asn Gly Phe Ile Pro His Asn
    530                 535
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<213> Human metapneumovirus

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Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                  10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60


Ser Leu Ile Lys Thr Glu Leu Glu Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110


Ala Thr Ala Ala Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile
        115                 120                 125


Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Lys Thr
    130                 135                 140


Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160


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


Ile Asn Lys Asn Lys Cys Asp Ile Asp Asp Leu Lys Met Ala Val Ser
            180                 185                 190
```

```
Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Lys Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415
```

```
Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Asn Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile
465                 470                 475                 480

Leu Ser Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Ile Ala Val Leu Gly Ser Ser Met Ile Leu Val Ser Ile Phe Ile
            500                 505                 510

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

Gly Val Thr Asn Asn Gly Phe Ile Pro His Ser
    530                 535
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<210> 3
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<213> Human metapneumovirus

<400> 3

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Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ser Asp Gly Pro
```

```
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110

Ala Thr Ala Ala Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile
        115                 120                 125

Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Thr Thr
    130                 135                 140

Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160

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

Ile Asn Lys Asn Lys Cys Asp Ile Asp Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Thr Val Gln
            260                 265                 270
```

```
Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Asn Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile
465                 470                 475                 480

Leu Ser Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
```

```
                485                 490                 495

Leu Ile Ala Val Leu Gly Ser Ser Met Ile Leu Val Ser Ile Phe Ile
            500                 505                 510

Ile Ile Lys Lys Thr Lys Lys Pro Thr Gly Ala Pro Pro Glu Leu Ser
        515                 520                 525

Gly Val Thr Asn Asn Gly Phe Ile Pro His Ser
    530                 535
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<210> 4
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<213> Human metapneumovirus

<400> 4

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Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Ser Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Pro Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110

Ala Thr Ala Ala Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile
        115                 120                 125
```

```
Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Lys Thr
    130                 135                 140

Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160

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

Ile Asn Lys Asn Lys Cys Asp Ile Asp Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro Thr Ala Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile
            340                 345                 350
```

```
Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Asn Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile
465                 470                 475                 480

Leu Ser Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Ile Ala Val Leu Gly Ser Ser Met Ile Leu Val Ser Val Phe Ile
            500                 505                 510

Ile Ile Lys Lys Thr Arg Lys Pro Thr Gly Ala Pro Pro Glu Leu Ser
        515                 520                 525

Gly Val Thr Asn Asn Gly Phe Ile Pro His Ser
    530                 535
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<210> 5
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<213> Human metapneumovirus

<400> 5

```
Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                  10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ser Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110

Ala Thr Ala Ala Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile
        115                 120                 125

Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Thr Thr
    130                 135                 140

Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160

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

Ile Asn Lys Asn Lys Cys Asp Ile Asp Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205
```

```
Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Gly Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
```

```
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Asn Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile
465                 470                 475                 480

Leu Ser Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Ile Ala Val Leu Gly Ser Ser Met Ile Leu Val Ser Ile Phe Ile
            500                 505                 510

Ile Ile Lys Lys Thr Lys Lys Pro Thr Gly Ala Pro Pro Glu Leu Ser
        515                 520                 525

Gly Val Thr Asn Asn Gly Phe Ile Pro His Ser
    530                 535
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<212> PRT
<213> Human metapneumovirus

<400> 6

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Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Pro Ser Leu Ile
    50                  55                  60
```

```
Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu Leu Lys Thr
65                  70                  75                  80

Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu Asn Pro Arg
                85                  90                  95

Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val Ala Thr Ala
            100                 105                 110

Ala Ala Val Thr Ala Gly Ile Ala Ile Ala Lys Thr Ile Arg Leu Glu
        115                 120                 125

Ser Glu Val Asn Ala Ile Lys Gly Ala Leu Lys Gln Thr Asn Glu Ala
    130                 135                 140

Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr Ala Val Arg
145                 150                 155                 160

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

Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser Phe Ser Gln
            180                 185                 190

Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser Asp Asn Ala
        195                 200                 205

Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp Ala Glu Leu
    210                 215                 220

Ala Arg Ala Val Ser Tyr Met Pro Thr Ser Ala Gly Gln Ile Lys Leu
225                 230                 235                 240

Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe Gly Ile Leu
                245                 250                 255

Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln Leu Pro Ile
            260                 265                 270

Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Ile Lys Ala Ala Pro Ser
        275                 280                 285
```

```
Cys Ser Glu Lys Asn Gly Asn Tyr Ala Cys Leu Leu Arg Glu Asp Gln
    290                 295                 300

Gly Trp Tyr Cys Lys Asn Ala Gly Ser Thr Val Tyr Tyr Pro Asn Glu
305                 310                 315                 320

Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp Thr Ala Ala
                325                 330                 335

Gly Ile Asn Val Ala Glu Gln Ser Arg Glu Cys Asn Ile Asn Ile Ser
            340                 345                 350

Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His Pro Ile Ser
        355                 360                 365

Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys Tyr Lys Gly
    370                 375                 380

Val Ser Cys Ser Ile Gly Ser Asn Trp Val Gly Ile Ile Lys Gln Leu
385                 390                 395                 400

Pro Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp Thr Val Thr
                405                 410                 415

Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly Glu Gln His
            420                 425                 430

Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro Ile Lys Phe
        435                 440                 445

Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe Glu Ser Ile
    450                 455                 460

Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Lys Ile Leu Asn Ser
465                 470                 475                 480

Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Val Ile Leu Val Ala
                485                 490                 495
```

```
Val Leu Gly Leu Thr Met Ile Ser Val Ser Ile Ile Ile Ile Ile Lys
            500                 505                 510

Lys Thr Arg Lys Pro Thr Gly Ala Pro Pro Glu Leu Asn Gly Val Thr
        515                 520                 525

Asn Gly Gly Phe Ile Pro His Ser
    530                 535
```

<210> 7
<211> 539
<212> PRT
<213> Human metapneumovirus

<400> 7

```
Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110

Ala Thr Ala Ala Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile
        115                 120                 125

Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Lys Thr
    130                 135                 140
```

```
Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160

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

Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Phe Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Gly Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
```

```
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile
465                 470                 475                 480

Leu Ser Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Ile Ala Val Leu Gly Ser Thr Met Ile Leu Val Ser Val Phe Ile
            500                 505                 510

Ile Ile Lys Lys Thr Lys Lys Pro Thr Gly Ala Pro Pro Glu Leu Ser
        515                 520                 525

Gly Val Thr Asn Asn Gly Phe Ile Pro His Asn
    530                 535
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<210> 8
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<212> PRT
<213> Human metapneumovirus

<400> 8

```
Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110

Ala Thr Ala Ala Ala Val Thr Ala Gly Ile Ala Ile Ala Lys Thr Ile
        115                 120                 125

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

Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160

Ala Val Arg Glu Leu Lys Glu Phe Val Ser Lys Asn Leu Thr Ser Ala
                165                 170                 175

Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220
```

```
Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Ile Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Asp Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Lys Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Arg Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430
```

```
Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Lys Ile
465                 470                 475                 480

Leu Asn Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Ile Ala Val Leu Gly Leu Thr Met Ile Ser Val Ser Ile Ile Ile
            500                 505                 510

Ile Ile Lys Lys Thr Arg Lys Pro Thr Gly Ala Pro Pro Glu Leu Asn
        515                 520                 525

Gly Val Thr Asn Gly Gly Phe Ile Pro His Ser
    530                 535
```

<210> 9
<211> 539
<212> PRT
<213> Human metapneumovirus

<400> 9

```
Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80
```

```
Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110

Ala Thr Ala Ala Ala Val Thr Ala Gly Ile Ala Ile Ala Lys Thr Ile
        115                 120                 125

Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly Ala Leu Lys Gln Thr
    130                 135                 140

Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160

Ala Val Arg Glu Leu Lys Glu Phe Val Ser Lys Asn Leu Thr Ser Ala
                165                 170                 175

Ile Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Ile Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr Ala Cys Leu Leu Arg
```

```
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Arg Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Ile Arg Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Glu Gln Ser Asn Lys Ile
465                 470                 475                 480

Leu Asn Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Val Ala Val Leu Gly Leu Thr Met Ile Ser Val Ser Ile Ile Ile
            500                 505                 510
```

```
Ile Ile Lys Lys Thr Arg Lys Pro Thr Gly Ala Pro Pro Glu Leu Asn
        515                 520                 525


Gly Val Thr Asn Gly Gly Phe Ile Pro His Ser
    530                 535


<210>  10
<211>  539
<212>  PRT
<213>  Human metapneumovirus

<400>  10

Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60


Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110


Ala Thr Ala Ala Ala Val Thr Ala Gly Ile Ala Ile Ala Lys Thr Ile
        115                 120                 125


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


Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160
```

```
Ala Val Arg Glu Leu Lys Glu Phe Val Ser Lys Asn Leu Thr Ser Ala
                165                 170                 175

Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Ile Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Asp Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Lys Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Arg Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365
```

```
Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Lys Ile
465                 470                 475                 480

Leu Asn Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Ile Ile
                485                 490                 495

Leu Ile Ala Val Leu Gly Leu Thr Met Ile Ser Val Ser Ile Ile Ile
            500                 505                 510

Ile Ile Lys Lys Thr Arg Lys Pro Thr Gly Ala Pro Pro Glu Leu Asn
        515                 520                 525

Gly Val Thr Asn Gly Gly Phe Ile Pro His Ser
    530                 535
```

<210> 11
<211> 523
<212> PRT
<213> Artificial sequence

<220>
<223> Artificial sequence

<400> 11

```
Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Val Ala
            100                 105                 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn
        115                 120                 125

Ala Leu Lys Lys Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Ala Thr Ala Val Arg Glu Leu Lys Asp Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Arg Ala Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro
    210                 215                 220
```

```
Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Phe Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Val Lys Ala Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Lys Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Arg Val Gly Ile Ile Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430
```

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

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Arg Ile Leu Ser Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480

Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495

Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
            500                 505                 510

His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
        515                 520
```

<210> 12
<211> 523
<212> PRT
<213> Artificial sequence

<220>
<223> Artificial sequence

<400> 12

```
Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80
```

```
Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Ile Ala
            100                 105                 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly
        115                 120                 125

Ala Leu Lys Gln Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Ala Thr Ala Val Arg Glu Leu Lys Glu Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Ser Ala Ile Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Ile Lys Ala Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly
    290                 295                 300
```

```
Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Arg Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Trp Val Gly Ile Ile Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Lys Ile Leu Asn Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480

Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495

Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
            500                 505                 510
```

His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
515 520

<210> 13
<211> 523
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 13

Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1 5 10 15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
20 25 30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
35 40 45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
50 55 60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65 70 75 80

Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
85 90 95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Val Thr Ala Gly Val Ala
100 105 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn
115 120 125

Ala Leu Lys Lys Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
130 135 140

Arg Val Leu Ala Thr Ala Val Arg Glu Leu Lys Asp Phe Val Ser Lys
145 150 155 160

```
Asn Leu Thr Arg Ala Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Phe Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Val Lys Ala Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Lys Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380
```

```
Arg Val Gly Ile Ile Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400


Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415


Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430


Ser Ser Phe Asp Pro Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445


Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460


Gln Ser Asn Arg Ile Leu Ser Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480


Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495


Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
            500                 505                 510


His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
        515                 520


<210>  14
<211>  523
<212>  PRT
<213>  Artificial sequence

<220>
<223>  artificial

<400>  14

Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30
```

```
Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Val Thr Ala Gly Ile Ala
            100                 105                 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly
        115                 120                 125

Ala Leu Lys Gln Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Ala Thr Ala Val Arg Glu Leu Lys Glu Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Ser Ala Ile Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240
```

```
Arg Arg Lys Gly Phe Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Ile Lys Ala Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Arg Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Trp Val Gly Ile Ile Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460
```

```
Gln Ser Asn Lys Ile Leu Asn Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480


Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495


Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
            500                 505                 510


His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
        515                 520


<210>  15
<211>  529
<212>  PRT
<213>  Artificial sequence

<220>
<223>  artificial

<400>  15

Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60


Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Val Ala
            100                 105                 110
```

```
Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn
        115                 120                 125

Ala Leu Lys Lys Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Ala Phe Ala Val Arg Glu Leu Lys Asp Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Arg Ala Leu Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Phe Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Val Lys Ala Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320
```

```
His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Lys Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Arg Val Gly Ile Ile Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Arg Ile Leu Ser Ser Ala Glu Ser Ala Ile Gly Gly Tyr
465                 470                 475                 480

Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly
                485                 490                 495

Glu Trp Val Leu Leu Ser Thr Phe Leu Gly Gly Leu Val Pro Arg Gly
            500                 505                 510

Ser His His His His His His Ser Ala Trp Ser His Pro Gln Phe Glu
        515                 520                 525

Lys
```

<210> 16
<211> 523
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 16

```
Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


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


Ser Leu Leu Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Asn
65                  70                  75                  80


Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Val Ala
            100                 105                 110


Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn
        115                 120                 125


Ala Leu Lys Lys Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140


Arg Val Leu Ala Thr Met Val Arg Glu Leu Lys Asp Phe Val Ser Lys
145                 150                 155                 160


Asn Leu Thr Arg Ala Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175
```

```
Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Val Lys Ala Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Lys Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380
```

```
Arg Val Gly Ile Ile Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400


Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415


Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430


Ser Ser Phe Asp Pro Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445


Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460


Gln Ser Asn Arg Ile Leu Ser Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480


Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495


Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
            500                 505                 510


His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
        515                 520


<210>  17
<211>  523
<212>  PRT
<213>  Artificial sequence

<220>
<223>  artificial

<400>  17

Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30
```

```
Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

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

Ser Leu Leu Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Val Ala
            100                 105                 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn
        115                 120                 125

Ala Leu Lys Lys Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Ala Thr Met Val Arg Glu Leu Cys Asp Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Arg Ala Ile Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Phe Leu Ile Gly Val Tyr Gly Ser Asp Val
                245                 250                 255
```

```
Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Val Lys Ala Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Lys Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Arg Val Gly Ile Ile Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460
```

```
Gln Ser Asn Arg Cys Cys Ser Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480


Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495


Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
            500                 505                 510


His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
        515                 520


<210>  18
<211>  529
<212>  PRT
<213>  Artificial sequence

<220>
<223>  artificial

<400>  18

Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


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


Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Val Ala
            100                 105                 110
```

```
Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Thr Ala Trp Lys Asn
        115                 120                 125

Ala Leu Lys Lys Thr Asn Glu Val Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Val Thr Met Val Arg Glu Leu Lys Asp Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Arg Ala Leu Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Phe Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Val Lys Ala Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335
```

```
Lys Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Arg Val Gly Ile Ile Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Arg Ile Leu Ser Ser Ala Glu Ser Ala Ile Gly Gly Tyr
465                 470                 475                 480

Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly
                485                 490                 495

Glu Trp Val Leu Leu Ser Thr Phe Leu Gly Gly Leu Val Pro Arg Gly
            500                 505                 510

Ser His His His His His His Ser Ala Trp Ser His Pro Gln Phe Glu
        515                 520                 525

Lys
```

<210> 19
<211> 540
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 19

```
Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                  10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60


Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110


Cys Thr Ala Ala Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile
        115                 120                 125


Arg Leu Glu Ser Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Lys Thr
    130                 135                 140


Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Phe
145                 150                 155                 160


Ala Val Arg Glu Leu Lys Asp Phe Val Ser Lys Asn Leu Thr Arg Ala
                165                 170                 175
```

```
Leu Asn Lys Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Asn Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Phe Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Cys Gly Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile
385                 390                 395                 400
```

```
Lys Gln Leu Asn Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
               405                 410                 415


Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430


Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445


Val Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460


Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile
465                 470                 475                 480


Leu Ser Ser Ala Glu Ser Ala Ile Gly Gly Tyr Ile Pro Glu Ala Pro
               485                 490                 495


Arg Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu
            500                 505                 510


Ser Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His
        515                 520                 525


His His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
    530                 535                 540


<210>  20
<211>  540
<212>  PRT
<213>  artificial sequence

<220>
<223>  artificial

<400>  20

Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30
```

```
Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110

Cys Thr Ala Ala Ala Val Thr Ala Gly Ile Ala Ile Ala Lys Thr Ile
        115                 120                 125

Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly Ala Leu Lys Gln Thr
    130                 135                 140

Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Phe
145                 150                 155                 160

Ala Val Arg Glu Leu Lys Glu Phe Val Ser Lys Asn Leu Thr Ser Ala
                165                 170                 175

Leu Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190

Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205

Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240
```

```
Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Ile Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Cys Gly Ile Asn Val Ala Glu Gln Ser Arg Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Trp Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415

Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460
```

```
Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Lys Ile
465                 470                 475                 480


Leu Asn Ser Ala Glu Ser Ala Ile Gly Gly Tyr Ile Pro Glu Ala Pro
                485                 490                 495


Arg Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu
            500                 505                 510


Ser Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His
        515                 520                 525


His His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
    530                 535                 540


<210>  21
<211>  538
<212>  PRT
<213>  Artificial sequence

<220>
<223>  artificial

<400>  21

Met Ser Trp Lys Val Val Ile Ile Phe Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Ala Asp Gly Pro
    50                  55                  60


Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Arg Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95
```

```
Asn Pro Arg Gln Ser Lys Lys Arg Lys Arg Arg Val Ala Thr Ala Ala
            100                 105                 110

Ala Val Thr Ala Gly Val Ala Ile Ala Lys Thr Ile Arg Leu Glu Ser
        115                 120                 125

Glu Val Thr Ala Ile Lys Asn Ala Leu Lys Lys Thr Asn Glu Ala Val
    130                 135                 140

Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr Ala Val Arg Glu
145                 150                 155                 160

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

Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser Phe Ser Gln Phe
            180                 185                 190

Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser Asp Asn Ala Gly
        195                 200                 205

Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp Ala Glu Leu Ala
    210                 215                 220

Arg Ala Val Ser Asn Met Pro Thr Ser Ala Gly Gln Ile Lys Leu Met
225                 230                 235                 240

Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe Gly Phe Leu Ile
                245                 250                 255

Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln Leu Pro Ile Phe
            260                 265                 270

Gly Val Ile Asp Thr Pro Cys Trp Ile Val Lys Ala Ala Pro Ser Cys
        275                 280                 285

Ser Glu Lys Lys Gly Asn Tyr Ala Cys Leu Leu Arg Glu Asp Gln Gly
    290                 295                 300
```

```
Trp Tyr Cys Gln Asn Ala Gly Ser Thr Val Tyr Tyr Pro Asn Glu Lys
305                 310                 315                 320

Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp Thr Ala Ala Gly
                325                 330                 335

Ile Asn Val Ala Glu Gln Ser Lys Glu Cys Asn Ile Asn Ile Ser Thr
            340                 345                 350

Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His Pro Ile Ser Met
        355                 360                 365

Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys Tyr Lys Gly Val
    370                 375                 380

Ser Cys Ser Ile Gly Ser Asn Arg Val Gly Ile Ile Lys Gln Leu Asn
385                 390                 395                 400

Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp Thr Val Thr Ile
                405                 410                 415

Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly Glu Gln His Val
            420                 425                 430

Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro Val Lys Phe Pro
        435                 440                 445

Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe Glu Ser Ile Glu
    450                 455                 460

Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Arg Ile Leu Ser Ser Ala
465                 470                 475                 480

Glu Lys Gly Asn Thr Ser Gly Arg Glu Asn Leu Tyr Phe Gln Gly Gly
                485                 490                 495

Gly Gly Ser Gly Tyr Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr
            500                 505                 510

Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser Thr Phe Leu Gly Gly
        515                 520                 525
```

Ile Glu Gly Arg His His His His His His
530 535

<210> 22
<211> 550
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 22

Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1 5 10 15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
20 25 30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
35 40 45

Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
50 55 60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65 70 75 80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
85 90 95

Asn Pro Arg Gln Ser Lys Lys Arg Lys Arg Arg Val Ala Thr Ala Ala
100 105 110

Ala Val Thr Ala Gly Ile Ala Ile Ala Lys Thr Ile Arg Leu Glu Ser
115 120 125

Glu Val Asn Ala Ile Lys Gly Ala Leu Lys Gln Thr Asn Glu Ala Val
130 135 140

Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr Ala Val Arg Glu
145 150 155 160

```
Leu Lys Glu Phe Val Ser Lys Asn Leu Thr Ser Ala Ile Asn Arg Asn
                165                 170                 175

Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser Phe Ser Gln Phe
            180                 185                 190

Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser Asp Asn Ala Gly
        195                 200                 205

Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp Ala Glu Leu Ala
    210                 215                 220

Arg Ala Val Ser Tyr Met Pro Thr Ser Ala Gly Gln Ile Lys Leu Met
225                 230                 235                 240

Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe Gly Ile Leu Ile
                245                 250                 255

Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln Leu Pro Ile Phe
            260                 265                 270

Gly Val Ile Asp Thr Pro Cys Trp Ile Ile Lys Ala Ala Pro Ser Cys
        275                 280                 285

Ser Glu Lys Asn Gly Asn Tyr Ala Cys Leu Leu Arg Glu Asp Gln Gly
    290                 295                 300

Trp Tyr Cys Lys Asn Ala Gly Ser Thr Val Tyr Tyr Pro Asn Glu Lys
305                 310                 315                 320

Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp Thr Ala Ala Gly
                325                 330                 335

Ile Asn Val Ala Glu Gln Ser Arg Glu Cys Asn Ile Asn Ile Ser Thr
            340                 345                 350

Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His Pro Ile Ser Met
        355                 360                 365
```

```
Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys Tyr Lys Gly Val
    370                 375                 380

Ser Cys Ser Ile Gly Ser Asn Trp Val Gly Ile Ile Lys Gln Leu Pro
385                 390                 395                 400

Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp Thr Val Thr Ile
                405                 410                 415

Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly Glu Gln His Val
            420                 425                 430

Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro Ile Lys Phe Pro
        435                 440                 445

Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe Glu Ser Ile Glu
    450                 455                 460

Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Lys Ile Leu Asn Ser Ala
465                 470                 475                 480

Glu Lys Gly Asn Thr Ser Gly Arg Glu Asn Leu Tyr Phe Gln Gly Gly
                485                 490                 495

Gly Gly Ser Gly Tyr Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr
            500                 505                 510

Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser Thr Phe Leu Gly Gly
        515                 520                 525

Leu Val Pro Arg Gly Ser His His His His His His Ser Ala Trp Ser
    530                 535                 540

His Pro Gln Phe Glu Lys
545                 550
```

<210> 23
<211> 27
<212> PRT
<213> Artificial sequence

<220>

<223> artificial

<400> 23

Gly Tyr Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr Val Arg Lys
1 5 10 15

Asp Gly Glu Trp Val Leu Leu Ser Thr Phe Leu
20 25

<210> 24
<211> 27
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 24

Gly Tyr Ile Pro Glu Ala Pro Arg Asn Gly Thr Ala Tyr Val Arg Lys
1 5 10 15

Asp Gly Glu Trp Val Leu Leu Ser Thr Phe Leu
20 25

<210> 25
<211> 27
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 25

Gly Tyr Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr Val Arg Lys
1 5 10 15

Asn Gly Thr Trp Val Leu Leu Ser Thr Phe Leu
20 25

<210> 26
<211> 27
<212> PRT
<213> Artificial sequence

<220>

<223> artificial

<400> 26

Gly Tyr Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr Val Arg Lys
1 5 10 15

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gcttggtccc atccacagtt cgagaagtga 1590

<210> 39
<211> 1623
<212> DNA
<213> Artificial sequence

<220>

<223> artificial

<400> 39
atgtcttgga aggtggtcat catcttctcc ctgctgatca cccctcagca cggcctgaaa 60

gagtcctacc tggaagagag ctgctccacc atcaccgagg gctacctgtc tgtgctgaga 120

accggctggt acaccaacgt gttcaccctg gaagtgggcg acgtggaaaa cctgacctgt 180

gctgatggcc ccagcctgat caagaccgag ctggacctga ccaagtctgc cctgagagaa 240

ctgaggaccg tgtctgccga tcagctggcc agagaggaac agatcgagaa ccctcggcag 300

tccagattcg tgctgggagc tattgctctg ggcgtgtgta cagccgctgc tgtgacagct 360

ggtgtcgcta tcgccaagac catccggctg gaatctgaag tgaccgccat caagaacgcc 420

ctgaaaaaga ccaacgaggc cgtgtccaca ctcggcaatg gcgttagagt gctggccttt 480

gctgtgcgcg agctgaagga cttcgtgtcc aagaacctga ccagggctct gaacaagaac 540

aagtgtgata tcgccgacct gaagatggcc gtgtctttca gccagttcaa ccggcggttc 600

ctgaacgtcg tgcggcagtt ctctgataac gccggcatca cccctgccat cagcctggat 660

ctgatgaccg atgccgagct ggctagagcc gtgtctaaca tgcctacctc tgccggccag 720

atcaagctga tgctggaaaa cagagccatg gtccgacgga aaggcttcgg ctttctgatc 780

ggcgtgtacg gctcctccgt gatctacatg gtgcagctgc ctatcttcgg cgtgatcgac 840

acccttgct ggatcgtgaa ggccgctcct agctgctctg agaagaaggg caactacgcc 900

tgcctgctga gagaggacca aggctggtac tgtcagaacg ccggctccac cgtgtactac 960

cccaacgaga aggactgcga gacaagaggc gaccacgtgt tctgcgatac cgcctgtggc 1020

atcaatgtgg ccgagcagtc caaagagtgc aacatcaaca tctccaccac caactatccc 1080

tgcaaggtgt ccaccggcag gcaccctatt tccatggtgg ctctgtctcc actgggcgcc 1140

ctggtggctt gttataaggg cgtgtcctgc tccatcggct ccaacagagt gggcatcatc 1200

aagcagctga acaagggctg cagctacatc accaaccagg acgccgatac cgtgaccatc 1260

gacaataccg tgtatcagct gtccaaggtg gaaggcgagc agcacgtgat caagggcaga 1320

cctgtgtcct ccagcttcga ccccgtgaag ttccctgagg atcagttcaa cgtggccctg 1380

gaccaggtgt tcgagtccat cgagaactct caggctctgg tggaccagtc caaccggatc 1440

ctgtcctctg ccgagtctgc tatcggcggc tatatccccg aggctcctag agatggccag 1500

gcctatgttc ggaaggatgg cgaatgggtg ctgctgtcta ccttcctcgg aggcctggtg 1560

cctagaggct ctcaccacca tcatcaccac tccgcttggt cccatccaca gttcgagaag 1620

tga 1623

<210> 40
<211> 1617
<212> DNA
<213> Artificial sequence

<220>
<223> artificial

<400> 40
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accggctggt acaccaacgt gttcaccctg gaagtgggcg acgtggaaaa cctgacctgc 180

gccgatggcc ccagcctgat caagaccgag ctggacctga ccaagtccgc cctgcgggaa 240

ctgagaaccg tgtctgccga tcagctggcc agagaggaac agatcgagaa cccccggcag 300

tccaagaaac ggaagcggag agtggccacc gccgctgctg tgacagctgg cgtggccatt 360

gccaagacca tccggctgga atccgaagtg accgccatca agaacgccct gaaaaagacc 420

aacgaggccg tgtctaccct gggcaatggc gtgcgagtgc tggctacagc tgtgcgcgag 480

ctgaaggact tcgtgtccaa gaacctgacc cgggccatca acaagaacaa gtgtgatatc 540

gccgacctga agatggccgt gtcctttagc cagttcaacc ggcggttcct gaacgtcgtg 600

cggcagttct ctgacaacgc cggcatcacc cctgccatct ccctggatct gatgaccgac 660

gccgagctgg ctagagccgt gtccaacatg cctacctctg ccggccagat caagctgatg 720

ctggaaaacc gggccatggt gcgacggaag ggcttcggct ttctgatcgg cgtgtacggc 780

tcctccgtga tctacatggt gcagctgcct atcttcggcg tgatcgacac cccctgctgg 840

atcgtgaagg ccgctcctag ctgctccgag aagaagggca actacgcctg cctgctgaga 900

gaggaccagg gctggtactg tcagaacgcc ggctccaccg tgtactaccc caacgagaag 960

gactgcgaga cacggggcga ccacgtgttc tgtgataccg ctgctggcat caacgtggcc 1020

gagcagtcca aagagtgcaa catcaacatc tccaccacca actacccctg caaggtgtcc 1080

accggcaggc accccatctc tatggtggcc ctgtctcctc tgggcgccct ggtggcttgt 1140

tacaagggcg tgtcctgctc catcggctcc aacagagtgg gcatcatcaa gcagctgaac 1200

aagggctgca gctacatcac caaccaggac gccgacaccg tgaccatcga caataccgtg 1260

tatcagctgt ccaaggtgga aggcgagcag cacgtgatca agggcagacc cgtgtcctcc 1320

agcttcgacc ccgtgaagtt ccccgaggat cagttcaatg tggccctgga ccaggtgttc 1380

gagtccatcg agaactccca ggctctggtg gaccagtcca accggatcct gtcctctgcc 1440

gagaagggaa acacctccgg cagagagaac ctgtattttc aaggcggcgg aggctccggc 1500

tacatccctg aggctcctag agatggccag gcctacgtgc ggaaggatgg cgaatgggtg 1560

ctgctgtcca ccttcctggg cggcatcgag ggcagacacc accatcatca ccactga 1617

<210> 41
<211> 276
<212> PRT
<213> Human metapneumovirus

<400> 41

Met Gly His His His His His His His His His His Ser Ser Gly His
1 5 10 15

Ile Asp Asp Asp Asp Lys Gln Glu Ser Tyr Leu Val Asp Thr Tyr Gln
20 25 30

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

Leu Leu Pro Ala Ser Leu Thr Ile Trp Phe Pro Leu Phe Gln Ala Asn
50 55 60

Thr Pro Pro Ala Val Leu Leu Asp Gln Leu Lys Thr Leu Thr Ile Thr
65 70 75 80

Thr Leu Tyr Ala Ala Ser Gln Ser Gly Pro Ile Leu Lys Val Asn Ala
85 90 95

Ser Ala Gln Gly Ala Ala Met Ser Val Leu Pro Lys Lys Phe Glu Val
100 105 110

Asn Ala Thr Val Ala Leu Asp Glu Tyr Ser Lys Leu Glu Phe Asp Lys
115 120 125

```
Leu Thr Val Cys Glu Val Lys Thr Val Tyr Leu Thr Thr Met Lys Pro
    130                 135                 140

Tyr Gly Met Val Ser Lys Phe Val Ser Ser Ala Lys Pro Val Gly Lys
145                 150                 155                 160

Lys Thr His Asp Leu Ile Ala Leu Cys Asp Phe Met Asp Leu Glu Lys
                165                 170                 175

Asn Thr Pro Val Thr Ile Pro Ala Phe Ile Lys Ser Val Ser Ile Lys
            180                 185                 190

Glu Ser Glu Ser Ala Thr Val Glu Ala Ala Ile Ser Ser Glu Ala Asp
        195                 200                 205

Gln Ala Leu Thr Gln Ala Lys Ile Ala Pro Tyr Ala Gly Leu Ile Met
    210                 215                 220

Ile Met Thr Met Asn Asn Pro Lys Gly Ile Phe Lys Lys Leu Gly Ala
225                 230                 235                 240

Gly Thr Gln Val Ile Val Glu Leu Gly Ala Tyr Val Gln Ala Glu Ser
                245                 250                 255

Ile Ser Lys Ile Cys Lys Thr Trp Ser His Gln Gly Thr Arg Tyr Val
            260                 265                 270

Leu Lys Ser Arg
        275
```

<210> 42
<211> 18
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 42

```
Cys Cys Lys Gln Thr Asn Glu Cys Cys Lys Asn Leu Glu Arg Ala Val
1               5                   10                  15
```

Ser Ala

<210> 43
<211> 18
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 43

Cys Cys Arg Glu Leu Lys Glu Cys Cys Lys Asn Leu Glu Asn Ala Val
1 5 10 15

Ser Ala

<210> 44
<211> 18
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 44

Cys Cys Arg Glu Leu Lys Asp Cys Cys Lys Asn Leu Glu Asn Ala Val
1 5 10 15

Ser Ala

<210> 45
<211> 18
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 45

Cys Cys Arg Glu Leu Lys Asp Cys Cys Lys Asn Leu Glu Arg Ala Val
1 5 10 15

Ser Ala

<210> 46
<211> 18
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 46

Cys Cys Arg Glu Leu Lys Asp Cys Cys Lys Gln Leu Asn Lys Ala Val
1 5 10 15

Ser Ala

<210> 47
<211> 18
<212> PRT
<213> Artificial sequuence

<220>
<223> artificial

<400> 47

Cys Cys Arg Glu Leu Lys Glu Cys Cys Lys Gln Leu Asn Lys Ala Val
1 5 10 15

Ser Ala

<210> 48
<211> 1566
<212> DNA
<213> Artificial sequence

<220>
<223> artificial

<400> 48
atgatcatta tctccctgct gatcaccccc cagcacggcc tgaaagagtc ctacctggaa 60

gagagctgct ccaccatcac cgagggctac ctgtctgtgc tgcggaccgg ctggtacacc 120

aacgtgttca ccctggaagt gggcgacgtg gaaaacctga cctgcaccga tggccccagc 180

ctgatcaaga ccgagctgga cctgaccaag tccgccctgc gcgagctgaa aaccgtgtct 240

gccgatcagc tggccagaga ggaacagatc gagaaccccc ggcagtccaa gaaacggaag 300

cggagagtgg ccaccgccgc tgctgtgaca gctggaatcg ctatcgccaa gaccatccgg 360

ctggaatccg aagtgaacgc catcaagggc gctctgaagc agaccaacga ggccgtgtct 420

accctgggca atggcgtgcg agtgctggct acagctgtgc gggaactgaa agaattcgtg 480

tccaagaacc tgaccagcgc catcaaccgg aacaagtgtg atatcgccga cctgaagatg 540

gccgtgtcct tcagccagtt caaccggcgg ttcctgaacg tcgtgcggca gttctctgac 600

aacgccggca tcacccctgc catctccctg gatctgatga ccgacgccga gctggctaga 660

gccgtgtctt acatgcctac ctctgccggc cagatcaagc tgatgctgga aaaccgggcc 720

atggtgcgac ggaagggctt cggcatcctg atcggcgtgt acggctcctc cgtgatctac 780

atggtgcagc tgcctatctt cggcgtgatc gacacccccc gctggattat caaggccgct 840

cccagctgct ccgagaagaa cggcaactac gcctgcctgc tgagagagga ccagggctgg 900

tactgcaaga acgccggctc caccgtgtac taccccaacg agaaggactg cgagacacgg 960

ggcgaccacg tgttctgtga taccgctgct ggcatcaacg tggccgagca gtccagagag 1020

tgcaacatca acatctccac caccaactac ccctgcaagg tgtccaccgg caggcacccc 1080

atctctatgg tggccctgtc tcctctggga gccctggtgg cttgttacaa gggcgtgtcc 1140

tgctccatcg gctccaactg ggtgggaatc atcaagcagc tgcccaaggg ctgcagctac 1200

atcaccaacc aggacgccga caccgtgacc atcgacaata ccgtgtatca gctgtccaag 1260

gtggaaggcg agcagcacgt gatcaagggc agacccgtgt ccagctcctt cgaccccatc 1320

aagttccccg aggatcagtt caatgtggcc ctggaccagg tgttcgagtc catcgagaac 1380

tcccaggctc tggtggacca gtccaacaag atcctgaact ccgccgagaa gggcaacacc 1440

tccggcagag agaacctgta ttttcaaggc ggcggaggct ccggctacat ccctgaggct 1500

cctagagatg gccaggccta cgtgcggaag gatggcgaat gggtgctgct gtccaccttc 1560

ctgtga 1566

<210> 49
<211> 539
<212> PRT

<213> Human metapneumovirus

<400> 49

```
Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                  10                  15


His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30


Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45


Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60


Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80


Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95


Asn Pro Arg Gln Ser Arg Phe Val Leu Gly Ala Ile Ala Leu Gly Val
            100                 105                 110


Ala Thr Ala Ala Ala Val Thr Ala Gly Ile Ala Ile Ala Lys Thr Ile
        115                 120                 125


Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly Ala Leu Lys Gln Thr
    130                 135                 140


Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val Arg Val Leu Ala Thr
145                 150                 155                 160


Ala Val Arg Glu Leu Lys Glu Phe Val Ser Lys Asn Leu Thr Ser Ala
                165                 170                 175


Ile Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu Lys Met Ala Val Ser
            180                 185                 190


Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val Val Arg Gln Phe Ser
        195                 200                 205
```

```
Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu Asp Leu Met Thr Asp
    210                 215                 220

Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro Thr Ser Ala Gly Gln
225                 230                 235                 240

Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val Arg Arg Lys Gly Phe
                245                 250                 255

Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val Ile Tyr Met Val Gln
            260                 265                 270

Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys Trp Ile Ile Lys Ala
        275                 280                 285

Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr Ala Cys Leu Leu Arg
    290                 295                 300

Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly Ser Thr Val Tyr Tyr
305                 310                 315                 320

Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp His Val Phe Cys Asp
                325                 330                 335

Thr Ala Ala Gly Ile Asn Val Ala Glu Gln Ser Arg Glu Cys Asn Ile
            340                 345                 350

Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val Ser Thr Gly Arg His
        355                 360                 365

Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly Ala Leu Val Ala Cys
    370                 375                 380

Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn Trp Val Gly Ile Ile
385                 390                 395                 400

Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr Asn Gln Asp Ala Asp
                405                 410                 415
```

```
Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu Ser Lys Val Glu Gly
            420                 425                 430

Glu Gln His Val Ile Lys Gly Arg Pro Val Ser Ser Ser Phe Asp Pro
        435                 440                 445

Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala Leu Asp Gln Val Phe
    450                 455                 460

Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp Gln Ser Asn Lys Ile
465                 470                 475                 480

Leu Asn Ser Ala Glu Lys Gly Asn Thr Gly Phe Ile Ile Val Val Ile
                485                 490                 495

Leu Val Ala Val Leu Gly Leu Thr Met Ile Ser Val Ser Ile Ile Ile
            500                 505                 510

Ile Ile Lys Lys Thr Arg Lys Pro Thr Gly Ala Pro Pro Glu Leu Asn
        515                 520                 525

Gly Val Thr Asn Gly Gly Phe Ile Pro His Ser
    530                 535


<210>  50
<211>  529
<212>  PRT
<213>  Artificial sequence

<220>
<223>  artificial

<400>  50

Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1               5                   10                  15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
            20                  25                  30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45
```

```
Thr Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60

Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Ile Ala
            100                 105                 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly
        115                 120                 125

Ala Leu Lys Gln Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

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

Asn Leu Thr Ser Ala Leu Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270
```

```
Trp Ile Ile Lys Ala Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Arg Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Trp Val Gly Ile Ile Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Lys Ile Leu Asn Ser Ala Glu Ser Ala Ile Gly Gly Tyr
465                 470                 475                 480
```

Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly
485 490 495

Glu Trp Val Leu Leu Ser Thr Phe Leu Gly Gly Leu Val Pro Arg Gly
500 505 510

Ser His His His His His His Ser Ala Trp Ser His Pro Gln Phe Glu
515 520 525

Lys

<210> 51
<211> 523
<212> PRT
<213> Artificial sequnce

<220>
<223> artificial

<400> 51

Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1 5 10 15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
20 25 30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
35 40 45

Met Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
50 55 60

Ser Leu Leu Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Asn
65 70 75 80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
85 90 95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Ile Ala
100 105 110

```
Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly
        115                 120                 125

Ala Leu Lys Gln Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Ala Thr Met Val Arg Glu Leu Lys Glu Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Ser Ala Ile Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Ile Lys Ala Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335
```

```
Arg Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Trp Val Gly Ile Ile Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Lys Ile Leu Asn Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480

Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495

Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
            500                 505                 510

His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
        515                 520
```

<210> 52
<211> 523
<212> PRT
<213> Artificial sequence

<220>
<223> artificial

<400> 52

Met Ser Trp Lys Val Met Ile Ile Ile Ser Leu Leu Ile Thr Pro Gln
1 5 10 15

His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
20 25 30

Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
35 40 45

Met Leu Cys Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
50 55 60

Ser Leu Leu Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65 70 75 80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
85 90 95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Ile Ala
100 105 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Asn Ala Ile Lys Gly
115 120 125

Ala Leu Lys Gln Thr Asn Glu Ala Val Ser Thr Leu Gly Asn Gly Val
130 135 140

Arg Val Leu Ala Thr Met Val Arg Glu Leu Cys Glu Phe Val Ser Lys
145 150 155 160

Asn Leu Thr Ser Ala Ile Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu
165 170 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
180 185 190

```
Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Ile Leu Ile Gly Val Tyr Gly Ser Asp Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270

Trp Ile Ile Lys Ala Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Arg Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Trp Val Gly Ile Ile Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415
```

```
Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Lys Cys Cys Asn Ala Gly Tyr Ile Pro Glu Ala Pro Arg
465                 470                 475                 480

Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly Glu Trp Val Leu Leu Ser
                485                 490                 495

Thr Phe Leu Gly Gly Leu Val Pro Arg Gly Ser His His His His His
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His Ser Ala Trp Ser His Pro Gln Phe Glu Lys
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His Gly Leu Lys Glu Ser Tyr Leu Glu Glu Ser Cys Ser Thr Ile Thr
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Glu Gly Tyr Leu Ser Val Leu Arg Thr Gly Trp Tyr Thr Asn Val Phe
        35                  40                  45

Met Leu Glu Val Gly Asp Val Glu Asn Leu Thr Cys Thr Asp Gly Pro
    50                  55                  60
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Ser Leu Ile Lys Thr Glu Leu Asp Leu Thr Lys Ser Ala Leu Arg Glu
65                  70                  75                  80

Leu Lys Thr Val Ser Ala Asp Gln Leu Ala Arg Glu Glu Gln Ile Glu
                85                  90                  95

Gln Pro Arg Gln Ser Gly Cys Gly Ala Gly Ala Thr Ala Gly Ile Ala
            100                 105                 110

Ile Ala Lys Thr Ile Arg Leu Glu Ser Glu Val Asn Ala Trp Lys Gly
        115                 120                 125

Ala Leu Lys Gln Thr Asn Glu Val Val Ser Thr Leu Gly Asn Gly Val
    130                 135                 140

Arg Val Leu Val Thr Met Val Arg Glu Leu Lys Glu Phe Val Ser Lys
145                 150                 155                 160

Asn Leu Thr Ser Ala Leu Asn Arg Asn Lys Cys Asp Ile Ala Asp Leu
                165                 170                 175

Lys Met Ala Val Ser Phe Ser Gln Phe Asn Arg Arg Phe Leu Asn Val
            180                 185                 190

Val Arg Gln Phe Ser Asp Asn Ala Gly Ile Thr Pro Ala Ile Ser Leu
        195                 200                 205

Asp Leu Met Thr Asp Ala Glu Leu Ala Arg Ala Val Ser Tyr Met Pro
    210                 215                 220

Thr Ser Ala Gly Gln Ile Lys Leu Met Leu Glu Asn Arg Ala Met Val
225                 230                 235                 240

Arg Arg Lys Gly Phe Gly Ile Leu Ile Gly Val Tyr Gly Ser Ser Val
                245                 250                 255

Ile Tyr Met Val Gln Leu Pro Ile Phe Gly Val Ile Asp Thr Pro Cys
            260                 265                 270
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Trp Ile Ile Lys Ala Ala Pro Ser Cys Ser Glu Lys Asn Gly Asn Tyr
        275                 280                 285

Ala Cys Leu Leu Arg Glu Asp Gln Gly Trp Tyr Cys Lys Asn Ala Gly
    290                 295                 300

Ser Thr Val Tyr Tyr Pro Asn Glu Lys Asp Cys Glu Thr Arg Gly Asp
305                 310                 315                 320

His Val Phe Cys Asp Thr Cys Ala Gly Ile Asn Val Ala Glu Gln Ser
                325                 330                 335

Arg Glu Cys Asn Ile Asn Ile Ser Thr Thr Asn Tyr Pro Cys Lys Val
            340                 345                 350

Ser Thr Gly Arg His Pro Ile Ser Met Val Ala Leu Ser Pro Leu Gly
        355                 360                 365

Ala Leu Val Ala Cys Tyr Lys Gly Val Ser Cys Ser Ile Gly Ser Asn
    370                 375                 380

Trp Val Gly Ile Ile Lys Gln Leu Pro Lys Gly Cys Ser Tyr Ile Thr
385                 390                 395                 400

Asn Gln Asp Ala Asp Thr Val Thr Ile Asp Asn Thr Val Tyr Gln Leu
                405                 410                 415

Ser Lys Val Glu Gly Glu Gln His Val Ile Lys Gly Arg Pro Val Ser
            420                 425                 430

Ser Ser Phe Asp Pro Ile Lys Phe Pro Glu Asp Gln Phe Asn Val Ala
        435                 440                 445

Leu Asp Gln Val Phe Glu Ser Ile Glu Asn Ser Gln Ala Leu Val Asp
    450                 455                 460

Gln Ser Asn Lys Ile Leu Asn Ser Ala Glu Ser Ala Ile Gly Gly Tyr
465                 470                 475                 480

Ile Pro Glu Ala Pro Arg Asp Gly Gln Ala Tyr Val Arg Lys Asp Gly
                485                 490                 495
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Glu Trp Val Leu Leu Ser Thr Phe Leu Gly Gly Leu Val Pro Arg Gly
500 505 510

Ser His His His His His His Ser Ala Trp Ser His Pro Gln Phe Glu
515 520 525

Lys

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