SEQUENCE LISTING

<110> Immune Design Corporation

<120> Lentiviral Vectors Pseudotyped with a Sindbis Virus Envelope Glycoprotein

<130> IDC 203PC

<160> 27

<170> PatentIn version 3.5

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

<220>
<221> misc_feature
<222> (160)..(160)
<223> Xaa can be any naturally occurring amino acid

<400> 1

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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
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```
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

```
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
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```
        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

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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

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

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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

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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 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

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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
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```
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
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```
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
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<210> 14
<211> 981

<212> PRT
<213> Sindbis virus

<400> 14

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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 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

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<213> Gallus gallus

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<400> 26

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Arg Ser Lys Arg
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