SEQUENCE LISTING

<110> Icahn School of Medicine at Mount Sinai

<120> INFLUENZA VIRUS VACCINES AND USES THEREOF

<130> 6923-219-228

<140> TBA
<141> 2013-12-17

<150> 61/738,672
<151> 2012-12-18

<150> 61/840,899
<151> 2013-06-28

<160> 35

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<210> 1
<211> 565
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H1

<400> 1

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 1               5                  10                  15
Ala Asp Thr Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr
            20                  25                  30
Val Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn
        35                  40                  45
Leu Leu Glu Asp Ser His Asn Gly Lys Leu Cys Arg Leu Lys Gly Ile
    50                  55                  60
Ala Pro Leu Gln Leu Gly Lys Cys Asn Ile Ala Gly Trp Leu Leu Gly
65                  70                  75                  80
Asn Pro Glu Cys Asp Pro Leu Leu Pro Val Arg Ser Trp Ser Tyr Ile
                85                  90                  95
Val Glu Thr Pro Asn Ser Glu Asn Gly Ile Cys Tyr Pro Gly Asp Phe
            100                 105                 110
Ile Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe
        115                 120                 125
Glu Arg Phe Glu Ile Phe Pro Lys Glu Ser Ser Trp Pro Asn His Asn
    130                 135                 140
Thr Asn Gly Val Thr Ala Ala Cys Ser His Glu Gly Lys Ser Ser Phe
145                 150                 155                 160
Tyr Arg Asn Leu Leu Trp Leu Thr Glu Lys Glu Gly Ser Tyr Pro Lys
                165                 170                 175
Leu Lys Asn Ser Tyr Val Asn Lys Lys Gly Lys Glu Val Leu Val Leu
            180                 185                 190
Trp Gly Ile His His Pro Pro Asn Ser Lys Glu Gln Gln Asn Leu Tyr
        195                 200                 205
Gln Asn Glu Asn Ala Tyr Val Ser Val Val Thr Ser Asn Tyr Asn Arg
    210                 215                 220
Arg Phe Thr Pro Glu Ile Ala Glu Arg Pro Lys Val Arg Asp Gln Ala
225                 230                 235                 240
Gly Arg Met Asn Tyr Tyr Trp Thr Leu Leu Lys Pro Gly Asp Thr Ile
                245                 250                 255
Ile Phe Glu Ala Asn Gly Asn Leu Ile Ala Pro Met Tyr Ala Phe Ala
            260                 265                 270
Leu Ser Arg Gly Phe Gly Ser Gly Ile Ile Thr Ser Asn Ala Ser Met
        275                 280                 285
```

```
His Glu Cys Asn Thr Lys Cys Gln Thr Pro Leu Gly Ala Ile Asn Ser
    290                 295                 300
Ser Leu Pro Tyr Gln Asn Ile His Pro Val Thr Ile Gly Glu Cys Pro
305                 310                 315                 320
Lys Tyr Val Arg Ser Ala Lys Leu Arg Met Val Thr Gly Leu Arg Asn
                325                 330                 335
Asn Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe
            340                 345                 350
Ile Glu Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr His
        355                 360                 365
His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser Thr
    370                 375                 380
Gln Asn Ala Ile Asn Gly Ile Thr Asn Lys Val Asn Thr Val Ile Glu
385                 390                 395                 400
Lys Met Asn Ile Gln Phe Thr Ala Val Gly Lys Glu Phe Asn Lys Leu
                405                 410                 415
Glu Lys Arg Met Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe Leu
            420                 425                 430
Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Glu
        435                 440                 445
Arg Thr Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu Lys
    450                 455                 460
Val Lys Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly Cys
465                 470                 475                 480
Phe Glu Phe Tyr His Lys Cys Asp Asn Glu Cys Met Glu Ser Val Arg
                485                 490                 495
Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu Asn
            500                 505                 510
Arg Glu Lys Val Asp Gly Val Lys Leu Glu Ser Met Gly Ile Tyr Gln
        515                 520                 525
Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu Val
    530                 535                 540
Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln
545                 550                 555                 560
Cys Arg Ile Cys Ile
                565
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<210> 2
<211> 562
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H2

<400> 2

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Met Ala Ile Ile Tyr Leu Ile Leu Leu Phe Thr Ala Val Arg Gly Asp
 1                5                  10                  15
Gln Ile Cys Ile Gly Tyr His Ser Asn Asn Ser Thr Glu Lys Val Asp
            20                  25                  30
Thr Ile Leu Glu Arg Asn Val Thr Val Thr His Ala Gln Asn Ile Leu
        35                  40                  45
Glu Lys Thr His Asn Gly Lys Leu Cys Lys Leu Asn Gly Ile Pro Pro
    50                  55                  60
Leu Glu Leu Gly Asp Cys Ser Ile Ala Gly Trp Leu Leu Gly Asn Pro
65                  70                  75                  80
Glu Cys Asp Arg Leu Leu Thr Val Pro Glu Trp Ser Tyr Ile Met Glu
                85                  90                  95
Lys Glu Asn Pro Arg Asn Gly Leu Cys Tyr Pro Gly Ser Phe Asn Asp
            100                 105                 110
Tyr Glu Glu Leu Lys His Leu Leu Ser Ser Val Thr His Phe Glu Lys
        115                 120                 125
Val Lys Ile Leu Pro Lys Asp Arg Trp Thr Gln His Thr Thr Thr Gly
    130                 135                 140
Gly Ser Arg Ala Cys Ala Val Ser Gly Asn Pro Ser Phe Phe Arg Asn
145                 150                 155                 160
```

```
Met Val Trp Leu Thr Lys Lys Gly Ser Asn Tyr Pro Ile Ala Lys Gly
                165                 170                 175
Ser Tyr Asn Asn Thr Ser Gly Glu Gln Met Leu Ile Ile Trp Gly Val
            180                 185                 190
His His Pro Asn Asp Glu Thr Glu Gln Arg Thr Leu Tyr Gln Asn Val
        195                 200                 205
Gly Thr Tyr Val Ser Ile Gly Thr Ser Thr Leu Asn Lys Arg Ser Ile
    210                 215                 220
Pro Val Ile Ala Thr Arg Pro Lys Val Asn Gly Gln Gly Gly Arg Met
225                 230                 235                 240
Glu Phe Ser Trp Thr Ile Leu Asp Ile Trp Asp Thr Ile Asn Phe Glu
                245                 250                 255
Ser Thr Gly Asn Leu Ile Ala Pro Glu Tyr Gly Phe Arg Ile Ser Lys
            260                 265                 270
Arg Gly Ser Ser Gly Ile Met Lys Thr Glu Gly Thr Leu Glu Asn Cys
        275                 280                 285
Glu Thr Lys Cys Gln Thr Pro Leu Gly Ala Ile Asn Thr Thr Leu Pro
    290                 295                 300
Phe His Asn Val His Pro Leu Thr Ile Gly Glu Cys Pro Lys Tyr Val
305                 310                 315                 320
Lys Ser Glu Arg Leu Val Leu Ala Thr Gly Leu Arg Asn Val Pro Gln
                325                 330                 335
Ile Glu Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile Glu Gly
            340                 345                 350
Gly Trp Gln Gly Met Ile Asp Gly Trp Tyr Gly Tyr His His Ser Asn
        355                 360                 365
Asp Gln Gly Ser Gly Tyr Ala Ala Asp Lys Glu Ser Thr Gln Lys Ala
    370                 375                 380
Ile Asp Gly Ile Thr Asn Arg Val Asn Ser Val Ile Glu Lys Met Asn
385                 390                 395                 400
Thr Gln Phe Glu Ala Val Gly Lys Glu Phe Ser Asn Leu Glu Lys Arg
                405                 410                 415
Leu Glu Asn Leu Asn Lys Lys Met Glu Asp Gly Phe Leu Asp Val Trp
            420                 425                 430
Thr Tyr Asn Ala Glu Leu Leu Val Leu Met Glu Asn Glu Arg Thr Leu
        435                 440                 445
Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Asp Arg Val Arg Met
    450                 455                 460
Gln Leu Arg Asp Asn Ala Lys Glu Leu Gly Asn Gly Cys Phe Glu Phe
465                 470                 475                 480
Tyr His Lys Cys Asp Asp Glu Cys Met Asn Ser Val Lys Asn Gly Thr
                485                 490                 495
Tyr Asp Tyr Pro Lys Tyr Glu Glu Glu Ser Lys Leu Asn Arg Asn Glu
            500                 505                 510
Ile Lys Gly Val Lys Leu Ser Asn Met Gly Val Tyr Gln Ile Leu Ala
        515                 520                 525
Ile Tyr Ala Thr Val Ala Gly Ser Leu Ser Leu Ala Ile Met Ile Ala
    530                 535                 540
Gly Ile Ser Leu Trp Met Cys Ser Asn Gly Ser Leu Gln Cys Arg Ile
545                 550                 555                 560
Cys Ile
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<210> 3
<211> 566
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H3

<400> 3

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Met Lys Thr Ile Ile Ala Leu Ser Tyr Ile Phe Cys Leu Ala Leu Gly
 1               5                  10                  15
Gln Asp Leu Pro Gly Asn Asp Asn Ser Thr Ala Thr Leu Cys Leu Gly
            20                  25                  30
```

```
His His Ala Val Pro Asn Gly Thr Leu Val Lys Thr Ile Thr Asp Asp
        35                  40                  45
Gln Ile Glu Val Thr Asn Ala Thr Glu Leu Val Gln Ser Ser Ser Thr
    50                  55                  60
Gly Lys Ile Cys Asn Asn Pro His Arg Ile Leu Asp Gly Ile Asp Cys
65                  70                  75                  80
Thr Leu Ile Asp Ala Leu Leu Gly Asp Pro His Cys Asp Val Phe Gln
                85                  90                  95
Asn Glu Thr Trp Asp Leu Phe Val Glu Arg Ser Lys Ala Phe Ser Asn
            100                 105                 110
Cys Tyr Pro Tyr Asp Val Pro Asp Tyr Ala Ser Leu Arg Ser Leu Val
        115                 120                 125
Ala Ser Ser Gly Thr Leu Glu Phe Ile Thr Glu Gly Phe Thr Trp Thr
    130                 135                 140
Gly Val Thr Gln Asn Gly Gly Ser Asn Ala Cys Lys Arg Gly Pro Gly
145                 150                 155                 160
Asn Gly Phe Phe Ser Arg Leu Asn Trp Leu Thr Lys Ser Gly Ser Thr
                165                 170                 175
Tyr Pro Val Leu Asn Val Thr Met Pro Asn Asn Asp Asn Phe Asp Lys
            180                 185                 190
Leu Tyr Ile Trp Gly Val His His Pro Ser Thr Asn Gln Glu Gln Thr
        195                 200                 205
Ser Leu Tyr Val Gln Glu Ser Gly Arg Val Thr Val Ser Thr Arg Arg
    210                 215                 220
Ser Gln Gln Ser Ile Ile Pro Asn Ile Gly Ser Arg Pro Trp Val Arg
225                 230                 235                 240
Gly Gln Ser Ser Arg Ile Ser Ile Tyr Trp Thr Ile Val Lys Pro Gly
                245                 250                 255
Asp Val Leu Val Ile Asn Ser Asn Gly Asn Leu Ile Ala Pro Arg Gly
            260                 265                 270
Tyr Phe Lys Met Arg Thr Gly Lys Ser Ser Ile Met Ser Ser Asp Ala
        275                 280                 285
Pro Ile Asp Thr Cys Ile Ser Glu Cys Ile Thr Pro Asn Gly Ser Ile
    290                 295                 300
Pro Asn Asp Lys Pro Phe Gln Asn Val Asn Lys Ile Thr Tyr Gly Ala
305                 310                 315                 320
Cys Pro Lys Tyr Val Lys Gln Asn Thr Leu Lys Leu Ala Thr Gly Met
                325                 330                 335
Arg Asn Val Pro Glu Lys Gln Thr Arg Gly Leu Phe Gly Ala Ile Ala
            340                 345                 350
Gly Phe Ile Glu Asn Gly Trp Glu Gly Met Ile Asp Gly Trp Tyr Gly
        355                 360                 365
Phe Arg His Gln Asn Ser Glu Gly Thr Gly Gln Ala Ala Asp Leu Lys
    370                 375                 380
Ser Thr Gln Ala Ala Ile Asp Gln Ile Asn Gly Lys Leu Asn Arg Val
385                 390                 395                 400
Ile Glu Lys Thr Asn Glu Lys Phe His Gln Ile Glu Lys Glu Phe Ser
                405                 410                 415
Glu Val Glu Gly Arg Ile Gln Asp Leu Glu Lys Tyr Val Glu Asp Thr
            420                 425                 430
Lys Ile Asp Leu Trp Ser Tyr Asn Ala Glu Leu Leu Val Ala Leu Glu
        435                 440                 445
Asn Gln His Thr Ile Asp Leu Thr Asp Ser Glu Met Asn Lys Leu Phe
    450                 455                 460
Glu Lys Thr Arg Arg Gln Leu Arg Glu Asn Ala Glu Asp Met Gly Asn
465                 470                 475                 480
Gly Cys Phe Lys Ile Tyr His Lys Cys Asp Asn Ala Cys Ile Glu Ser
                485                 490                 495
Ile Arg Asn Gly Thr Tyr Asp His Asp Val Tyr Arg Asp Glu Ala Leu
            500                 505                 510
Asn Asn Arg Phe Gln Ile Lys Gly Val Glu Leu Lys Ser Gly Tyr Lys
        515                 520                 525
Asp Trp Ile Leu Trp Ile Ser Phe Ala Ile Ser Cys Phe Leu Leu Cys
    530                 535                 540
Val Val Leu Leu Gly Phe Ile Met Trp Ala Cys Gln Arg Gly Asn Ile
545                 550                 555                 560
Arg Cys Asn Ile Cys Ile
                565
```

<210> 4
<211> 564
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H4

<400> 4

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Met Leu Ser Ile Val Ile Leu Phe Leu Leu Ile Ala Glu Asn Ser Ser
 1               5                  10                  15
Gln Asn Tyr Thr Gly Asn Pro Val Ile Cys Met Gly His His Ala Val
            20                  25                  30
Ala Asn Gly Thr Met Val Lys Thr Leu Ala Asp Asp Gln Val Glu Val
        35                  40                  45
Val Thr Ala Gln Glu Leu Val Glu Ser Gln Asn Leu Pro Glu Leu Cys
    50                  55                  60
Pro Ser Pro Leu Arg Leu Val Asp Gly Gln Thr Cys Asp Ile Ile Asn
65                  70                  75                  80
Gly Ala Leu Gly Ser Pro Gly Cys Asp His Leu Asn Gly Ala Glu Trp
                85                  90                  95
Asp Val Phe Ile Glu Arg Pro Asn Ala Val Asp Thr Cys Tyr Pro Phe
            100                 105                 110
Asp Val Pro Glu Tyr Gln Ser Leu Arg Ser Ile Leu Ala Asn Asn Gly
        115                 120                 125
Lys Phe Glu Phe Ile Ala Glu Glu Phe Gln Trp Asn Thr Val Lys Gln
    130                 135                 140
Asn Gly Lys Ser Gly Ala Cys Lys Arg Ala Asn Val Asp Asp Phe Phe
145                 150                 155                 160
Asn Arg Leu Asn Trp Leu Val Lys Ser Asp Gly Asn Ala Tyr Pro Leu
                165                 170                 175
Gln Asn Leu Thr Lys Ile Asn Asn Gly Asp Tyr Ala Arg Leu Tyr Ile
            180                 185                 190
Trp Gly Val His His Pro Ser Thr Ser Thr Glu Gln Thr Asn Leu Tyr
        195                 200                 205
Lys Asn Asn Pro Gly Arg Val Thr Val Ser Thr Lys Thr Ser Gln Thr
    210                 215                 220
Ser Val Val Pro Asp Ile Gly Ser Arg Pro Leu Val Arg Gly Gln Ser
225                 230                 235                 240
Gly Arg Val Ser Phe Tyr Trp Thr Ile Val Glu Pro Gly Asp Leu Ile
                245                 250                 255
Val Phe Asn Thr Ile Gly Asn Leu Ile Ala Pro Arg Gly His Tyr Lys
            260                 265                 270
Leu Asn Asn Gln Lys Lys Ser Thr Ile Leu Asn Thr Ala Ile Pro Ile
        275                 280                 285
Gly Ser Cys Val Ser Lys Cys His Thr Asp Lys Gly Ser Leu Ser Thr
    290                 295                 300
Thr Lys Pro Phe Gln Asn Ile Ser Arg Ile Ala Val Gly Asp Cys Pro
305                 310                 315                 320
Arg Tyr Val Lys Gln Gly Ser Leu Lys Leu Ala Thr Gly Met Arg Asn
                325                 330                 335
Ile Pro Glu Lys Ala Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe
            340                 345                 350
Ile Glu Asn Gly Trp Gln Gly Leu Ile Asp Gly Trp Tyr Gly Phe Arg
        355                 360                 365
His Gln Asn Ala Glu Gly Thr Gly Thr Ala Ala Asp Leu Lys Ser Thr
    370                 375                 380
Gln Ala Ala Ile Asp Gln Ile Asn Gly Lys Leu Asn Arg Leu Ile Glu
385                 390                 395                 400
Lys Thr Asn Asp Lys Tyr His Gln Ile Glu Lys Glu Phe Glu Gln Val
                405                 410                 415
Glu Gly Arg Ile Gln Asp Leu Glu Asn Tyr Val Glu Asp Thr Lys Ile
            420                 425                 430
Asp Leu Trp Ser Tyr Asn Ala Glu Leu Leu Val Ala Leu Glu Asn Gln
        435                 440                 445
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```
His Thr Ile Asp Val Thr Asp Ser Glu Met Asn Lys Leu Phe Glu Arg
    450                 455                 460
Val Arg Arg Gln Leu Arg Glu Asn Ala Glu Asp Lys Gly Asn Gly Cys
465                 470                 475                 480
Phe Glu Ile Phe His Lys Cys Asp Asn Asn Cys Ile Glu Ser Ile Arg
                485                 490                 495
Asn Gly Thr Tyr Asp His Asp Ile Tyr Arg Asp Glu Ala Ile Asn Asn
            500                 505                 510
Arg Phe Gln Ile Gln Gly Val Lys Leu Thr Gln Gly Tyr Lys Asp Ile
        515                 520                 525
Ile Leu Trp Ile Ser Phe Ser Ile Ser Cys Phe Leu Leu Val Ala Leu
    530                 535                 540
Leu Leu Ala Phe Ile Leu Trp Ala Cys Gln Asn Gly Asn Ile Arg Cys
545                 550                 555                 560
Gln Ile Cys Ile
```

<210> 5
<211> 564
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H5

<400> 5

```
Met Glu Arg Ile Val Leu Leu Leu Ala Ile Val Ser Leu Val Lys Ser
 1               5                  10                  15
Asp Gln Ile Cys Ile Gly Tyr His Ala Asn Lys Ser Thr Lys Gln Val
            20                  25                  30
Asp Thr Ile Met Glu Lys Asn Val Thr Val Thr His Ala Gln Asp Ile
        35                  40                  45
Leu Glu Arg Thr His Asn Gly Lys Leu Cys Ser Leu Asn Gly Val Lys
    50                  55                  60
Pro Leu Ile Leu Arg Asp Cys Ser Val Ala Gly Trp Leu Leu Gly Asn
65                  70                  75                  80
Pro Met Cys Asp Glu Phe Leu Asn Leu Pro Glu Trp Leu Tyr Ile Val
                85                  90                  95
Glu Lys Asp Asn Pro Ile Asn Ser Leu Cys Tyr Pro Gly Asp Phe Asn
            100                 105                 110
Asp Tyr Glu Glu Leu Lys Tyr Leu Leu Ser Ser Thr Asn His Phe Glu
        115                 120                 125
Lys Ile Arg Ile Ile Pro Arg Ser Ser Trp Ser Asn His Asp Ala Ser
    130                 135                 140
Ser Gly Val Ser Ser Ala Cys Pro Tyr Ile Gly Arg Ser Ser Phe Leu
145                 150                 155                 160
Arg Asn Val Val Trp Leu Ile Lys Lys Asn Asn Thr Tyr Pro Thr Ile
                165                 170                 175
Lys Arg Ser Tyr Asn Asn Thr Asn Gln Glu Asp Leu Leu Ile Leu Trp
            180                 185                 190
Gly Ile His His Pro Asn Asp Ala Ala Glu Gln Thr Lys Leu Tyr Gln
        195                 200                 205
Asn Pro Thr Thr Tyr Val Ser Val Gly Thr Ser Thr Leu Asn Gln Arg
    210                 215                 220
Ser Ile Pro Glu Ile Ala Thr Arg Pro Lys Val Asn Gly Gln Ser Gly
225                 230                 235                 240
Arg Met Glu Phe Phe Trp Thr Ile Leu Lys Pro Asn Asp Ala Ile Asn
                245                 250                 255
Phe Glu Ser Asn Gly Asn Phe Ile Ala Pro Arg Tyr Ala Tyr Lys Ile
            260                 265                 270
Val Lys Lys Gly Asp Ser Ala Ile Met Lys Ser Gly Leu Ala Tyr Gly
        275                 280                 285
Asn Cys Asp Thr Lys Cys Gln Thr Pro Val Gly Glu Ile Asn Ser Ser
    290                 295                 300
Met Pro Phe His Asn Ile His Pro His Thr Ile Gly Glu Cys Pro Lys
305                 310                 315                 320
```

```
Tyr Val Lys Ser Asp Arg Leu Val Leu Ala Thr Gly Leu Arg Asn Val
                325                 330                 335
Pro Gln Arg Lys Lys Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile
            340                 345                 350
Glu Gly Gly Trp Gln Gly Met Val Asp Gly Trp Tyr Gly Tyr His His
        355                 360                 365
Ser Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Lys Glu Ser Thr Gln
    370                 375                 380
Lys Ala Ile Asp Gly Ile Thr Asn Lys Val Asn Ser Ile Ile Asp Lys
385                 390                 395                 400
Met Asn Thr Arg Phe Glu Ala Val Gly Lys Glu Phe Asn Asn Leu Glu
                405                 410                 415
Arg Arg Val Glu Asn Leu Asn Lys Lys Met Glu Asp Gly Phe Leu Asp
            420                 425                 430
Val Trp Thr Tyr Asn Val Glu Leu Leu Val Leu Met Glu Asn Glu Arg
        435                 440                 445
Thr Leu Asp Phe His Asp Ser Asn Val Asn Asn Leu Tyr Asp Lys Val
    450                 455                 460
Arg Leu Gln Leu Lys Asp Asn Ala Arg Glu Leu Gly Asn Gly Cys Phe
465                 470                 475                 480
Glu Phe Tyr His Lys Cys Asp Asn Glu Cys Met Glu Ser Val Arg Asn
                485                 490                 495
Gly Thr Tyr Asp Tyr Pro Gln Tyr Ser Glu Glu Ala Arg Leu Asn Arg
            500                 505                 510
Glu Glu Ile Ser Gly Val Lys Leu Glu Ser Met Gly Val Tyr Gln Ile
        515                 520                 525
Leu Ser Ile Tyr Ser Thr Val Ala Ser Ser Leu Ala Leu Ala Ile Met
    530                 535                 540
Ile Ala Gly Leu Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln Cys
545                 550                 555                 560
Arg Ile Cys Ile
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<210> 6
<211> 566
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H6

<400> 6

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Met Ile Ala Ile Ile Val Val Ala Ile Leu Ala Thr Ala Gly Arg Ser
 1                5                  10                  15
Asp Lys Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Thr Gln Ile
            20                  25                  30
Asp Thr Ile Leu Glu Lys Asn Val Thr Val Thr His Ser Val Glu Leu
        35                  40                  45
Leu Glu Asn Gln Lys Glu Glu Arg Phe Cys Lys Ile Leu Lys Lys Ala
    50                  55                  60
Pro Leu Asp Leu Lys Gly Cys Thr Ile Glu Gly Trp Ile Leu Gly Asn
65                  70                  75                  80
Pro Gln Cys Asp Leu Leu Leu Gly Asp Gln Ser Trp Ser Tyr Ile Val
                85                  90                  95
Glu Arg Pro Thr Ala Gln Asn Gly Ile Cys Tyr Pro Gly Val Leu Asn
            100                 105                 110
Glu Val Glu Glu Leu Lys Ala Leu Ile Gly Ser Gly Glu Arg Val Glu
        115                 120                 125
Arg Phe Glu Met Phe Pro Lys Ser Thr Trp Thr Gly Val Asp Thr Ser
    130                 135                 140
Ser Gly Val Thr Arg Ala Cys Pro Tyr Asn Ser Gly Ser Ser Phe Tyr
145                 150                 155                 160
Arg Asn Leu Leu Trp Ile Ile Lys Thr Lys Ser Ala Ala Tyr Ser Val
                165                 170                 175
Ile Lys Gly Ala Tyr Asn Asn Thr Gly Asn Gln Pro Ile Leu Tyr Phe
            180                 185                 190
```

```
Trp Gly Val His His Pro Pro Asp Thr Asn Glu Gln Asn Thr Leu Tyr
        195                 200                 205
Gly Ser Gly Asp Arg Tyr Val Arg Met Gly Thr Glu Ser Met Asn Phe
    210                 215                 220
Ala Lys Ser Pro Glu Ile Ala Ala Arg Pro Ala Val Asn Gly Gln Arg
225                 230                 235                 240
Gly Arg Ile Asp Tyr Tyr Trp Ser Ile Leu Lys Pro Gly Glu Thr Leu
                245                 250                 255
Asn Val Glu Ser Asn Gly Asn Leu Ile Ala Pro Trp Tyr Ala Phe Arg
            260                 265                 270
Phe Val Ser Thr Ser Asn Lys Gly Ala Val Phe Lys Ser Asn Leu Pro
        275                 280                 285
Ile Glu Asn Cys Asp Ala Thr Cys Gln Thr Val Ala Gly Val Leu Arg
    290                 295                 300
Thr Asn Lys Thr Phe Gln Asn Val Ser Pro Leu Trp Ile Gly Glu Cys
305                 310                 315                 320
Pro Lys Tyr Val Lys Ser Glu Ser Leu Arg Leu Ala Thr Gly Leu Arg
                325                 330                 335
Asn Val Pro Gln Ile Glu Thr Arg Gly Leu Phe Gly Ala Ile Ala Gly
            340                 345                 350
Phe Ile Glu Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr
        355                 360                 365
His His Glu Asn Ser Gln Gly Ser Gly Tyr Ala Ala Asp Arg Glu Ser
    370                 375                 380
Thr Gln Lys Ala Val Asp Gly Ile Thr Asn Lys Val Asn Ser Ile Ile
385                 390                 395                 400
Asp Lys Met Asn Thr Gln Phe Glu Ala Val Asp His Glu Phe Ser Asn
                405                 410                 415
Leu Glu Arg Arg Ile Asp Asn Leu Asn Lys Arg Met Glu Asp Gly Phe
            420                 425                 430
Leu Asp Val Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn
        435                 440                 445
Glu Arg Thr Leu Asp Leu His Asp Ala Asn Val Lys Asn Leu Tyr Glu
    450                 455                 460
Arg Val Lys Ser Gln Leu Arg Asp Asn Ala Met Ile Leu Gly Asn Gly
465                 470                 475                 480
Cys Phe Glu Phe Trp His Lys Cys Asp Asp Glu Cys Met Glu Ser Val
                485                 490                 495
Lys Asn Gly Thr Tyr Asp Tyr Pro Lys Tyr Gln Asp Glu Ser Lys Leu
            500                 505                 510
Asn Arg Gln Glu Ile Glu Ser Val Lys Leu Glu Ser Leu Gly Val Tyr
        515                 520                 525
Gln Ile Leu Ala Ile Tyr Ser Thr Val Ser Ser Ser Leu Val Leu Val
    530                 535                 540
Gly Leu Ile Ile Ala Val Gly Leu Trp Met Cys Ser Asn Gly Ser Met
545                 550                 555                 560
Gln Cys Arg Ile Cys Ile
                565


<210> 7
<211> 563
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H7

<400> 7

Met Asn Thr Gln Ile Leu Val Phe Ala Leu Val Ala Val Ile Pro Thr
 1               5                  10                  15
Asn Ala Asp Lys Ile Cys Leu Gly His His Ala Val Ser Asn Gly Thr
            20                  25                  30
Lys Val Asn Thr Leu Thr Glu Arg Gly Val Glu Val Val Asn Ala Thr
        35                  40                  45
Glu Thr Val Glu Arg Thr Asn Ile Pro Lys Ile Cys Ser Lys Gly Lys
    50                  55                  60
```

```
Arg Thr Thr Asp Leu Gly Gln Cys Gly Leu Leu Gly Thr Ile Thr Gly
65                  70                  75                  80
Pro Pro Gln Cys Asp Gln Phe Leu Glu Phe Ser Ala Asp Leu Ile Ile
                85                  90                  95
Glu Arg Arg Glu Gly Asn Asp Val Cys Tyr Pro Gly Lys Phe Val Asn
            100                 105                 110
Glu Glu Ala Leu Arg Gln Ile Leu Arg Gly Ser Gly Gly Ile Asp Lys
        115                 120                 125
Glu Thr Met Gly Phe Thr Tyr Ser Gly Ile Arg Thr Asn Gly Thr Thr
    130                 135                 140
Ser Ala Cys Arg Arg Ser Gly Ser Ser Phe Tyr Ala Glu Met Glu Trp
145                 150                 155                 160
Leu Leu Ser Asn Thr Asp Asn Ala Ser Phe Pro Gln Met Thr Lys Ser
                165                 170                 175
Tyr Lys Asn Thr Arg Arg Glu Ser Ala Leu Ile Val Trp Gly Ile His
            180                 185                 190
His Ser Gly Ser Thr Thr Glu Gln Thr Lys Leu Tyr Gly Ser Gly Asn
        195                 200                 205
Lys Leu Ile Thr Val Gly Ser Ser Lys Tyr His Gln Ser Phe Val Pro
    210                 215                 220
Ser Pro Gly Thr Arg Pro Gln Ile Asn Gly Gln Ser Gly Arg Ile Asp
225                 230                 235                 240
Phe His Trp Leu Ile Leu Asp Pro Asn Asp Thr Val Thr Phe Ser Phe
                245                 250                 255
Asn Gly Ala Phe Ile Ala Pro Asn Arg Ala Ser Phe Leu Arg Gly Lys
            260                 265                 270
Ser Met Gly Ile Gln Ser Asp Val Gln Val Asp Ala Asn Cys Glu Gly
        275                 280                 285
Glu Cys Tyr His Ser Gly Gly Thr Ile Thr Ser Arg Leu Pro Phe Gln
    290                 295                 300
Asn Ile Asn Ser Arg Ala Val Gly Lys Cys Pro Arg Tyr Val Lys Gln
305                 310                 315                 320
Glu Ser Leu Leu Leu Ala Thr Gly Met Lys Asn Val Pro Glu Pro Ser
                325                 330                 335
Lys Lys Arg Lys Lys Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile
            340                 345                 350
Glu Asn Gly Trp Glu Gly Leu Val Asp Gly Trp Tyr Gly Phe Arg His
        355                 360                 365
Gln Asn Ala Gln Gly Glu Gly Thr Ala Ala Asp Tyr Lys Ser Thr Gln
    370                 375                 380
Ser Ala Ile Asp Gln Ile Thr Gly Lys Leu Asn Arg Leu Ile Glu Lys
385                 390                 395                 400
Thr Asn Gln Gln Phe Glu Leu Ile Asp Asn Glu Phe Thr Glu Val Glu
                405                 410                 415
Lys Gln Ile Gly Asn Leu Ile Asn Trp Thr Lys Asp Ser Ile Thr Glu
            420                 425                 430
Val Trp Ser Tyr Asn Ala Glu Leu Ile Val Ala Met Glu Asn Gln His
        435                 440                 445
Thr Ile Asp Leu Ala Asp Ser Glu Met Asn Arg Leu Tyr Glu Arg Val
    450                 455                 460
Arg Lys Gln Leu Arg Glu Asn Ala Glu Glu Asp Gly Thr Gly Cys Phe
465                 470                 475                 480
Glu Ile Phe His Lys Cys Asp Asp Asp Cys Met Ala Ser Ile Arg Asn
                485                 490                 495
Asn Thr Tyr Asp His Ser Lys Tyr Arg Glu Glu Ala Met Gln Asn Arg
            500                 505                 510
Ile Gln Ile Asp Pro Val Lys Leu Ser Ser Gly Tyr Lys Asp Val Ile
        515                 520                 525
Leu Trp Phe Ser Phe Gly Ala Ser Cys Phe Leu Leu Leu Ala Ile Ala
    530                 535                 540
Met Gly Leu Val Phe Ile Cys Val Lys Asn Gly Asn Met Arg Cys Thr
545                 550                 555                 560
Ile Cys Ile
```

<210> 8
<211> 565

<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H8

<400> 8

```
Met Glu Lys Phe Ile Ala Ile Ala Thr Leu Ala Ser Thr Asn Ala Tyr
 1               5                  10                  15
Asp Arg Ile Cys Ile Gly Tyr Gln Ser Asn Asn Ser Thr Asp Thr Val
            20                  25                  30
Asn Thr Leu Ile Glu Gln Asn Val Pro Val Thr Gln Thr Met Glu Leu
        35                  40                  45
Val Glu Thr Glu Lys His Pro Ala Tyr Cys Asn Thr Asp Leu Gly Ala
    50                  55                  60
Pro Leu Glu Leu Arg Asp Cys Lys Ile Glu Ala Val Ile Tyr Gly Asn
65                  70                  75                  80
Pro Lys Cys Asp Ile His Leu Lys Asp Gln Gly Trp Ser Tyr Ile Val
                85                  90                  95
Glu Arg Pro Ser Ala Pro Glu Gly Met Cys Tyr Pro Gly Ser Val Glu
            100                 105                 110
Asn Leu Glu Glu Leu Arg Phe Val Phe Ser Ser Ala Ala Ser Tyr Lys
        115                 120                 125
Arg Ile Arg Leu Phe Asp Tyr Ser Arg Trp Asn Val Thr Arg Ser Gly
    130                 135                 140
Thr Ser Lys Ala Cys Asn Ala Ser Thr Gly Gly Gln Ser Phe Tyr Arg
145                 150                 155                 160
Ser Ile Asn Trp Leu Thr Lys Lys Glu Pro Asp Thr Tyr Asp Phe Asn
                165                 170                 175
Glu Gly Ala Tyr Val Asn Asn Glu Asp Gly Asp Ile Ile Phe Leu Trp
            180                 185                 190
Gly Ile His His Pro Pro Asp Thr Lys Glu Gln Thr Thr Leu Tyr Lys
        195                 200                 205
Asn Ala Asn Thr Leu Ser Ser Val Thr Thr Asn Thr Ile Asn Arg Ser
    210                 215                 220
Phe Gln Pro Asn Ile Gly Pro Arg Pro Leu Val Arg Gly Gln Gln Gly
225                 230                 235                 240
Arg Met Asp Tyr Tyr Trp Gly Ile Leu Lys Arg Gly Glu Thr Leu Lys
                245                 250                 255
Ile Arg Thr Asn Gly Asn Leu Ile Ala Pro Glu Phe Gly Tyr Leu Leu
            260                 265                 270
Lys Gly Glu Ser Tyr Gly Arg Ile Ile Gln Asn Glu Asp Ile Pro Ile
        275                 280                 285
Gly Asn Cys Asn Thr Lys Cys Gln Thr Tyr Ala Gly Ala Ile Asn Ser
    290                 295                 300
Ser Lys Pro Phe Gln Asn Ala Ser Arg His Tyr Met Gly Glu Cys Pro
305                 310                 315                 320
Lys Tyr Val Lys Lys Ala Ser Leu Arg Leu Ala Val Gly Leu Arg Asn
                325                 330                 335
Thr Pro Ser Val Glu Pro Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe
            340                 345                 350
Ile Glu Gly Gly Trp Ser Gly Met Ile Asp Gly Trp Tyr Gly Phe His
        355                 360                 365
His Ser Asn Ser Glu Gly Thr Gly Met Ala Ala Asp Gln Lys Ser Thr
    370                 375                 380
Gln Glu Ala Ile Asp Lys Ile Thr Asn Lys Val Asn Asn Ile Val Asp
385                 390                 395                 400
Lys Met Asn Arg Glu Phe Glu Val Val Asn His Glu Phe Ser Glu Val
                405                 410                 415
Glu Lys Arg Ile Asn Met Ile Asn Asp Lys Ile Asp Asp Gln Ile Glu
            420                 425                 430
Asp Leu Trp Ala Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Gln
        435                 440                 445
Lys Thr Leu Asp Glu His Asp Ser Asn Val Lys Asn Leu Phe Asp Glu
    450                 455                 460
Val Lys Arg Arg Leu Ser Ala Asn Ala Ile Asp Ala Gly Asn Gly Cys
465                 470                 475                 480
```

```
Phe Asp Ile Leu His Lys Cys Asp Asn Glu Cys Met Glu Thr Ile Lys
                485                 490                 495
Asn Gly Thr Tyr Asp His Lys Glu Tyr Glu Glu Glu Ala Lys Leu Glu
            500                 505                 510
Arg Ser Lys Ile Asn Gly Val Lys Leu Glu Glu Asn Thr Thr Tyr Lys
        515                 520                 525
Ile Leu Ser Ile Tyr Ser Thr Val Ala Ala Ser Leu Cys Leu Ala Ile
    530                 535                 540
Leu Ile Ala Gly Gly Leu Ile Leu Gly Met Gln Asn Gly Ser Cys Arg
545                 550                 555                 560
Cys Met Phe Cys Ile
                565


<210> 9
<211> 560
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H9

<400> 9

Met Glu Thr Lys Ala Ile Ile Ala Ala Leu Leu Met Val Thr Ala Ala
 1                5                  10                  15
Asn Ala Asp Lys Ile Cys Ile Gly Tyr Gln Ser Thr Asn Ser Thr Glu
            20                  25                  30
Thr Val Asp Thr Leu Thr Glu Ser Asn Val Pro Val Thr His Thr Lys
        35                  40                  45
Glu Leu Leu His Thr Glu His Asn Gly Met Leu Cys Ala Thr Asp Leu
    50                  55                  60
Gly His Pro Leu Ile Leu Asp Thr Cys Thr Ile Glu Gly Leu Ile Tyr
65                  70                  75                  80
Gly Asn Pro Ser Cys Asp Ile Leu Leu Gly Gly Lys Glu Trp Ser Tyr
                85                  90                  95
Ile Val Glu Arg Ser Ser Ala Val Asn Gly Met Cys Tyr Pro Gly Asn
            100                 105                 110
Val Glu Asn Leu Glu Glu Leu Arg Ser Leu Phe Ser Ser Ala Lys Ser
        115                 120                 125
Tyr Lys Arg Ile Gln Ile Phe Pro Asp Lys Thr Trp Asn Val Thr Tyr
    130                 135                 140
Ser Gly Thr Ser Arg Ala Cys Ser Asn Ser Phe Tyr Arg Ser Met Arg
145                 150                 155                 160
Trp Leu Thr His Lys Ser Asn Ser Tyr Pro Phe Gln Asn Ala His Tyr
                165                 170                 175
Thr Asn Asn Glu Arg Glu Asn Ile Leu Phe Met Trp Gly Ile His His
            180                 185                 190
Pro Pro Thr Asp Thr Glu Gln Thr Asp Leu Tyr Lys Asn Ala Asp Thr
        195                 200                 205
Thr Thr Ser Val Thr Thr Glu Asp Ile Asn Arg Thr Phe Lys Pro Val
    210                 215                 220
Ile Gly Pro Arg Pro Leu Val Asn Gly Gln Gln Gly Arg Ile Asp Tyr
225                 230                 235                 240
Tyr Trp Ser Val Leu Lys Pro Gly Gln Thr Leu Arg Ile Arg Ser Asn
                245                 250                 255
Gly Asn Leu Ile Ala Pro Trp Tyr Gly His Val Leu Thr Gly Glu Ser
            260                 265                 270
His Gly Arg Ile Leu Lys Thr Asp Leu Asn Asn Gly Asn Cys Val Val
        275                 280                 285
Gln Cys Gln Thr Glu Lys Gly Gly Leu Asn Thr Thr Leu Pro Phe His
    290                 295                 300
Asn Ile Ser Lys Tyr Ala Phe Gly Asn Cys Pro Lys Tyr Val Gly Val
305                 310                 315                 320
Lys Ser Leu Lys Leu Pro Val Gly Leu Arg Asn Val Pro Ala Val Ser
                325                 330                 335
Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile Glu Gly Gly Trp
            340                 345                 350
```

```
Pro Gly Leu Val Ala Gly Trp Tyr Gly Phe Gln His Ser Asn Asp Gln
        355                 360                 365
Gly Val Gly Met Ala Ala Asp Lys Gly Ser Thr Gln Lys Ala Ile Asp
    370                 375                 380
Lys Ile Thr Ser Lys Val Asn Asn Ile Ile Asp Lys Met Asn Lys Gln
385                 390                 395                 400
Tyr Glu Val Ile Asp His Glu Phe Asn Glu Leu Glu Ala Arg Leu Asn
                405                 410                 415
Met Ile Asn Asn Lys Ile Asp Asp Gln Ile Gln Asp Ile Trp Ala Tyr
            420                 425                 430
Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Gln Lys Thr Leu Asp Glu
        435                 440                 445
His Asp Ala Asn Val Asn Asn Leu Tyr Asn Lys Val Lys Arg Ala Leu
    450                 455                 460
Gly Ser Asn Ala Val Glu Asp Gly Asn Gly Cys Phe Glu Leu Tyr His
465                 470                 475                 480
Lys Cys Asp Asp Gln Cys Met Glu Thr Ile Arg Asn Gly Thr Tyr Asp
                485                 490                 495
Arg Gln Lys Tyr Gln Glu Glu Ser Arg Leu Glu Arg Gln Lys Ile Glu
            500                 505                 510
Gly Val Lys Leu Glu Ser Glu Gly Thr Tyr Lys Ile Leu Thr Ile Tyr
        515                 520                 525
Ser Thr Val Ala Ser Ser Leu Val Leu Ala Met Gly Phe Ala Ala Phe
    530                 535                 540
Leu Phe Trp Ala Met Ser Asn Gly Ser Cys Arg Cys Asn Ile Cys Ile
545                 550                 555                 560


<210> 10
<211> 561
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H10

<400> 10

Met Tyr Lys Val Val Val Ile Ile Ala Leu Leu Gly Ala Val Lys Gly
 1               5                  10                  15
Leu Asp Arg Ile Cys Leu Gly His His Ala Val Ala Asn Gly Thr Ile
            20                  25                  30
Val Lys Thr Leu Thr Asn Glu Gln Glu Glu Val Thr Asn Ala Thr Glu
        35                  40                  45
Thr Val Glu Ser Thr Asn Leu Asn Lys Leu Cys Met Lys Gly Arg Ser
    50                  55                  60
Tyr Lys Asp Leu Gly Asn Cys His Pro Val Gly Met Leu Ile Gly Thr
65                  70                  75                  80
Pro Val Cys Asp Pro His Leu Thr Gly Thr Trp Asp Thr Leu Ile Glu
                85                  90                  95
Arg Glu Asn Ala Ile Ala His Cys Tyr Pro Gly Ala Thr Ile Asn Glu
            100                 105                 110
Glu Ala Leu Arg Gln Lys Ile Met Glu Ser Gly Gly Ile Ser Lys Met
        115                 120                 125
Ser Thr Gly Phe Thr Tyr Gly Ser Ser Ile Thr Ser Ala Gly Thr Thr
    130                 135                 140
Lys Ala Cys Met Arg Asn Gly Gly Asp Ser Phe Tyr Ala Glu Leu Lys
145                 150                 155                 160
Trp Leu Val Ser Lys Thr Lys Gly Gln Asn Phe Pro Gln Thr Thr Asn
                165                 170                 175
Thr Tyr Arg Asn Thr Asp Thr Ala Glu His Leu Ile Ile Trp Gly Ile
            180                 185                 190
His His Pro Ser Ser Thr Gln Glu Lys Asn Asp Leu Tyr Gly Thr Gln
        195                 200                 205
Ser Leu Ser Ile Ser Val Glu Ser Ser Thr Tyr Gln Asn Asn Phe Val
    210                 215                 220
Pro Val Val Gly Ala Arg Pro Gln Val Asn Gly Gln Ser Gly Arg Ile
225                 230                 235                 240
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```
Asp Phe His Trp Thr Leu Val Gln Pro Gly Asp Asn Ile Thr Phe Ser
                245                 250                 255
Asp Asn Gly Gly Leu Ile Ala Pro Ser Arg Val Ser Lys Leu Thr Gly
            260                 265                 270
Arg Asp Leu Gly Ile Gln Ser Glu Ala Leu Ile Asp Asn Ser Cys Glu
        275                 280                 285
Ser Lys Cys Phe Trp Arg Gly Gly Ser Ile Asn Thr Lys Leu Pro Phe
    290                 295                 300
Gln Asn Leu Ser Pro Arg Thr Val Gly Gln Cys Pro Lys Tyr Val Asn
305                 310                 315                 320
Gln Arg Ser Leu Leu Leu Ala Thr Gly Met Arg Asn Val Pro Glu Val
                325                 330                 335
Val Gln Gly Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile Glu Asn
            340                 345                 350
Gly Trp Glu Gly Met Val Asp Gly Trp Tyr Gly Phe Arg His Gln Asn
        355                 360                 365
Ala Gln Gly Thr Gly Gln Ala Ala Asp Tyr Lys Ser Thr Gln Ala Ala
    370                 375                 380
Ile Asp Gln Ile Thr Gly Lys Leu Asn Arg Leu Ile Glu Lys Thr Asn
385                 390                 395                 400
Thr Glu Phe Glu Ser Ile Glu Ser Glu Phe Ser Glu Thr Glu His Gln
                405                 410                 415
Ile Gly Asn Val Ile Asn Trp Thr Lys Asp Ser Ile Thr Asp Ile Trp
            420                 425                 430
Thr Tyr Asn Ala Glu Leu Leu Val Ala Met Glu Asn Gln His Thr Ile
        435                 440                 445
Asp Met Ala Asp Ser Glu Met Leu Asn Leu Tyr Glu Arg Val Arg Lys
    450                 455                 460
Gln Leu Arg Gln Asn Ala Glu Glu Asp Gly Lys Gly Cys Phe Glu Ile
465                 470                 475                 480
Tyr His Thr Cys Asp Asp Ser Cys Met Glu Ser Ile Arg Asn Asn Thr
                485                 490                 495
Tyr Asp His Ser Gln Tyr Arg Glu Glu Ala Leu Leu Asn Arg Leu Asn
            500                 505                 510
Ile Asn Pro Val Lys Leu Ser Ser Gly Tyr Lys Asp Ile Ile Leu Trp
        515                 520                 525
Phe Ser Phe Gly Glu Ser Cys Phe Val Leu Leu Ala Val Val Met Gly
    530                 535                 540
Leu Val Phe Phe Cys Leu Lys Asn Gly Asn Met Arg Cys Thr Ile Cys
545                 550                 555                 560
Ile
```

<210> 11
<211> 565
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H11

<400> 11

```
Met Glu Lys Thr Leu Leu Phe Ala Ala Ile Phe Leu Cys Val Lys Ala
 1               5                  10                  15
Asp Glu Ile Cys Ile Gly Tyr Leu Ser Asn Asn Ser Thr Asp Lys Val
            20                  25                  30
Asp Thr Ile Ile Glu Asn Asn Val Thr Val Thr Ser Ser Val Glu Leu
        35                  40                  45
Val Glu Thr Glu His Thr Gly Ser Phe Cys Ser Ile Asn Gly Lys Gln
    50                  55                  60
Pro Ile Ser Leu Gly Asp Cys Ser Phe Ala Gly Trp Ile Leu Gly Asn
65                  70                  75                  80
Pro Met Cys Asp Glu Leu Ile Gly Lys Thr Ser Trp Ser Tyr Ile Val
                85                  90                  95
Glu Lys Pro Asn Pro Thr Asn Gly Ile Cys Tyr Pro Gly Thr Leu Glu
            100                 105                 110
```

```
Ser Glu Glu Glu Leu Arg Leu Lys Phe Ser Gly Val Leu Glu Phe Asn
        115                 120                 125
Lys Phe Glu Val Phe Thr Ser Asn Gly Trp Gly Ala Val Asn Ser Gly
    130                 135                 140
Val Gly Val Thr Ala Ala Cys Lys Phe Gly Gly Ser Asn Ser Phe Phe
145                 150                 155                 160
Arg Asn Met Val Trp Leu Ile His Gln Ser Gly Thr Tyr Pro Val Ile
                165                 170                 175
Lys Arg Thr Phe Asn Asn Thr Lys Gly Arg Asp Val Leu Ile Val Trp
            180                 185                 190
Gly Ile His His Pro Ala Thr Leu Thr Glu His Gln Asp Leu Tyr Lys
        195                 200                 205
Lys Asp Ser Ser Tyr Val Ala Val Gly Ser Glu Thr Tyr Asn Arg Arg
    210                 215                 220
Phe Thr Pro Glu Ile Asn Thr Arg Pro Arg Val Asn Gly Gln Ala Gly
225                 230                 235                 240
Arg Met Thr Phe Tyr Trp Lys Ile Val Lys Pro Gly Glu Ser Ile Thr
                245                 250                 255
Phe Glu Ser Asn Gly Ala Phe Leu Ala Pro Arg Tyr Ala Phe Glu Ile
            260                 265                 270
Val Ser Val Gly Asn Gly Lys Leu Phe Arg Ser Glu Leu Asn Ile Glu
        275                 280                 285
Ser Cys Ser Thr Lys Cys Gln Thr Glu Ile Gly Gly Ile Asn Thr Asn
    290                 295                 300
Lys Ser Phe His Asn Val His Arg Asn Thr Ile Gly Asp Cys Pro Lys
305                 310                 315                 320
Tyr Val Asn Val Lys Ser Leu Lys Leu Ala Thr Gly Pro Arg Asn Val
                325                 330                 335
Pro Ala Ile Ala Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile
            340                 345                 350
Glu Gly Gly Trp Pro Gly Leu Ile Asn Gly Trp Tyr Gly Phe Gln His
        355                 360                 365
Arg Asp Glu Glu Gly Thr Gly Ile Ala Ala Asp Lys Glu Ser Thr Gln
    370                 375                 380
Lys Ala Ile Asp Gln Ile Thr Ser Lys Val Asn Asn Ile Val Asp Arg
385                 390                 395                 400
Met Asn Thr Asn Phe Glu Ser Val Gln His Glu Phe Ser Glu Ile Glu
                405                 410                 415
Glu Arg Ile Asn Gln Leu Ser Lys His Val Asp Asp Ser Val Val Asp
            420                 425                 430
Ile Trp Ser Tyr Asn Ala Gln Leu Leu Val Leu Leu Glu Asn Glu Lys
        435                 440                 445
Thr Leu Asp Leu His Asp Ser Asn Val Arg Asn Leu His Glu Lys Val
    450                 455                 460
Arg Arg Met Leu Lys Asp Asn Ala Lys Asp Glu Gly Asn Gly Cys Phe
465                 470                 475                 480
Thr Phe Tyr His Lys Cys Asp Asn Lys Cys Ile Glu Arg Val Arg Asn
                485                 490                 495
Gly Thr Tyr Asp His Lys Glu Phe Glu Glu Glu Ser Lys Ile Asn Arg
            500                 505                 510
Gln Glu Ile Glu Gly Val Lys Leu Asp Ser Ser Gly Asn Val Tyr Lys
        515                 520                 525
Ile Leu Ser Ile Tyr Ser Cys Ile Ala Ser Ser Leu Val Leu Ala Ala
    530                 535                 540
Leu Ile Met Gly Phe Met Phe Trp Ala Cys Ser Asn Gly Ser Cys Arg
545                 550                 555                 560
Cys Thr Ile Cys Ile
                565
```

<210> 12
<211> 564
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H12

<400> 12

```
Met Glu Lys Phe Ile Ile Leu Ser Thr Val Leu Ala Ala Ser Phe Ala
 1               5                  10                  15
Tyr Asp Lys Ile Cys Ile Gly Tyr Gln Thr Asn Asn Ser Thr Glu Thr
            20                  25                  30
Val Asn Thr Leu Ser Glu Gln Asn Val Pro Val Thr Gln Val Glu Glu
        35                  40                  45
Leu Val His Arg Gly Ile Asp Pro Ile Leu Cys Gly Thr Glu Leu Gly
    50                  55                  60
Ser Pro Leu Val Leu Asp Asp Cys Ser Leu Glu Gly Leu Ile Leu Gly
65                  70                  75                  80
Asn Pro Lys Cys Asp Leu Tyr Leu Asn Gly Arg Glu Trp Ser Tyr Ile
                85                  90                  95
Val Glu Arg Pro Lys Glu Met Glu Gly Val Cys Tyr Pro Gly Ser Ile
            100                 105                 110
Glu Asn Gln Glu Glu Leu Arg Ser Leu Phe Ser Ser Ile Lys Lys Tyr
        115                 120                 125
Glu Arg Val Lys Met Phe Asp Phe Thr Lys Trp Asn Val Thr Tyr Thr
    130                 135                 140
Gly Thr Ser Lys Ala Cys Asn Asn Thr Ser Asn Gln Gly Ser Phe Tyr
145                 150                 155                 160
Arg Ser Met Arg Trp Leu Thr Leu Lys Ser Gly Gln Phe Pro Val Gln
                165                 170                 175
Thr Asp Glu Tyr Lys Asn Thr Arg Asp Ser Asp Ile Val Phe Thr Trp
            180                 185                 190
Ala Ile His His Pro Pro Thr Ser Asp Glu Gln Val Lys Leu Tyr Lys
        195                 200                 205
Asn Pro Asp Thr Leu Ser Ser Val Thr Thr Val Glu Ile Asn Arg Ser
    210                 215                 220
Phe Lys Pro Asn Ile Gly Pro Arg Pro Leu Val Arg Gly Gln Gln Gly
225                 230                 235                 240
Arg Met Asp Tyr Tyr Trp Ala Val Leu Lys Pro Gly Gln Thr Val Lys
                245                 250                 255
Ile Gln Thr Asn Gly Asn Leu Ile Ala Pro Glu Tyr Gly His Leu Ile
            260                 265                 270
Thr Gly Lys Ser His Gly Arg Ile Leu Lys Asn Asn Leu Pro Met Gly
        275                 280                 285
Gln Cys Val Thr Glu Cys Gln Leu Asn Glu Gly Val Met Asn Thr Ser
    290                 295                 300
Lys Pro Phe Gln Asn Thr Ser Lys His Tyr Ile Gly Lys Cys Pro Lys
305                 310                 315                 320
Tyr Ile Pro Ser Gly Ser Leu Lys Leu Ala Ile Gly Leu Arg Asn Val
                325                 330                 335
Pro Gln Val Gln Asp Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile
            340                 345                 350
Glu Gly Gly Trp Pro Gly Leu Val Ala Gly Trp Tyr Gly Phe Gln His
        355                 360                 365
Gln Asn Ala Glu Gly Thr Gly Ile Ala Ala Asp Arg Asp Ser Thr Gln
    370                 375                 380
Arg Ala Ile Asp Asn Met Gln Asn Lys Leu Asn Asn Val Ile Asp Lys
385                 390                 395                 400
Met Asn Lys Gln Phe Glu Val Val Asn His Glu Phe Ser Glu Val Glu
                405                 410                 415
Ser Arg Ile Asn Met Ile Asn Ser Lys Ile Asp Asp Gln Ile Thr Asp
            420                 425                 430
Ile Trp Ala Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Gln Lys
        435                 440                 445
Thr Leu Asp Glu His Asp Ala Asn Val Arg Asn Leu His Asp Arg Val
    450                 455                 460
Arg Arg Val Leu Arg Glu Asn Ala Ile Asp Thr Gly Asp Gly Cys Phe
465                 470                 475                 480
Glu Ile Leu His Lys Cys Asp Asn Asn Cys Met Asp Thr Ile Arg Asn
                485                 490                 495
Gly Thr Tyr Asn His Lys Glu Tyr Glu Glu Glu Ser Lys Ile Glu Arg
            500                 505                 510
Gln Lys Val Asn Gly Val Lys Leu Glu Glu Asn Ser Thr Tyr Lys Ile
        515                 520                 525
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```
Leu Ser Ile Tyr Ser Ser Val Ala Ser Ser Leu Val Leu Leu Leu Met
    530                 535                 540
Ile Ile Gly Gly Phe Ile Phe Gly Cys Gln Asn Gly Asn Val Arg Cys
545                 550                 555                 560
Thr Phe Cys Ile
```

<210> 13
<211> 566
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H13

<400> 13

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Met Ala Leu Asn Val Ile Ala Thr Leu Thr Leu Ile Ser Val Cys Val
 1               5                  10                  15
His Ala Asp Arg Ile Cys Val Gly Tyr Leu Ser Thr Asn Ser Ser Glu
            20                  25                  30
Arg Val Asp Thr Leu Leu Glu Asn Gly Val Pro Val Thr Ser Ser Ile
        35                  40                  45
Asp Leu Ile Glu Thr Asn His Thr Gly Thr Tyr Cys Ser Leu Asn Gly
    50                  55                  60
Val Ser Pro Val His Leu Gly Asp Cys Ser Phe Glu Gly Trp Ile Val
65                  70                  75                  80
Gly Asn Pro Ala Cys Thr Ser Asn Phe Gly Ile Arg Glu Trp Ser Tyr
                85                  90                  95
Leu Ile Glu Asp Pro Ala Ala Pro His Gly Leu Cys Tyr Pro Gly Glu
            100                 105                 110
Leu Asn Asn Asn Gly Glu Leu Arg His Leu Phe Ser Gly Ile Arg Ser
        115                 120                 125
Phe Ser Arg Thr Glu Leu Ile Pro Pro Thr Ser Trp Gly Glu Val Leu
    130                 135                 140
Asp Gly Thr Thr Ser Ala Cys Arg Asp Asn Thr Gly Thr Asn Ser Phe
145                 150                 155                 160
Tyr Arg Asn Leu Val Trp Phe Ile Lys Lys Asn Thr Arg Tyr Pro Val
                165                 170                 175
Ile Ser Lys Thr Tyr Asn Asn Thr Thr Gly Arg Asp Val Leu Val Leu
            180                 185                 190
Trp Gly Ile His His Pro Val Ser Val Asp Glu Thr Lys Thr Leu Tyr
        195                 200                 205
Val Asn Ser Asp Pro Tyr Thr Leu Val Ser Thr Lys Ser Trp Ser Glu
    210                 215                 220
Lys Tyr Lys Leu Glu Thr Gly Val Arg Pro Gly Tyr Asn Gly Gln Arg
225                 230                 235                 240
Ser Trp Met Lys Ile Tyr Trp Ser Leu Ile His Pro Gly Glu Met Ile
                245                 250                 255
Thr Phe Glu Ser Asn Gly Gly Phe Leu Ala Pro Arg Tyr Gly Tyr Ile
            260                 265                 270
Ile Glu Glu Tyr Gly Lys Gly Arg Ile Phe Gln Ser Arg Ile Arg Met
        275                 280                 285
Ser Arg Cys Asn Thr Lys Cys Gln Thr Ser Val Gly Gly Ile Asn Thr
    290                 295                 300
Asn Arg Thr Phe Gln Asn Ile Asp Lys Asn Ala Leu Gly Asp Cys Pro
305                 310                 315                 320
Lys Tyr Ile Lys Ser Gly Gln Leu Lys Leu Ala Thr Gly Leu Arg Asn
                325                 330                 335
Val Pro Ala Ile Ser Asn Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe
            340                 345                 350
Ile Glu Gly Gly Trp Pro Gly Leu Ile Asn Gly Trp Tyr Gly Phe Gln
        355                 360                 365
His Gln Asn Glu Gln Gly Thr Gly Ile Ala Ala Asp Lys Glu Ser Thr
    370                 375                 380
Gln Lys Ala Ile Asp Gln Ile Thr Thr Lys Ile Asn Asn Ile Ile Asp
385                 390                 395                 400
```

```
Lys Met Asn Gly Asn Tyr Asp Ser Ile Arg Gly Glu Phe Asn Gln Val
                405                 410                 415
Glu Lys Arg Ile Asn Met Leu Ala Asp Arg Ile Asp Asp Ala Val Thr
            420                 425                 430
Asp Ile Trp Ser Tyr Asn Ala Lys Leu Leu Val Leu Leu Glu Asn Asp
        435                 440                 445
Lys Thr Leu Asp Met His Asp Ala Asn Val Lys Asn Leu His Glu Gln
    450                 455                 460
Val Arg Arg Glu Leu Lys Asp Asn Ala Ile Asp Glu Gly Asn Gly Cys
465                 470                 475                 480
Phe Glu Leu Leu His Lys Cys Asn Asp Ser Cys Met Glu Thr Ile Arg
                485                 490                 495
Asn Gly Thr Tyr Asp His Thr Glu Tyr Ala Glu Glu Ser Lys Leu Lys
            500                 505                 510
Arg Gln Glu Ile Asp Gly Ile Lys Leu Lys Ser Glu Asp Asn Val Tyr
        515                 520                 525
Lys Ala Leu Ser Ile Tyr Ser Cys Ile Ala Ser Ser Val Val Leu Val
    530                 535                 540
Gly Leu Ile Leu Ser Phe Ile Met Trp Ala Cys Ser Ser Gly Asn Cys
545                 550                 555                 560
Arg Phe Asn Val Cys Ile
                565


<210> 14
<211> 568
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H14

<400> 14

Met Ile Ala Leu Ile Leu Val Ala Leu Ala Leu Ser His Thr Ala Tyr
 1               5                  10                  15
Ser Gln Ile Thr Asn Gly Thr Thr Gly Asn Pro Ile Ile Cys Leu Gly
            20                  25                  30
His His Ala Val Glu Asn Gly Thr Ser Val Lys Thr Leu Thr Asp Asn
        35                  40                  45
His Val Glu Val Val Ser Ala Lys Glu Leu Val Glu Thr Asn His Thr
    50                  55                  60
Asp Glu Leu Cys Pro Ser Pro Leu Lys Leu Val Asp Gly Gln Asp Cys
65                  70                  75                  80
His Leu Ile Asn Gly Ala Leu Gly Ser Pro Gly Cys Asp Arg Leu Gln
                85                  90                  95
Asp Thr Thr Trp Asp Val Phe Ile Glu Arg Pro Thr Ala Val Asp Thr
            100                 105                 110
Cys Tyr Pro Phe Asp Val Pro Asp Tyr Gln Ser Leu Arg Ser Ile Leu
        115                 120                 125
Ala Ser Ser Gly Ser Leu Glu Phe Ile Ala Glu Gln Phe Thr Trp Asn
    130                 135                 140
Gly Val Lys Val Asp Gly Ser Ser Ser Ala Cys Leu Arg Gly Gly Arg
145                 150                 155                 160
Asn Ser Phe Phe Ser Arg Leu Asn Trp Leu Thr Lys Ala Thr Asn Gly
                165                 170                 175
Asn Tyr Gly Pro Ile Asn Val Thr Lys Glu Asn Thr Gly Ser Tyr Val
            180                 185                 190
Arg Leu Tyr Leu Trp Gly Val His His Pro Ser Ser Asp Asn Glu Gln
        195                 200                 205
Thr Asp Leu Tyr Lys Val Ala Thr Gly Arg Val Thr Val Ser Thr Arg
    210                 215                 220
Ser Asp Gln Ile Ser Ile Val Pro Asn Ile Gly Ser Arg Pro Arg Val
225                 230                 235                 240
Arg Asn Gln Ser Gly Arg Ile Ser Ile Tyr Trp Thr Leu Val Asn Pro
                245                 250                 255
Gly Asp Ser Ile Ile Phe Asn Ser Ile Gly Asn Leu Ile Ala Pro Arg
            260                 265                 270
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```
Gly His Tyr Lys Ile Ser Lys Ser Thr Lys Ser Thr Val Leu Lys Ser
        275                 280                 285
Asp Lys Arg Ile Gly Ser Cys Thr Ser Pro Cys Leu Thr Asp Lys Gly
    290                 295                 300
Ser Ile Gln Ser Asp Lys Pro Phe Gln Asn Val Ser Arg Ile Ala Ile
305                 310                 315                 320
Gly Asn Cys Pro Lys Tyr Val Lys Gln Gly Ser Leu Met Leu Ala Thr
                325                 330                 335
Gly Met Arg Asn Ile Pro Gly Lys Gln Ala Lys Gly Leu Phe Gly Ala
            340                 345                 350
Ile Ala Gly Phe Ile Glu Asn Gly Trp Gln Gly Leu Ile Asp Gly Trp
        355                 360                 365
Tyr Gly Phe Arg His Gln Asn Ala Glu Gly Thr Gly Thr Ala Ala Asp
    370                 375                 380
Leu Lys Ser Thr Gln Ala Ala Ile Asp Gln Ile Asn Gly Lys Leu Asn
385                 390                 395                 400
Arg Leu Ile Glu Lys Thr Asn Glu Lys Tyr His Gln Ile Glu Lys Glu
                405                 410                 415
Phe Glu Gln Val Glu Gly Arg Ile Gln Asp Leu Glu Lys Tyr Val Glu
            420                 425                 430
Asp Thr Lys Ile Asp Leu Trp Ser Tyr Asn Ala Glu Leu Leu Val Ala
        435                 440                 445
Leu Glu Asn Gln His Thr Ile Asp Val Thr Asp Ser Glu Met Asn Lys
    450                 455                 460
Leu Phe Glu Arg Val Arg Arg Gln Leu Arg Glu Asn Ala Glu Asp Gln
465                 470                 475                 480
Gly Asn Gly Cys Phe Glu Ile Phe His Gln Cys Asp Asn Asn Cys Ile
                485                 490                 495
Glu Ser Ile Arg Asn Gly Thr Tyr Asp His Asn Ile Tyr Arg Asp Glu
            500                 505                 510
Ala Ile Asn Asn Arg Ile Lys Ile Asn Pro Val Thr Leu Thr Met Gly
        515                 520                 525
Tyr Lys Asp Ile Ile Leu Trp Ile Ser Phe Ser Met Ser Cys Phe Val
    530                 535                 540
Phe Val Ala Leu Ile Leu Gly Phe Val Leu Trp Ala Cys Gln Asn Gly
545                 550                 555                 560
Asn Ile Arg Cys Gln Ile Cys Ile
                565
```

<210> 15
<211> 570
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H15

<400> 15

```
Met Asn Thr Gln Ile Ile Val Ile Leu Val Leu Gly Leu Ser Met Val
 1                  5                  10                  15
Lys Ser Asp Lys Ile Cys Leu Gly His His Ala Val Ala Asn Gly Thr
            20                  25                  30
Lys Val Asn Thr Leu Thr Glu Arg Gly Val Glu Val Val Asn Ala Thr
        35                  40                  45
Glu Thr Val Glu Ile Thr Gly Ile Asp Lys Val Cys Thr Lys Gly Lys
    50                  55                  60
Lys Ala Val Asp Leu Gly Ser Cys Gly Ile Leu Gly Thr Ile Ile Gly
65                  70                  75                  80
Pro Pro Gln Cys Asp Leu His Leu Glu Phe Lys Ala Asp Leu Ile Ile
                85                  90                  95
Glu Arg Arg Asn Ser Ser Asp Ile Cys Tyr Pro Gly Arg Phe Thr Asn
            100                 105                 110
Glu Glu Ala Leu Arg Gln Ile Ile Arg Glu Ser Gly Gly Ile Asp Lys
        115                 120                 125
Glu Ser Met Gly Phe Arg Tyr Ser Gly Ile Arg Thr Asp Gly Ala Thr
    130                 135                 140
```

```
Ser Ala Cys Lys Arg Thr Val Ser Ser Phe Tyr Ser Glu Met Lys Trp
145                 150                 155                 160
Leu Ser Ser Ser Met Asn Asn Gln Val Phe Pro Gln Leu Asn Gln Thr
                165                 170                 175
Tyr Arg Asn Thr Arg Lys Glu Pro Ala Leu Ile Val Trp Gly Val His
            180                 185                 190
His Ser Ser Ser Leu Asp Glu Gln Asn Lys Leu Tyr Gly Thr Gly Asn
        195                 200                 205
Lys Leu Ile Thr Val Gly Ser Ser Lys Tyr Gln Gln Ser Phe Ser Pro
    210                 215                 220
Ser Pro Gly Ala Arg Pro Lys Val Asn Gly Gln Ala Gly Arg Ile Asp
225                 230                 235                 240
Phe His Trp Met Leu Leu Asp Pro Gly Asp Thr Val Thr Phe Thr Phe
                245                 250                 255
Asn Gly Ala Phe Ile Ala Pro Asp Arg Ala Thr Phe Leu Arg Ser Asn
            260                 265                 270
Ala Pro Ser Gly Ile Glu Tyr Asn Gly Lys Ser Leu Gly Ile Gln Ser
        275                 280                 285
Asp Ala Gln Ile Asp Glu Ser Cys Glu Gly Glu Cys Phe Tyr Ser Gly
    290                 295                 300
Gly Thr Ile Asn Ser Pro Leu Pro Phe Gln Asn Ile Asp Ser Arg Ala
305                 310                 315                 320
Val Gly Lys Cys Pro Arg Tyr Val Lys Gln Ser Ser Leu Pro Leu Ala
                325                 330                 335
Leu Gly Met Lys Asn Val Pro Glu Lys Ile Arg Thr Arg Gly Leu Phe
            340                 345                 350
Gly Ala Ile Ala Gly Phe Ile Glu Asn Gly Trp Glu Gly Leu Ile Asp
        355                 360                 365
Gly Trp Tyr Gly Phe Arg His Gln Asn Ala Gln Gly Gln Gly Thr Ala
    370                 375                 380
Ala Asp Tyr Lys Ser Thr Gln Ala Ala Ile Asp Gln Ile Thr Gly Lys
385                 390                 395                 400
Leu Asn Arg Leu Ile Glu Lys Thr Asn Lys Gln Phe Glu Leu Ile Asp
                405                 410                 415
Asn Glu Phe Thr Glu Val Glu Gln Gln Ile Gly Asn Val Ile Asn Trp
            420                 425                 430
Thr Arg Asp Ser Leu Thr Glu Ile Trp Ser Tyr Asn Ala Glu Leu Leu
        435                 440                 445
Val Ala Met Glu Asn Gln His Thr Ile Asp Leu Ala Asp Ser Glu Met
    450                 455                 460
Asn Lys Leu Tyr Glu Arg Val Arg Arg Gln Leu Arg Glu Asn Ala Glu
465                 470                 475                 480
Glu Asp Gly Thr Gly Cys Phe Glu Ile Phe His Arg Cys Asp Asp Gln
                485                 490                 495
Cys Met Glu Ser Ile Arg Asn Asn Thr Tyr Asn His Thr Glu Tyr Arg
            500                 505                 510
Gln Glu Ala Leu Gln Asn Arg Ile Met Ile Asn Pro Val Lys Leu Ser
        515                 520                 525
Ser Gly Tyr Lys Asp Val Ile Leu Trp Phe Ser Phe Gly Ala Ser Cys
    530                 535                 540
Val Met Leu Leu Ala Ile Ala Met Gly Leu Ile Phe Met Cys Val Lys
545                 550                 555                 560
Asn Gly Asn Leu Arg Cys Thr Ile Cys Ile
                565                 570
```

<210> 16
<211> 565
<212> PRT
<213> Influenza virus A

<220>
<223> influenza virus A hemagglutinin subtype H16

<400> 16

```
Met Met Ile Lys Val Leu Tyr Phe Leu Ile Ile Val Leu Gly Arg Tyr
 1               5                  10                  15
```

```
Ser Lys Ala Asp Lys Ile Cys Ile Gly Tyr Leu Ser Asn Asn Ser Ser
            20                  25                  30
Asp Thr Val Asp Thr Leu Thr Glu Asn Gly Val Pro Val Thr Ser Ser
        35                  40                  45
Val Asp Leu Val Glu Thr Asn His Thr Gly Thr Tyr Cys Ser Leu Asn
    50                  55                  60
Gly Ile Ser Pro Ile His Leu Gly Asp Cys Ser Phe Glu Gly Trp Ile
65                  70                  75                  80
Val Gly Asn Pro Ser Cys Ala Thr Asn Ile Asn Ile Arg Glu Trp Ser
                85                  90                  95
Tyr Leu Ile Glu Asp Pro Asn Ala Pro Asn Lys Phe Cys Tyr Pro Gly
            100                 105                 110
Glu Leu Asp Asn Asn Gly Glu Leu Arg His Leu Phe Ser Gly Val Asn
        115                 120                 125
Ser Phe Ser Arg Thr Glu Leu Ile Asn Pro Ser Lys Trp Gly Asn Val
    130                 135                 140
Leu Asp Gly Val Thr Ala Ser Cys Leu Asp Arg Gly Ala Ser Ser Phe
145                 150                 155                 160
Tyr Arg Asn Leu Val Trp Ile Val Lys Lys Asp Glu Lys Tyr Pro Val
                165                 170                 175
Ile Lys Gly Asp Tyr Asn Asn Thr Thr Gly Arg Asp Val Leu Val Leu
            180                 185                 190
Trp Gly Ile His His Pro Asp Thr Glu Thr Thr Ala Thr Asn Leu Tyr
        195                 200                 205
Val Asn Lys Asn Pro Tyr Thr Leu Val Ser Thr Lys Glu Trp Ser Lys
    210                 215                 220
Arg Tyr Glu Leu Glu Ile Gly Thr Arg Ile Gly Asp Gly Gln Arg Ser
225                 230                 235                 240
Trp Met Lys Leu Tyr Trp His Leu Met His Pro Gly Glu Arg Ile Met
                245                 250                 255
Phe Glu Ser Asn Gly Gly Leu Ile Ala Pro Arg Tyr Gly Tyr Ile Ile
            260                 265                 270
Glu Lys Tyr Gly Thr Gly Arg Ile Phe Gln Ser Gly Val Arg Met Ala
        275                 280                 285
Arg Cys Asn Thr Lys Cys Gln Thr Ser Leu Gly Gly Ile Asn Thr Asn
    290                 295                 300
Lys Thr Phe Gln Asn Ile Glu Arg Asn Ala Leu Gly Asp Cys Pro Lys
305                 310                 315                 320
Tyr Ile Lys Ser Gly Gln Leu Lys Leu Ala Thr Gly Leu Arg Asn Val
                325                 330                 335
Pro Ser Ile Gly Glu Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile
            340                 345                 350
Glu Gly Gly Trp Pro Gly Leu Ile Asn Gly Trp Tyr Gly Phe Gln His
        355                 360                 365
Gln Asn Glu Gln Gly Thr Gly Ile Ala Ala Asp Lys Ala Ser Thr Gln
    370                 375                 380
Lys Ala Ile Asn Glu Ile Thr Thr Lys Ile Asn Asn Ile Ile Glu Lys
385                 390                 395                 400
Met Asn Gly Asn Tyr Asp Ser Ile Arg Gly Glu Phe Asn Gln Val Glu
                405                 410                 415
Lys Arg Ile Asn Met Leu Ala Asp Arg Val Asp Asp Ala Val Thr Asp
            420                 425                 430
Ile Trp Ser Tyr Asn Ala Lys Leu Leu Val Leu Leu Glu Asn Asp Arg
        435                 440                 445
Thr Leu Asp Leu His Asp Ala Asn Val Arg Asn Leu His Asp Gln Val
    450                 455                 460
Lys Arg Ala Leu Lys Ser Asn Ala Ile Asp Glu Gly Asp Gly Cys Phe
465                 470                 475                 480
Asn Leu Leu His Lys Cys Asn Asp Ser Cys Met Glu Thr Ile Arg Asn
                485                 490                 495
Gly Thr Tyr Asn His Glu Asp Tyr Arg Glu Glu Ser Gln Leu Lys Arg
            500                 505                 510
Gln Glu Ile Glu Gly Ile Lys Leu Lys Thr Glu Asp Asn Val Tyr Lys
        515                 520                 525
Val Leu Ser Ile Tyr Ser Cys Ile Ala Ser Ser Ile Val Leu Val Gly
    530                 535                 540
Leu Ile Leu Ala Phe Ile Met Trp Ala Cys Ser Asn Gly Ser Cys Arg
545                 550                 555                 560
```

Phe Asn Val Cys Ile
565

<210> 17
<211> 6
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic peptide - His tag

<400> 17

His His His His His His
1 5

<210> 18
<211> 29
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic peptide - an example of folden (trimerization) domain

<400> 18

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

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

<210> 19
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic peptide - an example of thrombin cleavage site

<400> 19

Leu Val Pro Arg Gly Ser Pro
1 5

<210> 20
<211> 7
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic peptide - cleavage site recognized by Tobacco
Etch Virus (TEV) protease

<220>
<221> misc_feature
<222> (7)..(7)
<223> Xaa = Gly or Ser

<400> 20

Glu Asn Leu Tyr Phe Gln Xaa
1 5

<210> 21
<211> 568
<212> PRT
<213> Artificial Sequence

<220>
<223> exemplary chimeric influenza virus hemagglutinin polypeptide

<400> 21

```
Met Lys Ala Ile Ile Val Leu Leu Met Val Val Thr Ser Asn Ala Asp
1               5                   10                  15

Arg Ile Cys Thr Gly Ile Thr Ser Ser Asn Ser Pro His Val Val Lys
            20                  25                  30

Thr Ala Thr Gln Gly Glu Val Asn Val Thr Gly Val Ile Pro Leu Thr
        35                  40                  45

Thr Thr Pro Thr Lys Ser Tyr Phe Ala Cys Asp Leu Asp Gly Val Lys
    50                  55                  60

Pro Leu Ile Leu Arg Asp Cys Ser Val Ala Gly Trp Leu Leu Gly Asn
65                  70                  75                  80

Pro Met Cys Asp Glu Phe Ile Asn Val Pro Glu Trp Ser Tyr Ile Val
                85                  90                  95

Glu Lys Ala Asn Pro Val Asn Asp Leu Cys Tyr Pro Gly Asp Phe Asn
            100                 105                 110

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

Lys Ile Gln Ile Ile Pro Lys Ser Ser Trp Ser Ser His Glu Ala Ser
    130                 135                 140

Leu Gly Val Ser Ser Ala Cys Pro Tyr Gln Gly Lys Ser Ser Phe Phe
145                 150                 155                 160

Arg Asn Val Val Trp Leu Ile Lys Lys Asn Ser Thr Tyr Pro Thr Ile
                165                 170                 175

Lys Arg Ser Tyr Asn Asn Thr Asn Gln Glu Asp Leu Leu Val Leu Trp
            180                 185                 190

Gly Ile His His Pro Asn Asp Ala Ala Glu Gln Thr Lys Leu Tyr Gln
        195                 200                 205

Asn Pro Thr Thr Tyr Ile Ser Val Gly Thr Ser Thr Leu Asn Gln Arg
    210                 215                 220
```

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

Arg Met Glu Phe Phe Trp Thr Ile Leu Lys Pro Asn Asp Ala Ile Asn
                245                 250                 255

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

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

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

Lys Pro Tyr Tyr Thr Gly Glu His Ala Lys Ala Ile Gly Asn Cys Pro
305                 310                 315                 320

Ile Trp Val Lys Thr Pro Leu Lys Leu Ala Asn Gly Thr Lys Tyr Arg
                325                 330                 335

Pro Pro Ala Lys Leu Leu Lys Glu Arg Gly Phe Phe Gly Ala Ile Ala
            340                 345                 350

Gly Phe Leu Glu Gly Gly Trp Glu Gly Met Ile Ala Gly Trp His Gly
        355                 360                 365

Tyr Thr Ser His Gly Ala His Gly Val Ala Val Ala Ala Asp Leu Lys
    370                 375                 380

Ser Thr Gln Glu Ala Ile Asn Lys Ile Thr Lys Asn Leu Asn Ser Leu
385                 390                 395                 400

Ser Glu Leu Glu Val Lys Asn Leu Gln Arg Leu Ser Gly Ala Met Asp
                405                 410                 415

Glu Leu His Asn Glu Ile Leu Glu Leu Asp Glu Lys Val Asp Asp Leu
            420                 425                 430

Arg Ala Asp Thr Ile Ser Ser Gln Ile Glu Leu Ala Val Leu Leu Ser
        435                 440                 445

Asn Glu Gly Ile Ile Asn Ser Glu Asp Glu His Leu Leu Ala Leu Glu
    450                 455                 460

Arg Lys Leu Lys Lys Met Leu Gly Pro Ser Ala Val Glu Ile Gly Asn
465                 470                 475                 480

Gly Cys Phe Glu Thr Lys His Lys Cys Asn Gln Thr Cys Leu Asp Arg
                485                 490                 495
```

Ile Ala Ala Gly Thr Phe Asn Ala Gly Glu Phe Ser Leu Pro Thr Phe
500 505 510

Asp Ser Leu Asn Ile Thr Ala Ala Ser Leu Asn Asp Asp Gly Leu Asp
515 520 525

Asn His Thr Ile Leu Leu Tyr Tyr Ser Thr Ala Ala Ser Ser Leu Ala
530 535 540

Val Thr Leu Met Leu Ala Ile Phe Ile Val Tyr Met Val Ser Arg Asp
545 550 555 560

Asn Val Ser Cys Ser Ile Cys Leu
565

<210> 22
<211> 5
<212> PRT
<213> Artificial Sequence

<220>
<223> synthetic peptide - HA1 N-terminal stem segment

<400> 22

Asp Arg Ile Cys Thr
1 5

<210> 23
<211> 52
<212> PRT
<213> Artificial Sequence

<220>
<223> N-terminal sequence of hemagglutinin protein of
A/Hong Kong/1/1968 (H3)

<400> 23

Gln Asp Leu Pro Gly Asn Asp Asn Ser Thr Ala Thr Leu Cys Leu Gly
1 5 10 15

His His Ala Val Pro Asn Gly Thr Leu Val Lys Thr Ile Thr Asp Asp
20 25 30

Gln Ile Glu Val Thr Asn Ala Thr Glu Leu Val Gln Ser Ser Ser Thr
35 40 45

Gly Lys Ile Cys
50

<210> 24
<211> 52
<212> PRT
<213> Artificial Sequence

<220>
<223> N-terminal sequence of hemagglutinin protein of

A/Perth/16/2009 (H3)

<400> 24

Gln Lys Leu Pro Gly Asn Asp Asn Ser Thr Ala Thr Leu Cys Leu Gly
1 5 10 15

His His Ala Val Pro Asn Gly Thr Ile Val Lys Thr Ile Thr Asn Asp
20 25 30

Gln Ile Glu Val Thr Asn Ala Thr Glu Leu Val Gln Ser Ser Ser Thr
35 40 45

Gly Glu Ile Cys
50

<210> 25
<211> 42
<212> PRT
<213> Artificial Sequence

<220>
<223> N-terminal sequence of hemagglutinin protein of A/PR/8/34 (H1)

<400> 25

Asp Thr Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr Val
1 5 10 15

Asp Thr Val Leu Glu Lys Asn Val Thr Val Thr His Ser Val Asn Leu
20 25 30

Leu Glu Asp Ser His Asn Gly Lys Leu Cys
35 40

<210> 26
<211> 42
<212> PRT
<213> Artificial Sequence

<220>
<223> N-terminal sequence of hemagglutinin protein of A/Cal/4/09 (H1)

<400> 26

Asp Thr Leu Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Asp Thr Val
1 5 10 15

Asp Thr Val Leu Lys Lys Asn Val Thr Val Thr His Ser Val Asn Leu
20 25 30

Leu Glu Asp Lys His Asn Gly Lys Leu Cys
35 40

<210> 27
<211> 42

<212> PRT
<213> Artificial Sequence

<220>
<223> N-terminal sequence of hemagglutinin protein of
A/Viet Nam/1203/04 (H5)

<400> 27

Asp Gln Ile Cys Ile Gly Tyr His Ala Asn Asn Ser Thr Glu Gln Val
1 5 10 15

Asp Thr Ile Met Glu Lys Asn Val Thr Val Thr His Ala Gln Asp Ile
20 25 30

Leu Glu Lys Lys His Asn Gly Lys Leu Cys
35 40

<210> 28
<211> 42
<212> PRT
<213> Artificial Sequence

<220>
<223> N-terminal sequence of hemagglutinin protein of
A/mallard/Alberta/24/01 (H7)

<400> 28

Asp Lys Ile Cys Leu Gly His His Ala Val Ala Asn Gly Thr Lys Val
1 5 10 15

Asn Thr Leu Thr Glu Lys Gly Ile Glu Val Val Asn Ala Thr Glu Thr
20 25 30

Val Glu Thr Val Asn Ile Lys Lys Ile Cys
35 40

<210> 29
<211> 274
<212> PRT
<213> Artificial Sequence

<220>
<223> C-terminal sequence of hemagglutinin protein of
A/Hong Kong/1/1968 (H3)

<400> 29

Cys Ile Ser Glu Cys Ile Thr Pro Asn Gly Ser Ile Pro Asn Asp Lys
1 5 10 15

Pro Phe Gln Asn Val Asn Lys Ile Thr Tyr Gly Ala Cys Pro Lys Tyr
20 25 30

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

Glu Lys Gln Thr Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile Glu

50 55 60

Asn Gly Trp Glu Gly Met Ile Asp Gly Trp Tyr Gly Phe Arg His Gln
65 70 75 80

Asn Ser Glu Gly Thr Gly Gln Ala Ala Asp Leu Lys Ser Thr Gln Ala
85 90 95

Ala Ile Asp Gln Ile Asn Gly Lys Leu Asn Arg Val Ile Glu Lys Thr
100 105 110

Asn Glu Lys Phe His Gln Ile Glu Lys Glu Phe Ser Glu Val Glu Gly
115 120 125

Arg Ile Gln Asp Leu Glu Lys Tyr Val Glu Asp Thr Lys Ile Asp Leu
130 135 140

Trp Ser Tyr Asn Ala Glu Leu Leu Val Ala Leu Glu Asn Gln His Thr
145 150 155 160

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

Arg Gln Leu Arg Glu Asn Ala Glu Asp Met Gly Asn Gly Cys Phe Lys
180 185 190

Ile Tyr His Lys Cys Asp Asn Ala Cys Ile Glu Ser Ile Arg Asn Gly
195 200 205

Thr Tyr Asp His Asp Val Tyr Arg Asp Glu Ala Leu Asn Asn Arg Phe
210 215 220

Gln Ile Lys Gly Val Glu Leu Lys Ser Gly Tyr Lys Asp Trp Ile Leu
225 230 235 240

Trp Ile Ser Phe Ala Ile Ser Cys Phe Leu Leu Cys Val Val Leu Leu
245 250 255

Gly Phe Ile Met Trp Ala Cys Gln Arg Gly Asn Ile Arg Cys Asn Ile
260 265 270

Cys Ile

<210> 30
<211> 274
<212> PRT
<213> Artificial Sequence

<220>
<223> C-terminal sequence of hemagglutinin protein of A/Perth/16/2009 (H3)

<400> 30

Cys Asn Ser Glu Cys Ile Thr Pro Asn Gly Ser Ile Pro Asn Asp Lys
1 5 10 15

Pro Phe Gln Asn Val Asn Arg Ile Thr Tyr Gly Ala Cys Pro Arg Tyr
20 25 30

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

Glu Lys Gln Thr Arg Gly Ile Phe Gly Ala Ile Ala Gly Phe Ile Glu
50 55 60

Asn Gly Trp Glu Gly Met Val Asp Gly Trp Tyr Gly Phe Arg His Gln
65 70 75 80

Asn Ser Glu Gly Arg Gly Gln Ala Ala Asp Leu Lys Ser Thr Gln Ala
85 90 95

Ala Ile Asp Gln Ile Asn Gly Lys Leu Asn Arg Leu Ile Gly Lys Thr
100 105 110

Asn Glu Lys Phe His Gln Ile Glu Lys Glu Phe Ser Glu Val Glu Gly
115 120 125

Arg Ile Gln Asp Leu Glu Lys Tyr Val Glu Asp Thr Lys Ile Asp Leu
130 135 140

Trp Ser Tyr Asn Ala Glu Leu Leu Val Ala Leu Glu Asn Gln His Thr
145 150 155 160

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

Lys Gln Leu Arg Glu Asn Ala Glu Asp Met Gly Asn Gly Cys Phe Lys
180 185 190

Ile Tyr His Lys Cys Asp Asn Ala Cys Ile Gly Ser Ile Arg Asn Gly
195 200 205

Thr Tyr Asp His Asp Val Tyr Arg Asp Glu Ala Leu Asn Asn Arg Phe
210 215 220

Gln Ile Lys Gly Val Glu Leu Lys Ser Gly Tyr Lys Asp Trp Ile Leu
225 230 235 240

Trp Ile Ser Phe Ala Ile Ser Cys Phe Leu Leu Cys Val Ala Leu Leu
245 250 255

Gly Phe Ile Met Trp Ala Cys Gln Lys Gly Asn Ile Arg Cys Asn Ile
260 265 270

Cys Ile

<210> 31
<211> 275
<212> PRT
<213> Artificial Sequence

<220>
<223> C-terminal sequence of hemagglutinin protein of A/PR/8/34 (H1)

<400> 31

Cys Asn Thr Lys Cys Gln Thr Pro Leu Gly Ala Ile Asn Ser Ser Leu
1 5 10 15

Pro Tyr Gln Asn Ile His Pro Val Thr Ile Gly Glu Cys Pro Lys Tyr
20 25 30

Val Arg Ser Ala Lys Leu Arg Met Val Thr Gly Leu Arg Asn Thr Pro
35 40 45

Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile Glu
50 55 60

Gly Gly Trp Thr Gly Met Ile Asp Gly Trp Tyr Gly Tyr His His Gln
65 70 75 80

Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Gln Lys Ser Thr Gln Asn
85 90 95

Ala Ile Asn Gly Ile Thr Asn Lys Val Asn Thr Val Ile Glu Lys Met
100 105 110

Asn Ile Gln Phe Thr Ala Val Gly Lys Glu Phe Asn Lys Leu Glu Lys
115 120 125

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

Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Glu Arg Thr
145 150 155 160

Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Glu Lys Val Lys
165 170 175

Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly Cys Phe Glu
180 185 190

Phe Tyr His Lys Cys Asp Asn Glu Cys Met Glu Ser Val Arg Asn Gly
195 200 205

Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ser Lys Leu Asn Arg Glu
210 215 220

Lys Val Asp Gly Val Lys Leu Glu Ser Met Gly Ile Tyr Gln Ile Leu
225 230 235 240

Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Leu Val Ser Leu
245 250 255

Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln Cys Arg
260 265 270

Ile Cys Ile
275

<210> 32
<211> 275
<212> PRT
<213> Artificial Sequence

<220>
<223> C-terminal sequence of hemagglutinin protein of A/Cal/4/09 (H1)

<400> 32

Cys Asn Thr Thr Cys Gln Thr Pro Lys Gly Ala Ile Asn Thr Ser Leu
1 5 10 15

Pro Phe Gln Asn Ile His Pro Ile Thr Ile Gly Lys Cys Pro Lys Tyr
20 25 30

Val Lys Ser Thr Lys Leu Arg Leu Ala Thr Gly Leu Arg Asn Ile Pro
35 40 45

Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile Glu
50 55 60

Gly Gly Trp Thr Gly Met Val Asp Gly Trp Tyr Gly Tyr His His Gln
65 70 75 80

Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Leu Lys Ser Thr Gln Asn
85 90 95

Ala Ile Asp Glu Ile Thr Asn Lys Val Asn Ser Val Ile Glu Lys Met
100 105 110

Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn His Leu Glu Lys
115 120 125

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

```
Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Glu Arg Thr
145                 150                 155                 160

Leu Asp Tyr His Asp Ser Asn Val Lys Asn Leu Tyr Glu Lys Val Arg
                165                 170                 175

Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly Cys Phe Glu
            180                 185                 190

Phe Tyr His Lys Cys Asp Asn Thr Cys Met Glu Ser Val Lys Asn Gly
        195                 200                 205

Thr Tyr Asp Tyr Pro Lys Tyr Ser Glu Glu Ala Lys Leu Asn Arg Glu
    210                 215                 220

Glu Ile Asp Gly Val Lys Leu Glu Ser Thr Arg Ile Tyr Gln Ile Leu
225                 230                 235                 240

Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Val Val Ser Leu
                245                 250                 255

Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln Cys Arg
            260                 265                 270

Ile Cys Ile
        275
```

<210> 33
<211> 275
<212> PRT
<213> Artificial Sequence

<220>
<223> C-terminal sequence of hemagglutinin protein of A/Viet Nam/1203/04 (H5)

<400> 33

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Cys Asn Thr Lys Cys Gln Thr Pro Met Gly Ala Ile Asn Ser Ser Met
1               5                   10                  15

Pro Phe His Asn Ile His Pro Leu Thr Ile Gly Glu Cys Pro Lys Tyr
            20                  25                  30

Val Lys Ser Asn Arg Leu Val Leu Ala Thr Gly Leu Arg Asn Ser Pro
        35                  40                  45

Gln Arg Glu Thr Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile Glu
    50                  55                  60

Gly Gly Trp Gln Gly Met Val Asp Gly Trp Tyr Gly Tyr His His Ser
65                  70                  75                  80

Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Lys Glu Ser Thr Gln Lys
```

85 90 95

Ala Ile Asp Gly Val Thr Asn Lys Val Asn Ser Ile Ile Asp Lys Met
100 105 110

Asn Thr Gln Phe Glu Ala Val Gly Arg Glu Phe Asn Asn Leu Glu Arg
115 120 125

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

Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Met Glu Asn Glu Arg Thr
145 150 155 160

Leu Asp Phe His Asp Ser Asn Val Lys Asn Leu Tyr Asp Lys Val Arg
165 170 175

Leu Gln Leu Arg Asp Asn Ala Lys Glu Leu Gly Asn Gly Cys Phe Glu
180 185 190

Phe Tyr His Lys Cys Asp Asn Glu Cys Met Glu Ser Val Arg Asn Gly
195 200 205

Thr Tyr Asp Tyr Pro Gln Tyr Ser Glu Glu Ala Arg Leu Lys Arg Glu
210 215 220

Glu Ile Ser Gly Val Lys Leu Glu Ser Ile Gly Ile Tyr Gln Ile Leu
225 230 235 240

Ser Ile Tyr Ser Thr Val Ala Ser Ser Leu Ala Leu Ala Ile Met Val
245 250 255

Ala Gly Leu Ser Leu Trp Met Cys Ser Asn Gly Ser Leu Gln Cys Arg
260 265 270

Ile Cys Ile
275

<210> 34
<211> 275
<212> PRT
<213> Artificial Sequence

<220>
<223> C-terminal sequence of hemagglutinin protein of A/mallard/Alberta/24/01 (H7)

<400> 34

Cys Glu Gly Asp Cys Phe His Ser Gly Gly Thr Ile Val Ser Ser Leu
1 5 10 15

Pro Phe Gln Asn Ile Asn Pro Arg Thr Val Gly Lys Cys Pro Arg Tyr
20 25 30

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Val Lys Gln Thr Ser Leu Leu Leu Ala Thr Gly Met Arg Asn Val Pro
        35                  40                  45

Glu Asn Pro Lys Thr Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile
    50                  55                  60

Glu Asn Gly Trp Glu Gly Leu Ile Asp Gly Trp Tyr Gly Phe Arg His
65                  70                  75                  80

Gln Asn Ala Gln Gly Glu Gly Thr Ala Ala Asp Tyr Lys Ser Thr Gln
                85                  90                  95

Ser Ala Ile Asp Gln Ile Thr Gly Lys Leu Asn Arg Leu Ile Asp Lys
            100                 105                 110

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

Gln Gln Ile Gly Asn Val Ile Asn Trp Thr Arg Asp Ser Met Thr Glu
    130                 135                 140

Val Trp Ser Tyr Asn Ala Glu Leu Leu Val Ala Met Glu Asn Gln His
145                 150                 155                 160

Thr Ile Asp Leu Ala Asn Ser Glu Met Asn Lys Leu Tyr Glu Arg Val
                165                 170                 175

Arg Lys Gln Leu Arg Glu Asn Ala Glu Glu Asp Gly Thr Gly Cys Phe
            180                 185                 190

Glu Ile Phe His Lys Cys Asp Asp Gln Cys Met Glu Ser Ile Arg Asn
        195                 200                 205

Asn Thr Tyr Asp His Thr Gln Tyr Arg Thr Glu Ser Leu Gln Asn Arg
    210                 215                 220

Ile Gln Ile Asp Pro Val Lys Leu Ser Ser Gly Tyr Lys Asp Ile Ile
225                 230                 235                 240

Leu Trp Phe Ser Phe Gly Ala Ser Cys Phe Ile Leu Leu Ala Ile Ala
                245                 250                 255

Met Gly Leu Val Phe Ile Cys Ile Lys Asn Gly Asn Met Arg Cys Thr
            260                 265                 270

Ile Cys Ile
        275
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<211> 564

<212> PRT
<213> influenza virus A

<220>
<223> influenza virus A hemagglutinin

<400> 35

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Leu Gly Asp Arg Ile Cys Ile Gly Tyr Gln Ala Asn Gln Asn Asn Gln
            20                  25                  30

Thr Val Asn Thr Leu Leu Glu Gln Asn Val Pro Val Thr Gly Ala Gln
        35                  40                  45

Glu Ile Leu Glu Thr Asn His Asn Gly Lys Leu Cys Ser Leu Asn Gly
    50                  55                  60

Val Pro Pro Leu Asp Leu Gln Ser Cys Thr Leu Ala Gly Trp Leu Leu
65                  70                  75                  80

Gly Asn Pro Asn Cys Asp Ser Leu Leu Glu Ala Glu Glu Trp Ser Tyr
                85                  90                  95

Ile Lys Ile Asn Glu Ser Ala Pro Asp Asp Leu Cys Phe Pro Gly Asn
            100                 105                 110

Phe Glu Asn Leu Gln Asp Leu Leu Leu Glu Met Ser Gly Val Gln Asn
        115                 120                 125

Phe Thr Lys Val Lys Leu Phe Asn Pro Gln Ser Met Thr Gly Val Thr
    130                 135                 140

Thr Asn Asn Val Asp Gln Thr Cys Pro Phe Glu Gly Lys Pro Ser Phe
145                 150                 155                 160

Tyr Arg Asn Leu Asn Trp Ile Gln Gly Asn Ser Gly Leu Pro Phe Asn
                165                 170                 175

Ile Glu Ile Lys Asn Pro Thr Ser Asn Pro Leu Leu Leu Leu Trp Gly
            180                 185                 190

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

Asp Tyr Ser Tyr Thr Ile Phe Asn Phe Gly Glu Lys Ser Glu Glu Phe
    210                 215                 220

Arg Pro Glu Ile Gly Gln Arg Asp Glu Val Lys Ala His Gln Asp Arg
225                 230                 235                 240
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```
Ile Asp Tyr Tyr Trp Gly Ser Leu Pro Ala Gln Ser Thr Leu Arg Ile
                245                 250                 255

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

Arg Lys Glu Gly Lys Gly Gly Leu Met Lys Ser Lys Leu Pro Ile Ser
        275                 280                 285

Asp Cys Ser Thr Lys Cys Gln Thr Pro Leu Gly Ala Leu Asn Ser Thr
    290                 295                 300

Leu Pro Phe Gln Asn Val His Gln Gln Thr Ile Gly Asn Cys Pro Lys
305                 310                 315                 320

Tyr Val Lys Ala Thr Ser Leu Met Leu Ala Thr Gly Leu Arg Asn Asn
                325                 330                 335

Pro Gln Met Glu Gly Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe Ile
            340                 345                 350

Glu Gly Gly Trp Gln Gly Met Ile Asp Gly Trp Tyr Gly Tyr His His
        355                 360                 365

Glu Asn Gln Glu Gly Ser Gly Tyr Ala Ala Asp Lys Glu Ala Thr Gln
    370                 375                 380

Lys Ala Val Asp Ala Ile Thr Asn Lys Val Asn Ser Ile Ile Asp Lys
385                 390                 395                 400

Met Asn Ser Gln Phe Glu Ser Asn Ile Lys Glu Phe Asn Arg Leu Glu
                405                 410                 415

Leu Arg Ile Gln His Leu Ser Asp Arg Val Asp Asp Ala Leu Leu Asp
            420                 425                 430

Ile Trp Ser Tyr Asn Thr Glu Leu Leu Val Leu Leu Glu Asn Glu Arg
        435                 440                 445

Thr Leu Asp Phe His Asp Ala Asn Val Lys Asn Leu Phe Glu Lys Val
    450                 455                 460

Lys Ala Gln Leu Lys Asp Asn Ala Ile Asp Glu Gly Asn Gly Cys Phe
465                 470                 475                 480

Leu Leu Leu His Lys Cys Asn Asn Ser Cys Met Asp Asp Ile Lys Asn
                485                 490                 495

Gly Thr Tyr Lys Tyr Met Asp Tyr Arg Glu Glu Ser His Ile Glu Lys
            500                 505                 510
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Gln Lys Ile Asp Gly Val Lys Leu Thr Asp Tyr Ser Arg Tyr Tyr Ile
        515                 520                 525

Met Thr Leu Tyr Ser Thr Ile Ala Ser Ser Val Val Leu Gly Ser Leu
    530                 535                 540

Ile Ile Ala Ala Phe Leu Trp Gly Cys Gln Lys Gly Ser Ile Gln Cys
545                 550                 555                 560

Lys Ile Cys Ile
```