SEQUENCE LISTING

<110> IMMUNE DESIGN CORP.

<120> MATERIALS AND METHODS FOR PRODUCING IMPROVED LENTIVIRAL VECTOR PARTICLES

<130> 31943/46417A

<150> 13/436,472
<151> 2012-03-30

<150> 61/666,103
<151> 2012-06-29

<150> 61/732,756
<151> 2012-12-03

<150> 61/789,575
<151> 2012-03-15

<160> 68

<170> PatentIn version 3.5

<210> 1
<211> 423
<212> PRT
<213> Sindbis virus

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<221> misc_feature
<222> (160)..(160)
<223> Xaa can be any naturally occurring amino acid

<400> 1

Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1 5 10 15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
20 25 30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
35 40 45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
50 55 60

Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr Met
65 70 75 80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
85 90 95

Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val Thr

100 105 110

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
115 120 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
130 135 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Xaa
145 150 155 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
165 170 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
195 200 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
210 215 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225 230 235 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
245 250 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
260 265 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
275 280 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
290 295 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305 310 315 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
325 330 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
340 345 350

```
His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
        355                 360                 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
    370                 375                 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385                 390                 395                 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
                405                 410                 415

Cys Val Arg Ser Ala Asn Ala
            420
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<210> 2
<211> 986
<212> PRT
<213> Sindbis virus

<400> 2

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Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Ser Val Ile
    50                  55                  60

Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys Ser Tyr Cys
65                  70                  75                  80

His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu Gln Val Trp
                85                  90                  95

Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser Ala Gln Phe
            100                 105                 110

Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr Arg Tyr Met
        115                 120                 125

Ser Leu Lys Gln Met Tyr Pro Tyr Asp Val Pro Asp Tyr Ala Thr Val
    130                 135                 140
```

```
Lys Glu Gly Thr Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys
145                 150                 155                 160

Arg Arg Leu Ser Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro
                165                 170                 175

Gly Asp Ser Val Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser
            180                 185                 190

Cys Thr Leu Ala Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys
        195                 200                 205

Tyr Asp Leu Pro Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr
    210                 215                 220

Asp Arg Leu Ala Ala Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro
225                 230                 235                 240

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

Tyr Ala Lys Pro Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys
            260                 265                 270

Gly Asp Tyr Lys Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly
        275                 280                 285

Cys Thr Ala Ile Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys
    290                 295                 300

Trp Val Phe Asn Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala
305                 310                 315                 320

Gln Gly Lys Leu His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met
                325                 330                 335

Val Pro Val Ala His Ala Pro Asn Val Ile His Gly Phe Lys His Ile
            340                 345                 350

Ser Leu Gln Leu Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg
        355                 360                 365

Leu Gly Ala Asn Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr
    370                 375                 380

Val Arg Asn Phe Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly
385                 390                 395                 400
```

```
Asn His Glu Pro Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp
                405                 410                 415

Pro His Gly Trp Pro His Glu Ile Val Gln His Tyr Tyr His Arg His
            420                 425                 430

Pro Val Tyr Thr Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met
        435                 440                 445

Ile Gly Val Thr Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu
    450                 455                 460

Cys Leu Thr Pro Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser
465                 470                 475                 480

Leu Ala Leu Leu Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr
                485                 490                 495

Glu Thr Met Ser Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val
            500                 505                 510

Gln Leu Cys Ile Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys
        515                 520                 525

Ser Cys Cys Leu Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys
    530                 535                 540

Val Asp Ala Tyr Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile
545                 550                 555                 560

Pro Tyr Lys Ala Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu
                565                 570                 575

Glu Ile Thr Val Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu
            580                 585                 590

Tyr Ile Thr Cys Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys
        595                 600                 605

Cys Cys Gly Ser Leu Glu Cys Gln Pro Ala Ala His Ala Gly Tyr Thr
    610                 615                 620

Cys Lys Val Phe Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln
625                 630                 635                 640

Cys Phe Cys Asp Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu
                645                 650                 655
```

Leu Ser Ala Asp Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His
660 665 670

Thr Ala Ala Met Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr
675 680 685

Ser Phe Leu Asp Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys
690 695 700

Asp Leu Lys Val Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe
705 710 715 720

Asp His Lys Val Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe
725 730 735

Pro Glu Tyr Gly Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala
740 745 750

Thr Ser Leu Thr Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu
755 760 765

Leu Lys Pro Ser Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser
770 775 780

Ser Gly Phe Glu Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu
785 790 795 800

Thr Ala Pro Phe Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val
805 810 815

Asp Cys Ser Tyr Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala
820 825 830

Ala Phe Ile Arg Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys
835 840 845

Glu Val Ser Glu Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr
850 855 860

Leu Gln Tyr Val Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His
865 870 875 880

Ser Ser Thr Ala Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys
885 890 895

Gly Ala Val Thr Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe

900 905 910

Ile Val Ser Leu Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys
915 920 925

Pro Pro Ala Asp His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu
930 935 940

Phe Gln Ala Ala Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu
945 950 955 960

Phe Gly Gly Ala Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala
965 970 975

Cys Ser Met Met Leu Thr Ser Thr Arg Arg
980 985

<210> 3
<211> 982
<212> PRT
<213> Sindbis virus

<400> 3

Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1 5 10 15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
20 25 30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
50 55 60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65 70 75 80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
85 90 95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
100 105 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
115 120 125

Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr

130 135 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145 150 155 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
165 170 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
180 185 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
195 200 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu
210 215 220

Gly Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225 230 235 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
245 250 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
260 265 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
275 280 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
290 295 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305 310 315 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
325 330 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
340 345 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
355 360 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
370 375 380

```
Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385                 390                 395                 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
                405                 410                 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
            420                 425                 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
        435                 440                 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
    450                 455                 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465                 470                 475                 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
                485                 490                 495

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
            500                 505                 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu
        515                 520                 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
    530                 535                 540

Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545                 550                 555                 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val
                565                 570                 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
            580                 585                 590

Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
        595                 600                 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
    610                 615                 620

Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625                 630                 635                 640
```

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
645 650 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
660 665 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
675 680 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
690 695 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705 710 715 720

Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
725 730 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
740 745 750

Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
755 760 765

Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
770 775 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785 790 795 800

Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
805 810 815

Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
820 825 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
835 840 845

Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
850 855 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865 870 875 880

Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
885 890 895

```
Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975

Leu Thr Ser Thr Arg Arg
            980
```

<210> 4
<211> 982
<212> PRT
<213> Sindbis virus

<400> 4

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Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125
```

```
Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu
    210                 215                 220

Gly Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225                 230                 235                 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
                245                 250                 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
            260                 265                 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
        275                 280                 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
    290                 295                 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305                 310                 315                 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
                325                 330                 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
            340                 345                 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
        355                 360                 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
```

370 375 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385 390 395 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
405 410 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
420 425 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
435 440 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
450 455 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465 470 475 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
485 490 495

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
500 505 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu
515 520 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
530 535 540

Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545 550 555 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val
565 570 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
580 585 590

Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
595 600 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
610 615 620

```
Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625                 630                 635                 640

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
                645                 650                 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
            660                 665                 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
        675                 680                 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
    690                 695                 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705                 710                 715                 720

Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
                725                 730                 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
            740                 745                 750

Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
        755                 760                 765

Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
    770                 775                 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785                 790                 795                 800

Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
                805                 810                 815

Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
            820                 825                 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
        835                 840                 845

Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
    850                 855                 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865                 870                 875                 880
```

```
Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
                885                 890                 895

Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975

Leu Thr Ser Thr Arg Arg
            980
```

<210> 5
<211> 980
<212> PRT
<213> Sindbis virus

<400> 5

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110
```

```
Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Thr
    210                 215                 220

Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr
225                 230                 235                 240

Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser
                245                 250                 255

Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly
            260                 265                 270

Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys Gln
        275                 280                 285

Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro
    290                 295                 300

Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu
305                 310                 315                 320

Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala
                325                 330                 335

Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp Thr
            340                 345                 350

Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu
        355                 360                 365
```

```
Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val
    370                 375                 380

Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg
385                 390                 395                 400

Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His
                405                 410                 415

Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu
            420                 425                 430

Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala
        435                 440                 445

Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala
    450                 455                 460

Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys
465                 470                 475                 480

Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser Tyr Leu
                485                 490                 495

Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile Pro Leu
            500                 505                 510

Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu Pro Phe
        515                 520                 525

Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr Glu His
    530                 535                 540

Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala Leu Val
545                 550                 555                 560

Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val Met Ser
                565                 570                 575

Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys Lys Phe
            580                 585                 590

Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser Leu Glu
        595                 600                 605

Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe Gly Gly
```

610 615 620

Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp Ser Glu
625 630 635 640

Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp Cys Ala
645 650 655

Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met Lys Val
660 665 670

Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp Val Tyr
675 680 685

Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val Ile Ala
690 695 700

Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val Val Ile
705 710 715 720

His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala Met
725 730 735

Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr Ser Lys
740 745 750

Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser Ala Lys
755 760 765

Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu Met Trp
770 775 780

Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe Gly Cys
785 790 795 800

Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr Gly Asn
805 810 815

Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg Thr Ser
820 825 830

Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu Cys Thr
835 840 845

Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val Ser Asp
850 855 860

```
Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala Thr Leu
865                 870                 875                 880

Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr Val His
                885                 890                 895

Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu Cys Gly
            900                 905                 910

Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp His Ile
        915                 920                 925

Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala Ile Ser
    930                 935                 940

Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala Ser Ser
945                 950                 955                 960

Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met Leu Thr
                965                 970                 975

Ser Thr Arg Arg
            980
```

<210> 6
<211> 981
<212> PRT
<213> Sindbis virus

<400> 6

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95
```

```
Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu
    210                 215                 220

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
225                 230                 235                 240

Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro
                245                 250                 255

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
            260                 265                 270

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
        275                 280                 285

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
    290                 295                 300

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
305                 310                 315                 320

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
                325                 330                 335

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
            340                 345                 350
```

```
Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
        355                 360                 365

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
    370                 375                 380

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
385                 390                 395                 400

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
                405                 410                 415

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
            420                 425                 430

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
        435                 440                 445

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
    450                 455                 460

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
465                 470                 475                 480

Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser Tyr
                485                 490                 495

Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile Pro
            500                 505                 510

Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu Pro
        515                 520                 525

Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr Glu
    530                 535                 540

His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala Leu
545                 550                 555                 560

Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val Met
                565                 570                 575

Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys Lys
            580                 585                 590

Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser Leu
        595                 600                 605
```

```
Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe Gly
    610                 615                 620

Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp Ser
625                 630                 635                 640

Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp Cys
                645                 650                 655

Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met Lys
            660                 665                 670

Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp Val
        675                 680                 685

Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val Ile
    690                 695                 700

Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val Val
705                 710                 715                 720

Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala
                725                 730                 735

Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr Ser
            740                 745                 750

Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser Ala
        755                 760                 765

Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu Met
    770                 775                 780

Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe Gly
785                 790                 795                 800

Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr Gly
                805                 810                 815

Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg Thr
            820                 825                 830

Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu Cys
        835                 840                 845

Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val Ser
```

850 855 860

Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala Thr
865 870 875 880

Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr Val
885 890 895

His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu Cys
900 905 910

Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp His
915 920 925

Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala Ile
930 935 940

Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala Ser
945 950 955 960

Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met Leu
965 970 975

Thr Ser Thr Arg Arg
980

<210> 7
<211> 982
<212> PRT
<213> Sindbis virus

<400> 7

Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1 5 10 15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
20 25 30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
50 55 60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65 70 75 80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile

85 90 95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
100 105 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
115 120 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr
130 135 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145 150 155 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
165 170 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
180 185 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
195 200 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu
210 215 220

Gly Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225 230 235 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
245 250 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
260 265 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
275 280 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
290 295 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305 310 315 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
325 330 335

```
His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
            340                 345                 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
        355                 360                 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
    370                 375                 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385                 390                 395                 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
                405                 410                 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
            420                 425                 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
        435                 440                 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
    450                 455                 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465                 470                 475                 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
                485                 490                 495

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
            500                 505                 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu
        515                 520                 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
    530                 535                 540

Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545                 550                 555                 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val
                565                 570                 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
            580                 585                 590
```

```
Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
        595                 600                 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
    610                 615                 620

Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625                 630                 635                 640

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
                645                 650                 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
            660                 665                 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
        675                 680                 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
    690                 695                 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705                 710                 715                 720

Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
                725                 730                 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
            740                 745                 750

Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
        755                 760                 765

Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
    770                 775                 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785                 790                 795                 800

Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
                805                 810                 815

Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
            820                 825                 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
        835                 840                 845
```

```
Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
    850                 855                 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865                 870                 875                 880

Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
                885                 890                 895

Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975

Leu Thr Ser Thr Arg Arg
            980
```

<210> 8
<211> 981
<212> PRT
<213> Sindbis virus

<400> 8

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80
```

```
Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu
    210                 215                 220

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
225                 230                 235                 240

Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro
                245                 250                 255

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
            260                 265                 270

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
        275                 280                 285

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
    290                 295                 300

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
305                 310                 315                 320

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
```

325 330 335

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
340 345 350

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
355 360 365

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
370 375 380

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
385 390 395 400

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
405 410 415

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
420 425 430

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
435 440 445

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
450 455 460

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
465 470 475 480

Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser Tyr
485 490 495

Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile Pro
500 505 510

Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu Pro
515 520 525

Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr Glu
530 535 540

His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala Leu
545 550 555 560

Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val Met
565 570 575

```
Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys Lys
            580                 585                 590

Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser Leu
        595                 600                 605

Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe Gly
    610                 615                 620

Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp Ser
625                 630                 635                 640

Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp Cys
                645                 650                 655

Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met Lys
            660                 665                 670

Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp Val
        675                 680                 685

Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val Ile
    690                 695                 700

Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val Val
705                 710                 715                 720

Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala
                725                 730                 735

Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr Ser
            740                 745                 750

Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser Ala
        755                 760                 765

Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu Met
    770                 775                 780

Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe Gly
785                 790                 795                 800

Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr Gly
                805                 810                 815

Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg Thr
            820                 825                 830
```

```
Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu Cys
        835                 840                 845

Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val Ser
    850                 855                 860

Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala Thr
865                 870                 875                 880

Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr Val
                885                 890                 895

His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu Cys
            900                 905                 910

Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp His
        915                 920                 925

Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala Ile
    930                 935                 940

Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala Ser
945                 950                 955                 960

Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met Leu
                965                 970                 975

Thr Ser Thr Arg Arg
            980
```

<210> 9
<211> 982
<212> PRT
<213> Sindbis virus

<400> 9

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60
```

```
Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu
    210                 215                 220

Gly Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225                 230                 235                 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
                245                 250                 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
            260                 265                 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
        275                 280                 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
    290                 295                 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305                 310                 315                 320
```

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
325 330 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
340 345 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
355 360 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
370 375 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385 390 395 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
405 410 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
420 425 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
435 440 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
450 455 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465 470 475 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
485 490 495

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
500 505 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu
515 520 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
530 535 540

Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545 550 555 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val

565 570 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
580 585 590

Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
595 600 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
610 615 620

Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625 630 635 640

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
645 650 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
660 665 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
675 680 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
690 695 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705 710 715 720

Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
725 730 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
740 745 750

Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
755 760 765

Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
770 775 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785 790 795 800

Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
805 810 815

```
Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
            820                 825                 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
        835                 840                 845

Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
    850                 855                 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865                 870                 875                 880

Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
                885                 890                 895

Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975

Leu Thr Ser Thr Arg Arg
            980
```

<210> 10
<211> 981
<212> PRT
<213> Sindbis virus

<400> 10

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

```
Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu
    210                 215                 220

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
225                 230                 235                 240

Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro
                245                 250                 255

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
            260                 265                 270

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
        275                 280                 285

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
    290                 295                 300
```

```
Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
305                 310                 315                 320

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
                325                 330                 335

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
            340                 345                 350

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
        355                 360                 365

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
    370                 375                 380

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
385                 390                 395                 400

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
                405                 410                 415

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
            420                 425                 430

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
        435                 440                 445

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
    450                 455                 460

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
465                 470                 475                 480

Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser Tyr
                485                 490                 495

Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile Pro
            500                 505                 510

Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu Pro
        515                 520                 525

Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr Glu
    530                 535                 540

His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala Leu
545                 550                 555                 560
```

Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val Met
565 570 575

Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys Lys
580 585 590

Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser Leu
595 600 605

Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe Gly
610 615 620

Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp Ser
625 630 635 640

Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp Cys
645 650 655

Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met Lys
660 665 670

Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp Val
675 680 685

Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val Ile
690 695 700

Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val Val
705 710 715 720

Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala
725 730 735

Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr Ser
740 745 750

Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser Ala
755 760 765

Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu Met
770 775 780

Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe Gly
785 790 795 800

Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr Gly

805 810 815

Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg Thr
820 825 830

Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu Cys
835 840 845

Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val Ser
850 855 860

Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala Thr
865 870 875 880

Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr Val
885 890 895

His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu Cys
900 905 910

Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp His
915 920 925

Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala Ile
930 935 940

Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala Ser
945 950 955 960

Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met Leu
965 970 975

Thr Ser Thr Arg Arg
980

<210> 11
<211> 982
<212> PRT
<213> Sindbis virus

<400> 11

Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1 5 10 15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
20 25 30

Arg Ala Leu Asp Ile Leu Glu Glu Asn Val Asn His Glu Ala Tyr Asp

35 40 45

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
50 55 60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65 70 75 80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
85 90 95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
100 105 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
115 120 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr
130 135 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145 150 155 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
165 170 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
180 185 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
195 200 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
210 215 220

Gly Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225 230 235 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
245 250 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
260 265 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
275 280 285

```
Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
    290                 295                 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305                 310                 315                 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
                325                 330                 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
            340                 345                 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
        355                 360                 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
    370                 375                 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385                 390                 395                 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
                405                 410                 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
            420                 425                 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
        435                 440                 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
    450                 455                 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465                 470                 475                 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
                485                 490                 495

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
            500                 505                 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu
        515                 520                 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
    530                 535                 540
```

```
Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545                 550                 555                 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val
                565                 570                 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
            580                 585                 590

Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
        595                 600                 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
    610                 615                 620

Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625                 630                 635                 640

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
                645                 650                 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
            660                 665                 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
        675                 680                 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
    690                 695                 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705                 710                 715                 720

Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
                725                 730                 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
            740                 745                 750

Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
        755                 760                 765

Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
    770                 775                 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785                 790                 795                 800
```

```
Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
                805                 810                 815

Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
            820                 825                 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
        835                 840                 845

Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
    850                 855                 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865                 870                 875                 880

Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
                885                 890                 895

Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975

Leu Thr Ser Thr Arg Arg
            980
```

<210> 12
<211> 981
<212> PRT
<213> Sindbis virus

<400> 12

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30
```

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
    210                 215                 220

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
225                 230                 235                 240

Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro
                245                 250                 255

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
            260                 265                 270

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
```

275 280 285

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
290 295 300

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
305 310 315 320

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
325 330 335

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
340 345 350

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
355 360 365

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
370 375 380

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
385 390 395 400

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
405 410 415

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
420 425 430

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
435 440 445

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
450 455 460

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
465 470 475 480

Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser Tyr
485 490 495

Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile Pro
500 505 510

Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu Pro
515 520 525

```
Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr Glu
    530                 535                 540

His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala Leu
545                 550                 555                 560

Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val Met
                565                 570                 575

Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys Lys
            580                 585                 590

Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser Leu
        595                 600                 605

Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe Gly
    610                 615                 620

Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp Ser
625                 630                 635                 640

Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp Cys
                645                 650                 655

Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met Lys
            660                 665                 670

Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp Val
        675                 680                 685

Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val Ile
    690                 695                 700

Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val Val
705                 710                 715                 720

Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala
                725                 730                 735

Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr Ser
            740                 745                 750

Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser Ala
        755                 760                 765

Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu Met
    770                 775                 780
```

```
Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe Gly
785                 790                 795                 800

Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr Gly
                805                 810                 815

Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg Thr
            820                 825                 830

Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu Cys
        835                 840                 845

Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val Ser
    850                 855                 860

Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala Thr
865                 870                 875                 880

Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr Val
                885                 890                 895

His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu Cys
            900                 905                 910

Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp His
        915                 920                 925

Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala Ile
    930                 935                 940

Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala Ser
945                 950                 955                 960

Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met Leu
                965                 970                 975

Thr Ser Thr Arg Arg
            980
```

<210> 13
<211> 982
<212> PRT
<213> Sindbis virus

<400> 13

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                   10                  15
```

```
Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
    210                 215                 220

Gly Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225                 230                 235                 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
                245                 250                 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
            260                 265                 270
```

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
275 280 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
290 295 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305 310 315 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
325 330 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
340 345 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
355 360 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
370 375 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385 390 395 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
405 410 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
420 425 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
435 440 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
450 455 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465 470 475 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
485 490 495

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
500 505 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu

515 520 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
530 535 540

Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545 550 555 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val
565 570 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
580 585 590

Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
595 600 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
610 615 620

Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625 630 635 640

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
645 650 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
660 665 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
675 680 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
690 695 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705 710 715 720

Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
725 730 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
740 745 750

Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
755 760 765

```
Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
    770                 775                 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785                 790                 795                 800

Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
                805                 810                 815

Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
            820                 825                 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
        835                 840                 845

Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
    850                 855                 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865                 870                 875                 880

Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
                885                 890                 895

Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975

Leu Thr Ser Thr Arg Arg
            980
```

<210> 14
<211> 981
<212> PRT
<213> Sindbis virus

<400> 14

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                  10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
    210                 215                 220

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
225                 230                 235                 240

Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro
                245                 250                 255
```

```
Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
            260                 265                 270

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
        275                 280                 285

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
    290                 295                 300

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
305                 310                 315                 320

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
                325                 330                 335

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
            340                 345                 350

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
        355                 360                 365

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
    370                 375                 380

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
385                 390                 395                 400

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
                405                 410                 415

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
            420                 425                 430

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
        435                 440                 445

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
    450                 455                 460

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
465                 470                 475                 480

Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser Tyr
                485                 490                 495

Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile Pro
            500                 505                 510
```

Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu Pro
515 520 525

Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr Glu
530 535 540

His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala Leu
545 550 555 560

Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val Met
565 570 575

Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys Lys
580 585 590

Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser Leu
595 600 605

Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe Gly
610 615 620

Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp Ser
625 630 635 640

Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp Cys
645 650 655

Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met Lys
660 665 670

Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp Val
675 680 685

Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val Ile
690 695 700

Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val Val
705 710 715 720

Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala
725 730 735

Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr Ser
740 745 750

Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser Ala

```
        755                 760                 765

Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu Met
    770                 775                 780

Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe Gly
785                 790                 795                 800

Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr Gly
                805                 810                 815

Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg Thr
            820                 825                 830

Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu Cys
        835                 840                 845

Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val Ser
    850                 855                 860

Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala Thr
865                 870                 875                 880

Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr Val
                885                 890                 895

His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu Cys
            900                 905                 910

Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp His
        915                 920                 925

Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala Ile
    930                 935                 940

Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala Ser
945                 950                 955                 960

Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met Leu
                965                 970                 975

Thr Ser Thr Arg Arg
            980
```

<210> 15
<211> 982
<212> PRT
<213> Sindbis virus

<400> 15

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                  10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
    210                 215                 220

Gly Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225                 230                 235                 240
```

```
Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
                245                 250                 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
            260                 265                 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
        275                 280                 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
    290                 295                 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305                 310                 315                 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
                325                 330                 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
            340                 345                 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
        355                 360                 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
    370                 375                 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385                 390                 395                 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
                405                 410                 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
            420                 425                 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
        435                 440                 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
    450                 455                 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465                 470                 475                 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
                485                 490                 495
```

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
500 505 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu
515 520 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
530 535 540

Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545 550 555 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val
565 570 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
580 585 590

Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
595 600 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
610 615 620

Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625 630 635 640

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
645 650 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
660 665 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
675 680 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
690 695 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705 710 715 720

Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
725 730 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
740 745 750

```
Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
        755                 760                 765

Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
    770                 775                 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785                 790                 795                 800

Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
                805                 810                 815

Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
            820                 825                 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
        835                 840                 845

Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
    850                 855                 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865                 870                 875                 880

Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
                885                 890                 895

Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975

Leu Thr Ser Thr Arg Arg
            980
```

<210> 16

<211> 981
<212> PRT
<213> Sindbis virus

<400> 16

Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1 5 10 15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
20 25 30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
50 55 60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65 70 75 80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
85 90 95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
100 105 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
115 120 125

Tyr Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr
130 135 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145 150 155 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
165 170 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
180 185 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
195 200 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
210 215 220

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr

225 230 235 240

Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro
245 250 255

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
260 265 270

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
275 280 285

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
290 295 300

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
305 310 315 320

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
325 330 335

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
340 345 350

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
355 360 365

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
370 375 380

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
385 390 395 400

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
405 410 415

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
420 425 430

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
435 440 445

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
450 455 460

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
465 470 475 480

```
Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser Tyr
                485                 490                 495

Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile Pro
            500                 505                 510

Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu Pro
        515                 520                 525

Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr Glu
    530                 535                 540

His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala Leu
545                 550                 555                 560

Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val Met
                565                 570                 575

Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys Lys
            580                 585                 590

Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser Leu
        595                 600                 605

Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe Gly
    610                 615                 620

Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp Ser
625                 630                 635                 640

Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp Cys
                645                 650                 655

Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met Lys
            660                 665                 670

Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp Val
        675                 680                 685

Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val Ile
    690                 695                 700

Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val Val
705                 710                 715                 720

Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly Ala
                725                 730                 735
```

```
Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr Ser
            740                 745                 750

Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser Ala
        755                 760                 765

Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu Met
    770                 775                 780

Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe Gly
785                 790                 795                 800

Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr Gly
                805                 810                 815

Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg Thr
            820                 825                 830

Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu Cys
        835                 840                 845

Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val Ser
    850                 855                 860

Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala Thr
865                 870                 875                 880

Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr Val
                885                 890                 895

His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu Cys
            900                 905                 910

Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp His
        915                 920                 925

Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala Ile
    930                 935                 940

Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala Ser
945                 950                 955                 960

Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met Leu
                965                 970                 975

Thr Ser Thr Arg Arg
            980
```

<210> 17
<211> 982
<212> PRT
<213> Sindbis virus

<400> 17

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                  10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr
    130                 135                 140

Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
    210                 215                 220
```

```
Glu Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225                 230                 235                 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
                245                 250                 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
            260                 265                 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
        275                 280                 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
    290                 295                 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305                 310                 315                 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
                325                 330                 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
            340                 345                 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
        355                 360                 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
    370                 375                 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385                 390                 395                 400

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
                405                 410                 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
            420                 425                 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
        435                 440                 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
    450                 455                 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
```

```
465                 470                 475                 480

Cys Cys Val Arg Ser Ala Asn Ala Glu Thr Phe Thr Glu Thr Met Ser
                485                 490                 495

Tyr Leu Trp Ser Asn Ser Gln Pro Phe Phe Trp Val Gln Leu Cys Ile
            500                 505                 510

Pro Leu Ala Ala Phe Ile Val Leu Met Arg Cys Cys Ser Cys Cys Leu
        515                 520                 525

Pro Phe Leu Val Val Ala Gly Ala Tyr Leu Ala Lys Val Asp Ala Tyr
    530                 535                 540

Glu His Ala Thr Thr Val Pro Asn Val Pro Gln Ile Pro Tyr Lys Ala
545                 550                 555                 560

Leu Val Glu Arg Ala Gly Tyr Ala Pro Leu Asn Leu Glu Ile Thr Val
                565                 570                 575

Met Ser Ser Glu Val Leu Pro Ser Thr Asn Gln Glu Tyr Ile Thr Cys
            580                 585                 590

Lys Phe Thr Thr Val Val Pro Ser Pro Lys Ile Lys Cys Cys Gly Ser
        595                 600                 605

Leu Glu Cys Gln Pro Ala Ala His Ala Asp Tyr Thr Cys Lys Val Phe
    610                 615                 620

Gly Gly Val Tyr Pro Phe Met Trp Gly Gly Ala Gln Cys Phe Cys Asp
625                 630                 635                 640

Ser Glu Asn Ser Gln Met Ser Glu Ala Tyr Val Glu Leu Ser Ala Asp
                645                 650                 655

Cys Ala Ser Asp His Ala Gln Ala Ile Lys Val His Thr Ala Ala Met
            660                 665                 670

Lys Val Gly Leu Arg Ile Val Tyr Gly Asn Thr Thr Ser Phe Leu Asp
        675                 680                 685

Val Tyr Val Asn Gly Val Thr Pro Gly Thr Ser Lys Asp Leu Lys Val
    690                 695                 700

Ile Ala Gly Pro Ile Ser Ala Ser Phe Thr Pro Phe Asp His Lys Val
705                 710                 715                 720
```

```
Val Ile His Arg Gly Leu Val Tyr Asn Tyr Asp Phe Pro Glu Tyr Gly
                725                 730                 735

Ala Met Lys Pro Gly Ala Phe Gly Asp Ile Gln Ala Thr Ser Leu Thr
            740                 745                 750

Ser Lys Asp Leu Ile Ala Ser Thr Asp Ile Arg Leu Leu Lys Pro Ser
        755                 760                 765

Ala Lys Asn Val His Val Pro Tyr Thr Gln Ala Ser Ser Gly Phe Glu
    770                 775                 780

Met Trp Lys Asn Asn Ser Gly Arg Pro Leu Gln Glu Thr Ala Pro Phe
785                 790                 795                 800

Gly Cys Lys Ile Ala Val Asn Pro Leu Arg Ala Val Asp Cys Ser Tyr
                805                 810                 815

Gly Asn Ile Pro Ile Ser Ile Asp Ile Pro Asn Ala Ala Phe Ile Arg
            820                 825                 830

Thr Ser Asp Ala Pro Leu Val Ser Thr Val Lys Cys Glu Val Ser Glu
        835                 840                 845

Cys Thr Tyr Ser Ala Asp Phe Gly Gly Met Ala Thr Leu Gln Tyr Val
    850                 855                 860

Ser Asp Arg Glu Gly Gln Cys Pro Val His Ser His Ser Ser Thr Ala
865                 870                 875                 880

Thr Leu Gln Glu Ser Thr Val His Val Leu Glu Lys Gly Ala Val Thr
                885                 890                 895

Val His Phe Ser Thr Ala Ser Pro Gln Ala Asn Phe Ile Val Ser Leu
            900                 905                 910

Cys Gly Lys Lys Thr Thr Cys Asn Ala Glu Cys Lys Pro Pro Ala Asp
        915                 920                 925

His Ile Val Ser Thr Pro His Lys Asn Asp Gln Glu Phe Gln Ala Ala
    930                 935                 940

Ile Ser Lys Thr Ser Trp Ser Trp Leu Phe Ala Leu Phe Gly Gly Ala
945                 950                 955                 960

Ser Ser Leu Leu Ile Ile Gly Leu Met Ile Phe Ala Cys Ser Met Met
                965                 970                 975
```

Leu Thr Ser Thr Arg Arg
980

<210> 18
<211> 423
<212> PRT
<213> Sindbis virus

<400> 18

Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1 5 10 15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
20 25 30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
35 40 45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
50 55 60

Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr Met
65 70 75 80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
85 90 95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
115 120 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
130 135 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Glu
145 150 155 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
165 170 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
195 200 205

```
Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
    210                 215                 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225                 230                 235                 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
                245                 250                 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
            260                 265                 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
        275                 280                 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
    290                 295                 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305                 310                 315                 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
                325                 330                 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
            340                 345                 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
        355                 360                 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
    370                 375                 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385                 390                 395                 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
                405                 410                 415

Cys Val Arg Ser Ala Asn Ala
            420
```

<210> 19
<211> 65
<212> PRT
<213> Sindbis virus

<400> 19

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                  10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg
65
```

<210> 20
<211> 488
<212> PRT
<213> Sindbis virus

<400> 20

```
Met Ser Ala Ala Pro Leu Val Thr Ala Met Cys Leu Leu Gly Asn Val
1               5                  10                  15

Ser Phe Pro Cys Asp Arg Pro Pro Thr Cys Tyr Thr Arg Glu Pro Ser
            20                  25                  30

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

Thr Leu Leu Asn Ala Ile Leu Arg Cys Gly Ser Ser Gly Arg Ser Lys
    50                  55                  60

Arg Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr
65                  70                  75                  80

Cys Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile
                85                  90                  95

Glu Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr
            100                 105                 110

Ser Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys
        115                 120                 125

Tyr Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr
    130                 135                 140
```

```
Met Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser
145                 150                 155                 160

Tyr Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val
                165                 170                 175

Thr Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala
            180                 185                 190

Arg Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro
        195                 200                 205

Pro Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys
    210                 215                 220

Glu Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala
225                 230                 235                 240

Tyr Thr Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro
                245                 250                 255

Pro Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys
            260                 265                 270

Thr Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile
        275                 280                 285

Lys Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn
    290                 295                 300

Ser Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu
305                 310                 315                 320

His Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala
                325                 330                 335

His Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu
            340                 345                 350

Asp Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn
        355                 360                 365

Pro Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe
    370                 375                 380

Thr Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro
385                 390                 395                 400
```

Val Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp
405 410 415

Pro His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr
420 425 430

Ile Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr
435 440 445

Val Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro
450 455 460

Tyr Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu
465 470 475 480

Cys Cys Val Arg Ser Ala Asn Ala
485

<210> 21
<211> 683
<212> DNA
<213> Human immunodeficiency virus type 1

<400> 21
cctagaaaaa catggagcaa tcacaagtag caatacagca gctaccaatg ctgattgtgc 60

ctggctagaa gcacaagagg aggaggaggt gggttttcca gtcacacctc aggtaccttt 120

aagaccaatg acttacaagg cagctgtaga tcttagccac tttttaaaag aaaaggggg 180

actggaaggg ctaattcact cccaacgaag acaagatatc cttgatctgt ggatctacca 240

cacacaaggc tacttccctg attggcagaa ctacacacca gggccaggga tcagatatcc 300

actgaccttt ggatggtgct acaagctagt accagttgag caagagaagg tagaagaagc 360

caatgaagga gagaacaccc gcttgttaca ccctgtgagc ctgcatggga tggatgaccc 420

ggagagagaa gtattagagt ggaggtttga cagccgccta gcatttcatc acatggcccg 480

agagctgcat ccggactgta ctgggtctct ctggttagac cagatctgag cctgggagct 540

ctctggctaa ctagggaacc cactgcttaa gcctcaataa agcttgcctt gagtgcttca 600

agtagtgtgt gcccgtctgt tgtgtgactc tggtaactag agatccctca gacccttta 660

gtcagtgtgg aaaatctcta gca 683

<210> 22
<211> 416
<212> DNA
<213> Human immunodeficiency virus type 1

<400> 22

cctagaaaaa catggagcaa tcacaagtag caatacagca gctaccaatg ctgattgtgc 60

ctggctagaa gcacaagagg aggaggaggt gggttttcca gtcacacctc aggtaccttt 120

aagaccaatg acttacaagg cagctgtaga tcttagccac tttttaaaag aaaaggggga 180

actggaaggg ctaattcact cccaacgaag acaagatctg ctttttgcct gtactgggtc 240

tctctggtta gaccagatct gagcctggga gctctctggc taactaggga acccactgct 300

taagcctcaa taaagcttgc cttgagtgct tcaagtagtg tgtgcccgtc tgttgtgtga 360

ctctggtaac tagagatccc tcagaccctt ttagtcagtg tggaaaatct ctagca 416

<210> 23
<211> 401
<212> DNA
<213> Human immunodeficiency virus type 1

<400> 23
cctagaaaaa catggagcaa tcacaagtag caatacagca gctaccaatg ctgattgtgc 60

ctggctagaa gcacaagagg aggaggaggt gggttttcca gtcacacctc aggtaccttt 120

aagaccaatg acttacaagg cagctgtaga tcttagccac tttttactgg aagggctaat 180

tcactcccaa cgaagacaag atctgctttt tgcctgtact gggtctctct ggttagacca 240

gatctgagcc tgggagctct ctggctaact agggaaccca ctgcttaagc ctcaataaag 300

cttgccttga gtgcttcaag tagtgtgtgc ccgtctgttg tgtgactctg gtaactagag 360

atccctcaga ccctttttagt cagtgtggaa aatctctagc a 401

<210> 24
<211> 8
<212> PRT
<213> Gallus gallus

<400> 24

Ser Ile Ile Asn Phe Glu Lys Leu
1 5

<210> 25
<211> 9
<212> PRT
<213> Mus musculus

<400> 25

Ser Pro Ser Tyr Ala Tyr His Gln Phe
1 5

<210> 26
<211> 5
<212> PRT
<213> Sindbis virus

<400> 26

Arg Ser Lys Arg Ser
1 5

<210> 27
<211> 4
<212> PRT
<213> Sindbis virus

<400> 27

Arg Ser Lys Arg
1

<210> 28
<211> 8
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic peptide

<400> 28

Asp Tyr Lys Asp Asp Asp Asp Lys
1 5

<210> 29
<211> 11
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic peptide

<400> 29

Ala Ala Val Lys Asn Trp Met Thr Gln Thr Leu
1 5 10

<210> 30
<211> 423
<212> PRT
<213> Sindbis virus

<400> 30

Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1 5 10 15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
20 25 30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
35 40 45

```
Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu Gly
145                 150                 155                 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
                165                 170                 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
        195                 200                 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
    210                 215                 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225                 230                 235                 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
                245                 250                 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
            260                 265                 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
        275                 280                 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
    290                 295                 300
```

```
Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305                 310                 315                 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
                325                 330                 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
            340                 345                 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
        355                 360                 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
    370                 375                 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385                 390                 395                 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
                405                 410                 415

Cys Val Arg Ser Ala Asn Ala
            420
```

<210> 31
<211> 423
<212> PRT
<213> Sindbis virus

<400> 31

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95
```

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu Gly
145                 150                 155                 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
                165                 170                 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
        195                 200                 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
    210                 215                 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225                 230                 235                 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
                245                 250                 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
            260                 265                 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
        275                 280                 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
    290                 295                 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305                 310                 315                 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
                325                 330                 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
```

340 345 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
355 360 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
370 375 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385 390 395 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
405 410 415

Cys Val Arg Ser Ala Asn Ala
420

<210> 32
<211> 421
<212> PRT
<213> Sindbis virus

<400> 32

Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1 5 10 15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
20 25 30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
35 40 45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
50 55 60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr Met
65 70 75 80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
85 90 95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
115 120 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro

130 135 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Thr Thr
145 150 155 160

Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr Ser
165 170 175

Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser Gly
180 185 190

Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly Thr
195 200 205

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

Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro Asp
225 230 235 240

Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu Pro
245 250 255

Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala Pro
260 265 270

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

His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu Pro
290 295 300

Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val Asp
305 310 315 320

Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg Val
325 330 335

Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His Glu
340 345 350

Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu Ala
355 360 365

Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala Val
370 375 380

```
Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala Leu
385                 390                 395                 400

Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys Val
                405                 410                 415

Arg Ser Ala Asn Ala
            420
```

<210> 33
<211> 422
<212> PRT
<213> Sindbis virus

<400> 33

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu Thr
145                 150                 155                 160

Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr
                165                 170                 175
```

```
Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser
            180                 185                 190

Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly
        195                 200                 205

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

Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro
225                 230                 235                 240

Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu
                245                 250                 255

Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala
            260                 265                 270

Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp Thr
        275                 280                 285

Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu
    290                 295                 300

Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val
305                 310                 315                 320

Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg
                325                 330                 335

Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His
            340                 345                 350

Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu
        355                 360                 365

Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala
    370                 375                 380

Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala
385                 390                 395                 400

Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys
                405                 410                 415

Val Arg Ser Ala Asn Ala
            420
```

<210> 34
<211> 423
<212> PRT
<213> Sindbis virus

<400> 34

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                  10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu Gly
145                 150                 155                 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
                165                 170                 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
        195                 200                 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
    210                 215                 220
```

```
Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225                 230                 235                 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
                245                 250                 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
            260                 265                 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
        275                 280                 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
    290                 295                 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305                 310                 315                 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
                325                 330                 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
            340                 345                 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
        355                 360                 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
    370                 375                 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385                 390                 395                 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
                405                 410                 415

Cys Val Arg Ser Ala Asn Ala
            420
```

<210> 35
<211> 422
<212> PRT
<213> Sindbis virus

<400> 35

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15
```

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
20 25 30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
35 40 45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
50 55 60

Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Lys Glu Gly Thr Met
65 70 75 80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
85 90 95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
115 120 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
130 135 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu Thr
145 150 155 160

Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr
165 170 175

Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser
180 185 190

Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly
195 200 205

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

Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro
225 230 235 240

Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu
245 250 255

Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala
260 265 270

```
Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp Thr
        275                 280                 285

Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu
    290                 295                 300

Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val
305                 310                 315                 320

Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg
                325                 330                 335

Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His
            340                 345                 350

Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu
        355                 360                 365

Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala
    370                 375                 380

Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala
385                 390                 395                 400

Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys
                405                 410                 415

Val Arg Ser Ala Asn Ala
            420
```

<210> 36
<211> 423
<212> PRT
<213> Sindbis virus

<400> 36

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60
```

```
Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu Gly
145                 150                 155                 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
                165                 170                 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
        195                 200                 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
    210                 215                 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225                 230                 235                 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
                245                 250                 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
            260                 265                 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
        275                 280                 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
    290                 295                 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
```

305 310 315 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
325 330 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
340 345 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
355 360 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
370 375 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385 390 395 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
405 410 415

Cys Val Arg Ser Ala Asn Ala
420

<210> 37
<211> 422
<212> PRT
<213> Sindbis virus

<400> 37

Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1 5 10 15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
20 25 30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
35 40 45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
50 55 60

Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr Met
65 70 75 80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
85 90 95

Lys Gly Tyr Phe Leu Leu Ala Lys Cys Pro Pro Gly Asp Ser Val Thr

100 105 110

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
115 120 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
130 135 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Glu Thr
145 150 155 160

Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr
165 170 175

Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser
180 185 190

Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly
195 200 205

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

Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro
225 230 235 240

Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu
245 250 255

Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala
260 265 270

Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp Thr
275 280 285

Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu
290 295 300

Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val
305 310 315 320

Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg
325 330 335

Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His
340 345 350

```
Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu
        355                 360                 365

Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala
    370                 375                 380

Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala
385                 390                 395                 400

Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys
                405                 410                 415

Val Arg Ser Ala Asn Ala
            420
```

<210> 38
<211> 423
<212> PRT
<213> Sindbis virus

<400> 38

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140
```

```
Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Gly
145                 150                 155                 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
                165                 170                 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
        195                 200                 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
    210                 215                 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225                 230                 235                 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
                245                 250                 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
            260                 265                 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
        275                 280                 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
    290                 295                 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305                 310                 315                 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
                325                 330                 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
            340                 345                 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
        355                 360                 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
    370                 375                 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385                 390                 395                 400
```

```
Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
                405                 410                 415

Cys Val Arg Ser Ala Asn Ala
            420
```

<210> 39
<211> 422
<212> PRT
<213> Sindbis virus

<400> 39

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Lys Gln Asp His Thr Val Glu Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Thr
145                 150                 155                 160

Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr
                165                 170                 175

Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser
            180                 185                 190
```

```
Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly
        195                 200                 205

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

Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro
225                 230                 235                 240

Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu
                245                 250                 255

Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala
            260                 265                 270

Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp Thr
        275                 280                 285

Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu
    290                 295                 300

Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val
305                 310                 315                 320

Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg
                325                 330                 335

Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His
            340                 345                 350

Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu
        355                 360                 365

Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala
    370                 375                 380

Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala
385                 390                 395                 400

Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys
                405                 410                 415

Val Arg Ser Ala Asn Ala
            420
```

<210> 40
<211> 423

<212> PRT
<213> Sindbis virus

<400> 40

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                  10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Gly
145                 150                 155                 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
                165                 170                 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
        195                 200                 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
    210                 215                 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225                 230                 235                 240
```

```
Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
                245                 250                 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
            260                 265                 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
        275                 280                 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
    290                 295                 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305                 310                 315                 320

Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
                325                 330                 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
            340                 345                 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
        355                 360                 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
    370                 375                 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385                 390                 395                 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
                405                 410                 415

Cys Val Arg Ser Ala Asn Ala
            420
```

<210> 41
<211> 422
<212> PRT
<213> Sindbis virus

<400> 41

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30
```

```
Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Lys Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
        115                 120                 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Thr
145                 150                 155                 160

Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr
                165                 170                 175

Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser
            180                 185                 190

Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly
        195                 200                 205

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

Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro
225                 230                 235                 240

Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu
                245                 250                 255

Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala
            260                 265                 270

Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp Thr
```

275 280 285

Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu
290 295 300

Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val
305 310 315 320

Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg
325 330 335

Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His
340 345 350

Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu
355 360 365

Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala
370 375 380

Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala
385 390 395 400

Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys
405 410 415

Val Arg Ser Ala Asn Ala
420

<210> 42
<211> 423
<212> PRT
<213> Sindbis virus

<400> 42

Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1 5 10 15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
20 25 30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
35 40 45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
50 55 60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr Met

65 70 75 80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
85 90 95

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

Val Ser Ile Val Ser Ser Asn Ser Ala Thr Ser Cys Thr Leu Ala Arg
115 120 125

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
130 135 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Gly
145 150 155 160

Thr Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr
165 170 175

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

Ser Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr
195 200 205

Gly Thr Val Ser Thr Arg Thr Glu Ile Thr Gly Cys Thr Ala Ile Lys
210 215 220

Gln Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser
225 230 235 240

Pro Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His
245 250 255

Leu Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His
260 265 270

Ala Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp
275 280 285

Thr Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro
290 295 300

Glu Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr
305 310 315 320

```
Val Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val
                325                 330                 335

Arg Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro
            340                 345                 350

His Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile
        355                 360                 365

Leu Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val
    370                 375                 380

Ala Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr
385                 390                 395                 400

Ala Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys
                405                 410                 415

Cys Val Arg Ser Ala Asn Ala
            420
```

<210> 43
<211> 422
<212> PRT
<213> Sindbis virus

<400> 43

```
Ser Val Ile Asp Asp Phe Thr Leu Thr Ser Pro Tyr Leu Gly Thr Cys
1               5                   10                  15

Ser Tyr Cys His His Thr Val Pro Cys Phe Ser Pro Val Lys Ile Glu
            20                  25                  30

Gln Val Trp Asp Glu Ala Asp Asp Asn Thr Ile Arg Ile Gln Thr Ser
        35                  40                  45

Ala Gln Phe Gly Tyr Asp Gln Ser Gly Ala Ala Ser Ala Asn Lys Tyr
    50                  55                  60

Arg Tyr Met Ser Leu Glu Gln Asp His Thr Val Glu Glu Gly Thr Met
65                  70                  75                  80

Asp Asp Ile Lys Ile Ser Thr Ser Gly Pro Cys Arg Arg Leu Ser Tyr
                85                  90                  95

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

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

Lys Ile Lys Pro Lys Phe Val Gly Arg Glu Lys Tyr Asp Leu Pro Pro
    130                 135                 140

Val His Gly Lys Lys Ile Pro Cys Thr Val Tyr Asp Arg Leu Lys Thr
145                 150                 155                 160

Thr Ala Gly Tyr Ile Thr Met His Arg Pro Arg Pro His Ala Tyr Thr
                165                 170                 175

Ser Tyr Leu Glu Glu Ser Ser Gly Lys Val Tyr Ala Lys Pro Pro Ser
            180                 185                 190

Gly Lys Asn Ile Thr Tyr Glu Cys Lys Cys Gly Asp Tyr Lys Thr Gly
        195                 200                 205

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

Cys Val Ala Tyr Lys Ser Asp Gln Thr Lys Trp Val Phe Asn Ser Pro
225                 230                 235                 240

Asp Leu Ile Arg His Asp Asp His Thr Ala Gln Gly Lys Leu His Leu
                245                 250                 255

Pro Phe Lys Leu Ile Pro Ser Thr Cys Met Val Pro Val Ala His Ala
            260                 265                 270

Pro Asn Val Ile His Gly Phe Lys His Ile Ser Leu Gln Leu Asp Thr
        275                 280                 285

Asp His Leu Thr Leu Leu Thr Thr Arg Arg Leu Gly Ala Asn Pro Glu
    290                 295                 300

Pro Thr Thr Glu Trp Ile Val Gly Lys Thr Val Arg Asn Phe Thr Val
305                 310                 315                 320

Asp Arg Asp Gly Leu Glu Tyr Ile Trp Gly Asn His Glu Pro Val Arg
                325                 330                 335

Val Tyr Ala Gln Glu Ser Ala Pro Gly Asp Pro His Gly Trp Pro His
            340                 345                 350

Glu Ile Val Gln His Tyr Tyr His Arg His Pro Val Tyr Thr Ile Leu
        355                 360                 365
```

```
Ala Val Ala Ser Ala Thr Val Ala Met Met Ile Gly Val Thr Val Ala
    370                 375                 380

Val Leu Cys Ala Cys Lys Ala Arg Arg Glu Cys Leu Thr Pro Tyr Ala
385                 390                 395                 400

Leu Ala Pro Asn Ala Val Ile Pro Thr Ser Leu Ala Leu Leu Cys Cys
                405                 410                 415

Val Arg Ser Ala Asn Ala
            420
```

<210> 44
<211> 112
<212> PRT
<213> Simian immunodeficiency virus

<400> 44

```
Met Ser Asp Pro Arg Glu Arg Ile Pro Pro Gly Asn Ser Gly Glu Glu
1               5                   10                  15

Thr Ile Gly Glu Ala Phe Glu Trp Leu Asn Arg Thr Val Glu Glu Ile
            20                  25                  30

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

Trp Gln Arg Ser Trp Glu Tyr Trp His Asp Glu Gln Gly Met Ser Gln
    50                  55                  60

Ser Tyr Val Lys Tyr Arg Tyr Leu Cys Leu Met Gln Lys Ala Leu Phe
65                  70                  75                  80

Met His Cys Lys Lys Gly Cys Arg Cys Leu Gly Glu Gly His Gly Ala
                85                  90                  95

Gly Gly Trp Arg Pro Gly Pro Pro Pro Pro Pro Pro Pro Gly Leu Ala
            100                 105                 110
```

<210> 45
<211> 112
<212> PRT
<213> Simian immunodeficiency virus

<400> 45

```
Met Thr Asp Pro Arg Glu Arg Ile Pro Pro Gly Asn Ser Gly Glu Glu
1               5                   10                  15
```

```
Thr Ile Gly Glu Ala Phe Glu Trp Leu His Asn Thr Val Glu Ala Leu
            20                  25                  30

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

Trp Arg Arg Cys Trp Glu Tyr Trp Val Asp Glu Gln Gly Tyr Ser Pro
    50                  55                  60

Ser Tyr Ala Lys Tyr Arg Tyr Val Gln Leu Met Gln Lys Ala Met Phe
65                  70                  75                  80

Gln His Phe Arg Lys Gly Cys Thr Cys Arg Gly Glu Gly His Ser Gln
                85                  90                  95

Gly Gly Trp Arg Thr Gly Pro Pro Pro Pro Pro Pro Pro Gly Leu Ala
            100                 105                 110
```

<210> 46
<211> 112
<212> PRT
<213> Simian immunodeficiency virus

<400> 46

```
Met Ser Asp Pro Arg Glu Arg Ile Pro Pro Gly Asn Ser Gly Glu Glu
1               5                   10                  15

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

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

Trp Arg Arg Ser Trp Glu Tyr Trp His Asp Glu Met Gly Met Ser Val
    50                  55                  60

Ser Tyr Thr Lys Tyr Arg Tyr Leu Cys Leu Ile Gln Lys Ala Met Phe
65                  70                  75                  80

Met His Cys Lys Lys Gly Cys Arg Cys Leu Gly Gly Glu His Gly Ala
                85                  90                  95

Gly Gly Trp Arg Pro Gly Pro Pro Pro Pro Pro Pro Pro Gly Leu Ala
            100                 105                 110
```

<210> 47
<211> 112
<212> PRT
<213> Human immunodeficiency virus type 2

<400> 47

Met Ala Asp Pro Arg Glu Arg Val Pro Pro Gly Asn Ser Gly Glu Glu
1 5 10 15

Thr Ile Gly Glu Ala Phe Glu Trp Leu Asp Arg Thr Ile Glu Ala Leu
20 25 30

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

Trp Gln Arg Ser Trp Ala Tyr Trp His Asp Glu Gln Gly Met Ser Thr
50 55 60

Ser Tyr Thr Lys Tyr Arg Tyr Leu Cys Ile Met Gln Lys Ala Val Tyr
65 70 75 80

Ile His Phe Lys Lys Gly Cys Thr Cys Leu Gly Arg Gly His Gly Pro
85 90 95

Gly Gly Trp Arg Pro Gly Pro Pro Pro Pro Pro Pro Pro Gly Leu Val
100 105 110

<210> 48
<211> 117
<212> PRT
<213> Simian immunodeficiency virus

<400> 48

Met Glu Arg Tyr Pro Pro Ser His Pro Pro His Phe Thr Ser Arg Thr
1 5 10 15

Val Pro Met Thr Arg Leu Ala Leu Gln Gln Ala Met Gln Asp Leu Asn
20 25 30

Glu Glu Ala Leu Lys His Phe Thr Arg Glu Glu Leu Trp Gly Val Trp
35 40 45

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

Ala Trp Ala Ala Ser Val Ile Asp Tyr Ile Lys Ile Val Gln Arg Met
65 70 75 80

Leu Trp Leu His Leu Arg Glu Ala Cys Phe His Arg Glu Arg Glu Ala
85 90 95

Thr Arg Arg Tyr Pro Asn Ile Arg Pro Leu Thr Gly Arg Asn Arg Glu

100 105 110

Val Arg Asp Gly Glu
115

<210> 49
<211> 135
<212> PRT
<213> Simian immunodeficiency virus

<400> 49

Met Glu Arg Val Pro Pro Ser His Arg Pro Pro Trp His Ser Arg Val
1 5 10 15

Val Pro Thr Thr Met Gln Gln Ala Gln Gln Ala Met Trp Asp Leu Asn
20 25 30

Glu Glu Ala Glu Lys His Phe Ser Arg Glu Glu Leu Arg Gly Ile Trp
35 40 45

Asn Asp Val Thr Glu Leu Pro Ala Asp Pro Asn Trp Thr Val Asp Gln
50 55 60

Ala Ala Ile Ala Cys Ala Ile Asp Tyr Ile Arg Arg Thr Gln Thr Leu
65 70 75 80

Leu Phe Arg His Tyr Arg Glu Gly Cys Tyr His Arg Tyr Ser Asn Thr
85 90 95

Ile Arg Arg Tyr Pro Asn Ile Arg Pro Leu Arg Gly Thr Gln Ala Pro
100 105 110

Pro Ser Asn Ser Met Pro Asn Ala Asp Pro Thr Pro Pro Leu Arg Pro
115 120 125

Ser Arg Tyr Arg Met Asp Glu
130 135

<210> 50
<211> 942
<212> DNA
<213> Homo sapiens

<400> 50
atgcctcttg agcagaggag tcagcactgc aagcctgaag aaggccttga ggcccgagga 60

gaggccctgg gcctggtggg tgcgcaggct cctgctactg aggagcagga ggctgcctcc 120

tcctcttcta ctctagttga agtcaccctg ggggaggtgc ctgctgccga gtcaccagat 180

cctccccaga gtcctcaggg agcctccagc ctccccacta ccatgaacta ccctctctgg 240

agccaatcct atgaggactc cagcaaccaa gaagaggagg ggccaagcac cttccctgac 300

ctggagtccg agttccaagc agcactcagt aggaaggtgg ccgagttggt tcattttctg 360

ctcctcaagt atcgagccag ggagccggtc acaaaggcag aaatgctggg gagtgtcgtc 420

ggaaattggc agtatttctt tcctgtgatc ttcagcaagg cttccagttc cttgcagctg 480

gtctttggca tcgagctgat ggaagtggac cccatcggcc acttgtacat ctttgccacc 540

tgcctgggcc tctcctacga tggcctgctg ggtgacaatc agatcatgcc caaggcaggc 600

ctcctgataa tcgtcctggc cataatcgca agagagggcg actgtgcccc tgaggagaaa 660

atctgggagg agctgagtgt gttagaggtg tttgagggga gggaagacag tatcttgggc 720

gatcccaaga agctgctcac ccaacatttc gtgcaggaaa actacctgga gtaccggcag 780

gtccccggca gtgatcctgc atgttatgag ttcctgtggg gtccaagggc cctcgttgaa 840

accagctatg tgaaagtcct gcaccacatg gtaaagatca gtggaggacc tcacatttcc 900

tacccacccc tgcatgagtg ggttttgaga gaggggaag ag 942

<210> 51
<211> 540
<212> DNA
<213> Homo sapiens

<400> 51
atgcaggccg aaggccgggg cacaggggt tcgacgggcg atgctgatgg cccaggaggc 60

cctggcattc ctgatggccc agggggcaat gctggcggcc caggagaggc gggtgccacg 120

ggcggcagag gtccccgggg cgcaggggca gcaagggcct cggggccggg aggaggcgcc 180

ccgcggggtc cgcatggcgg cgcggcttca gggctgaatg gatgctgcag atgcggggcc 240

agggggccgg agagccgcct gcttgagttc tacctcgcca tgcctttcgc gacacccatg 300

gaagcagagc tggcccgcag gagcctggcc caggatgccc caccgcttcc cgtgccaggg 360

gtgcttctga aggagttcac tgtgtccggc aacatactga ctatccgact gactgctgca 420

gaccaccgcc aactgcagct ctccatcagc tcctgtctcc agcagctttc cctgttgatg 480

tggatcacgc agtgctttct gcccgtgttt ttggctcagc ctccctcagg gcagaggcgc 540

<210> 52
<211> 54
<212> DNA
<213> Thosea asigna virus

<400> 52
gagggcagag gcagtcttct gacatgtgga gatgtggaag aaaaccctgg cccc 54

<210> 53
<211> 9020
<212> DNA

<213> Artificial Sequence

<220>
<223> Synthetic polynucleotide

<400> 53
atgcattagt tattaatagt aatcaattac ggggtcatta gttcatagcc catatatgga 60

gttccgcgtt acataactta cggtaaatgg cccgcctggc tgaccgccca acgacccccg 120

cccattgacg tcaataatga cgtatgttcc catagtaacg ccaataggga ctttccattg 180

acgtcaatgg gtggagtatt tacggtaaac tgcccacttg gcagtacatc aagtgtatca 240

tatgccaagt acgccccct ttgacgtcaa tgacggtaaa tggcccgcct ggcattatgc 300

ccagtacatg accttatggg actttcctac ttggcagtac atctacgtat tagtcatcgc 360

tattaccatg gtgatgcggt tttggcagta catcaatggg cgtggatagc ggtttgactc 420

acggggattt ccaagtctcc accccattga cgtcaatggg agtttgtttt ggcaccaaaa 480

tcaacgggac tttccaaaat gtcgtaacaa ctccgcccca ttgacgcaaa tgggcggtag 540

gcgtgtacgg tgggaggtct atataagcag cgcgttttgc ctgtactggg tctctctggt 600

tagaccagat ctgagcctgg gagctctctg gctaactagg gaacccactg cttaagcctc 660

aataaagctt gccttgagtg cttcaagtag tgtgtgcccg tctgttgtgt gactctggta 720

actagagatc cctcagaccc ttttagtcag tgtggaaaat ctctagcagt ggcgcccgaa 780

cagggacttg aaagcgaaag ggaaaccaga ggagctctct cgacgcagga ctcggcttgc 840

tgaagcgcgc acggcaagag gcgaggggcg gcgactggtg agtacgccaa aaattttgac 900

tagcggaggc tagaaggaga gagatgggtg cgagagcgtc agtattaagc gggggagaat 960

tagatcgcga tgggaaaaaa ttcggttaag gccaggggga aagaaaaaat ataaattaaa 1020

acatatagta tgggcaagca gggagctaga acgattcgca gttaatcctg gcctgttaga 1080

aacatcagaa ggctgtagac aaatactggg acagctacaa ccatcccttc agacaggatc 1140

agaagaactt agatcattat ataatacagt agcaaccctc tattgtgtgc atcaaaggat 1200

agagataaaa gacaccaagg aagctttaga caagatagag gaagagcaaa acaaaagtaa 1260

gaccaccgca cagcaagcgg ccgctgatct tcagacctgg aggaggagat atgagggaca 1320

attggagaag tgaattatat aaatataaag tagtaaaaat tgaaccatta ggagtagcac 1380

ccaccaaggc aaagagaaga gtggtgcaga gagaaaaaag agcagtggga ataggagctt 1440

tgttccttgg gttcttggga gcagcaggaa gcactatggg cgcagcgtca atgacgctga 1500

cggtacaggc cagacaatta ttgtctggta tagtgcagca gcagaacaat ttgctgaggg 1560

ctattgaggc gcaacagcat ctgttgcaac tcacagtctg gggcatcaag cagctccagg 1620

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<210> 57
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<212> PRT
<213> Thosea asigna virus

<400> 57

Glu Gly Arg Gly Ser Leu Leu Thr Cys Gly Asp Val Glu Glu Asn Pro
1 5 10 15

Gly Pro

<210> 58
<211> 314
<212> PRT
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<400> 58

Met Pro Leu Glu Gln Arg Ser Gln His Cys Lys Pro Glu Glu Gly Leu
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Glu Ala Arg Gly Glu Ala Leu Gly Leu Val Gly Ala Gln Ala Pro Ala
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Thr Glu Glu Gln Glu Ala Ala Ser Ser Ser Ser Thr Leu Val Glu Val
35 40 45

Thr Leu Gly Glu Val Pro Ala Ala Glu Ser Pro Asp Pro Pro Gln Ser

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50                  55                  60

Pro Gln Gly Ala Ser Ser Leu Pro Thr Thr Met Asn Tyr Pro Leu Trp
65                  70                  75                  80

Ser Gln Ser Tyr Glu Asp Ser Ser Asn Gln Glu Glu Glu Gly Pro Ser
                85                  90                  95

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

Val Ala Glu Leu Val His Phe Leu Leu Leu Lys Tyr Arg Ala Arg Glu
        115                 120                 125

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

Tyr Phe Phe Pro Val Ile Phe Ser Lys Ala Ser Ser Ser Leu Gln Leu
145                 150                 155                 160

Val Phe Gly Ile Glu Leu Met Glu Val Asp Pro Ile Gly His Leu Tyr
                165                 170                 175

Ile Phe Ala Thr Cys Leu Gly Leu Ser Tyr Asp Gly Leu Leu Gly Asp
            180                 185                 190

Asn Gln Ile Met Pro Lys Ala Gly Leu Leu Ile Ile Val Leu Ala Ile
        195                 200                 205

Ile Ala Arg Glu Gly Asp Cys Ala Pro Glu Glu Lys Ile Trp Glu Glu
    210                 215                 220

Leu Ser Val Leu Glu Val Phe Glu Gly Arg Glu Asp Ser Ile Leu Gly
225                 230                 235                 240

Asp Pro Lys Lys Leu Leu Thr Gln His Phe Val Gln Glu Asn Tyr Leu
                245                 250                 255

Glu Tyr Arg Gln Val Pro Gly Ser Asp Pro Ala Cys Tyr Glu Phe Leu
            260                 265                 270

Trp Gly Pro Arg Ala Leu Val Glu Thr Ser Tyr Val Lys Val Leu His
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His Met Val Lys Ile Ser Gly Gly Pro His Ile Ser Tyr Pro Pro Leu
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His Glu Trp Val Leu Arg Glu Gly Glu Glu
305 310

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<213> Homo sapiens

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1 5 10 15

Gly Pro Gly Gly Pro Gly Ile Pro Asp Gly Pro Gly Gly Asn Ala Gly
20 25 30

Gly Pro Gly Glu Ala Gly Ala Thr Gly Gly Arg Gly Pro Arg Gly Ala
35 40 45

Gly Ala Ala Arg Ala Ser Gly Pro Gly Gly Gly Ala Pro Arg Gly Pro
50 55 60

His Gly Gly Ala Ala Ser Gly Leu Asn Gly Cys Cys Arg Cys Gly Ala
65 70 75 80

Arg Gly Pro Glu Ser Arg Leu Leu Glu Phe Tyr Leu Ala Met Pro Phe
85 90 95

Ala Thr Pro Met Glu Ala Glu Leu Ala Arg Arg Ser Leu Ala Gln Asp
100 105 110

Ala Pro Pro Leu Pro Val Pro Gly Val Leu Leu Lys Glu Phe Thr Val
115 120 125

Ser Gly Asn Ile Leu Thr Ile Arg Leu Thr Ala Ala Asp His Arg Gln
130 135 140

Leu Gln Leu Ser Ile Ser Ser Cys Leu Gln Gln Leu Ser Leu Leu Met
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Trp Ile Thr Gln Cys Phe Leu Pro Val Phe Leu Ala Gln Pro Pro Ser
165 170 175

Gly Gln Arg Arg
180

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<400> 67

Ser Pro Ser Tyr Val Tyr His Gln Phe
1 5

<210> 68
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<400> 68

Arg Gly Pro Glu Ser Arg Leu Leu
1 5