MED0459PCT_SequenceListing
SEQUENCE LISTING

<110> Jin, Hong

<120> Swine Influenza Hemagglutinin Variants

<130> FL265PCT/MED0459.PCT

<140> PCT/US2010/039826
<141> 2010-06-24

<150> 61/258,890
<151> 2009-11-06

<150> 61/234,021
<151> 2009-08-14

<150> 61/227,986
<151> 2009-07-23

<150> 61/220,426
<151> 2009-06-25

<160> 9

<170> PatentIn version 3.5

<210> 1
<211> 549
<212> PRT
<213> Haemophilus influenzae

<400> 1

```
Asp Thr Leu 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 Lys His Asn Gly Lys Leu Cys Lys Leu Arg Gly Val Ala
        35                  40                  45

Pro Leu His Leu Gly Lys Cys Asn Ile Ala Gly Trp Ile Leu Gly Asn
    50                  55                  60

Pro Glu Cys Glu Ser Leu Ser Thr Ala Ser Ser Trp Ser Tyr Ile Val
65                  70                  75                  80

Glu Thr Pro Ser Ser Asp Asn Gly Thr Cys Tyr Pro Gly Asp Phe Ile
                85                  90                  95

Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe Glu
            100                 105                 110

Arg Phe Glu Ile Phe Pro Lys Thr Ser Ser Trp Pro Asn His Asp Ser
        115                 120                 125

Asn Lys Gly Val Thr Ala Ala Cys Pro His Ala Gly Ala Lys Ser Phe
```

130 135 140

Tyr Lys Asn Leu Ile Trp Leu Val Lys Lys Gly Asn Ser Tyr Pro Lys
145 150 155 160

Leu Ser Lys Ser Tyr Ile Asn Asp Lys Gly Lys Glu Val Leu Val Leu
165 170 175

Trp Gly Ile His His Pro Ser Thr Ser Ala Asp Gln Gln Ser Leu Tyr
180 185 190

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

Lys Phe Lys Pro Glu Ile Ala Ile Arg Pro Lys Val Arg Gly Gln Glu
210 215 220

Gly Arg Met Asn Tyr Tyr Trp Thr Leu Val Glu Pro Gly Asp Lys Ile
225 230 235 240

Thr Phe Glu Ala Thr Gly Asn Leu Val Val Pro Arg Tyr Ala Phe Ala
245 250 255

Met Glu Arg Asn Ala Gly Ser Gly Ile Ile Ile Ser Asp Thr Pro Val
260 265 270

His Asp Cys Asn Thr Thr Cys Gln Thr Pro Lys Gly Ala Ile Asn Thr
275 280 285

Ser Leu Pro Phe Gln Asn Ile His Pro Ile Thr Ile Gly Lys Cys Pro
290 295 300

Lys Tyr Val Lys Ser Thr Lys Leu Arg Leu Ala Thr Gly Leu Arg Asn
305 310 315 320

Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe
325 330 335

Ile Glu Gly Gly Trp Thr Gly Met Val Asp Gly Trp Tyr Gly Tyr His
340 345 350

His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Leu Lys Ser Thr
355 360 365

Gln Asn Ala Ile Asp Glu Ile Thr Asn Lys Val Asn Ser Val Ile Glu
370 375 380

Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn His Leu
385 390 395 400

Glu Lys Arg Ile Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe Leu
405 410 415

Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Glu
420 425 430

Arg Thr Leu Asp Tyr His Asp Ser Asn Val Lys Asn Leu Tyr Glu Lys
435 440 445

Val Arg Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly Cys
450 455 460

Phe Glu Phe Tyr His Lys Cys Asp Asn Thr Cys Met Glu Ser Val Lys
465 470 475 480

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

Arg Glu Glu Ile Asp Gly Val Lys Leu Glu Ser Thr Arg Ile Tyr Gln
500 505 510

Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Val Val
515 520 525

Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln
530 535 540

Cys Arg Ile Cys Ile
545

<210> 2
<211> 1777
<212> DNA
<213> Haemophilus influenzae

<400> 2
agcaaaagca ggggaaaaca aaagcaacaa aaatgaaggc aatactagta gttctgctat 60

atacatttgc aaccgcaaat gcagacacat tatgtatagg ttatcatgcg aacaattcaa 120

cagacactgt agacacagta ctagaaaaga atgtaacagt aacacactct gttaaccttc 180

tagaagacaa gcataacggg aaactatgca aactaagagg ggtagcccca ttgcatttgg 240

gtaaatgtaa cattgctggc tggatcctgg gaaatccaga gtgtgaatca ctctccacag 300

caagctcatg gtcctacatt gtggaaacac ctagttcaga caatggaacg tgttacccag 360

gagatttcat cgattatgag gagctaagag agcaattgag ctcagtgtca tcatttgaaa 420

ggtttgagat attccccaag acaagttcat ggcccaatca tgactcgaac aaaggtgtaa 480

cggcagcatg tcctcatgct ggagcaaaaa gcttctacaa aaatttaata tggctagtta 540

aaaaaggaaa ttcataccca aagctcagca aatcctacat taatgataaa gggaaagaag 600

tcctcgtgct atggggcatt caccatccat ctactagtgc tgaccaacaa agtctctatc 660

agaatgcaga tgcatatgtt tttgtggggt catcaagata cagcaagaag ttcaagccgg 720

aaatagcaat aagacccaaa gtgaggggtc aagaagggag aatgaactat tactggacac 780

tagtagagcc gggagacaaa ataacattcg aagcaactgg aaatctagtg gtaccgagat 840

atgcattcgc aatggaaaga aatgctggat ctggtattat catttcagat acaccagtcc 900

acgattgcaa tacaacttgt caaacaccca agggtgctat aaacaccagc ctcccatttc 960

agaatataca tccgatcaca attggaaaat gtccaaaata tgtaaaaagc acaaaattga 1020

gactggccac aggattgagg aatatcccgt ctattcaatc tagaggccta tttggggcca 1080

ttgccggttt cattgaaggg gggtggacag ggatggtaga tggatggtac ggttatcacc 1140

atcaaaatga gcaggggtca ggatatgcag ccgacctgaa gagcacacag aatgccattg 1200

acgagattac taacaaagta aattctgtta ttgaaaagat gaatacacag ttcacagcag 1260

taggtaaaga gttcaaccac ctggaaaaaa gaatagagaa tttaaataaa aaagttgatg 1320

atggtttcct ggacatttgg acttacaatg ccgaactgtt ggttctattg gaaaatgaaa 1380

gaactttgga ctaccacgat tcaaatgtga agaacttata tgaaaaggta agaagccagc 1440

taaaaaacaa tgccaaggaa attggaaacg gctgctttga attttaccac aaatgcgata 1500

acacgtgcat ggaaagtgtc aaaaatggga cttatgacta cccaaaatac tcagaggaag 1560

caaaattaaa cagagaagaa atagatgggg taaagctgga atcaacaagg atttaccaga 1620

ttttggcgat ctattcaact gtcgccagtt cattggtact ggtagtctcc ctgggggcaa 1680

tcagtttctg gatgtgctct aatgggtctc tacagtgtag aatatgtatt taacattagg 1740

atttcagaag catgagaaaa acacccttgt ttctact 1777

<210> 3
<211> 1777
<212> DNA
<213> Haemophilus influenzae

<400> 3
agcaaaagca ggggaaaaca aaagcaacaa aaatgaaggc aatactagta gttctgctat 60

atacatttgc aaccgcaaat gcagacacat tatgtatagg ttatcatgcg aacaattcaa 120

cagacactgt agacacagta ctagaaaaga atgtaacagt aacacactct gttaaccttc 180

tagaagacaa gcataacggg aaactatgca aactaagagg ggtagcccca ttgcatttgg 240

gtaaatgtaa cattgctggc tggatcctgg gaaatccaga gtgtgaatca ctctccacag 300

caagctcatg gtcctacatt gtggaaacac ctagttcaga caatggaacg tgttacccag 360

gagatttcat cgattatgag gagctaagag agcaattgag ctcagtgtca tcatttgaaa 420

ggtttgagat attccccgag acaagttcat ggcccaatca tgactcgaac aaaggtgtaa 480

cggcagcatg tcctcatgct ggagcaaaaa gcttctacaa aaatttaata tggctagtta 540

aaaaaggaaa ttcataccca aagctcagca aatcctacat taatgataaa gggaaagaag 600

tcctcgtgct atggggcatt caccatccat ctactagtga tgaccaacaa agtctctatc 660

agaatgcaga tgcatatgtt tttgtggggt catcaagata cagcaagaag ttcaagccgg 720

aaatagcaat aagacccaaa gtgaggggtc aagaagggag aatgaactat tactggacac 780

tagtagagcc gggagacaaa ataacattcg aagcaactgg aaatctagtg gtaccgagat 840

atgcattcgc aatggaaaga aatgctggat ctggtattat catttcagat acaccagtcc 900

acgattgcaa tacaacttgt caaacaccca agggtgctat aaacaccagc ctcccatttc 960

agaatataca tccgatcaca attggaaaat gtccaaaata tgtaaaaagc acaaaattga 1020

gactggccac aggattgagg aatatcccgt ctattcaatc tagaggccta tttggggcca 1080

ttgccggttt cattgaaggg gggtggacag ggatggtaga tggatggtac ggttatcacc 1140

atcaaaatga gcaggggtca ggatatgcag ccgacctgaa gagcacacag aatgccattg 1200

acgagattac taacaaagta aattctgtta ttgaaaagat gaatacacag ttcacagcag 1260

taggtaaaga gttcaaccac ctggaaaaaa gaatagagaa tttaaataaa aaagttgatg 1320

atggtttcct ggacatttgg acttacaatg ccgaactgtt ggttctattg gaaaatgaaa 1380

gaactttgga ctaccacgat tcaaatgtga agaacttata tgaaaaggta agaagccagc 1440

taaaaaacaa tgccaaggaa attggaaacg gctgctttga attttaccac aaatgcgata 1500

acacgtgcat ggaaagtgtc aaaaatggga cttatgacta cccaaaatac tcagaggaag 1560

caaaattaaa cagagaagaa atagatgggg taaagctgga atcaacaagg atttaccaga 1620

ttttggcgat ctattcaact gtcgccagtt cattggtact ggtagtctcc ctgggggcaa 1680

tcagtttctg gatgtgctct aatgggtctc tacagtgtag aatatgtatt taacattagg 1740

atttcagaag catgagaaaa acacccttgt ttctact 1777

<210> 4
<211> 469
<212> PRT
<213> Haemophilus influenzae

<400> 4

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

Ile Gly Met Ala Asn Leu Ile Leu Gln Ile Gly Asn Ile Ile Ser Ile
20 25 30

Trp Ile Ser His Ser Ile Gln Leu Gly Asn Gln Asn Gln Ile Glu Thr
35 40 45

Cys Asn Gln Ser Val Ile Thr Tyr Glu Asn Asn Thr Trp Val Asn Gln
50 55 60

Thr Tyr Val Asn Ile Ser Asn Thr Asn Phe Ala Ala Gly Gln Ser Val
65 70 75 80

```
Val Ser Val Lys Leu Ala Gly Asn Ser Ser Leu Cys Pro Val Ser Gly
                85                  90                  95

Trp Ala Ile Tyr Ser Lys Asp Asn Ser Val Arg Ile Gly Ser Lys Gly
            100                 105                 110

Asp Val Phe Val Ile Arg Glu Pro Phe Ile Ser Cys Ser Pro Leu Glu
        115                 120                 125

Cys Arg Thr Phe Phe Leu Thr Gln Gly Ala Leu Leu Asn Asp Lys His
    130                 135                 140

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

Cys Pro Ile Gly Glu Val Pro Ser Pro Tyr Asn Ser Arg Phe Glu Ser
                165                 170                 175

Val Ala Trp Ser Ala Ser Ala Cys His Asp Gly Ile Asn Trp Leu Thr
            180                 185                 190

Ile Gly Ile Ser Gly Pro Asp Asn Gly Ala Val Ala Val Leu Lys Tyr
        195                 200                 205

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

Arg Thr Gln Glu Ser Glu Cys Ala Cys Val Asn Gly Ser Cys Phe Thr
225                 230                 235                 240

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

Arg Ile Glu Lys Gly Lys Ile Val Lys Ser Val Glu Met Asn Ala Pro
            260                 265                 270

Asn Tyr His Tyr Glu Glu Cys Ser Cys Tyr Pro Asp Ser Ser Glu Ile
        275                 280                 285

Thr Cys Val Cys Arg Asp Asn Trp His Gly Ser Asn Arg Pro Trp Val
    290                 295                 300

Ser Phe Asn Gln Asn Leu Glu Tyr Gln Ile Gly Tyr Ile Cys Ser Gly
305                 310                 315                 320

Ile Phe Gly Asp Asn Pro Arg Pro Asn Asp Lys Thr Gly Ser Cys Gly
                325                 330                 335

Pro Val Ser Ser Asn Gly Ala Asn Gly Val Lys Gly Phe Ser Phe Lys
            340                 345                 350
```

Tyr Gly Asn Gly Val Trp Ile Gly Arg Thr Lys Ser Ile Ser Ser Arg
355 360 365

Asn Gly Phe Glu Met Ile Trp Asp Pro Asn Gly Trp Thr Gly Thr Asp
370 375 380

Asn Asn Phe Ser Ile Lys Gln Asp Ile Val Gly Ile Asn Glu Trp Ser
385 390 395 400

Gly Tyr Ser Gly Ser Phe Val Gln His Pro Glu Leu Thr Gly Leu Asp
405 410 415

Cys Ile Arg Pro Cys Phe Trp Val Glu Leu Ile Arg Gly Arg Pro Lys
420 425 430

Glu Asn Thr Ile Trp Thr Ser Gly Ser Ser Ile Ser Phe Cys Gly Val
435 440 445

Asn Ser Asp Thr Val Gly Trp Ser Trp Pro Asp Gly Ala Glu Leu Pro
450 455 460

Phe Thr Ile Asp Lys
465

<210> 5
<211> 1458
<212> DNA
<213> Haemophilus influenzae

<400> 5
agcaaaagca ggagtttaaa atgaatccaa accaaaagat aataaccatt ggttcggtct 60

gtatgacaat tggaatggct aacttaatat tacaaattgg aaacataatc tcaatatgga 120

ttagccactc aattcaactt gggaatcaaa atcagattga aacatgcaat caaagcgtca 180

ttacttatga aaacaacact tgggtaaatc agacatatgt taacatcagc aacaccaact 240

ttgctgctgg acagtcagtg gtttccgtga aattagcggg caattcctct ctctgccctg 300

ttagtggatg ggctatatac agtaaagaca acagtgtaag aatcggttcc aaggggatg 360

tgtttgtcat aagggaacca ttcatatcat gctccccctt ggaatgcaga accttcttct 420

tgactcaagg ggccttgcta aatgacaaac attccaatgg aaccattaaa gacaggagcc 480

catatcgaac cctaatgagc tgtcctattg gtgaagttcc ctctccatac aactcaagat 540

ttgagtcagt cgcttggtca gcaagtgctt gtcatgatgg catcaattgg ctaacaattg 600

gaatttctgg cccagacaat ggggcagtgg ctgtgttaaa gtacaacggc ataataacag 660

acactatcaa gagttggaga aacaatatat tgagaacaca agagtctgaa tgtgcatgtg 720

taaatggttc ttgctttact gtaatgaccg atggaccaag taatggacag gcctcataca 780

agatcttcag aatagaaaag ggaaagatag tcaaatcagt cgaaatgaat gcccctaatt 840

atcactatga ggaatgctcc tgttatcctg attctagtga aatcacatgt gtgtgcaggg 900

ataactggca tggctcgaat cgaccgtggg tgtctttcaa ccagaatctg gaatatcaga 960

taggatacat atgcagtggg attttcggag acaatccacg ccctaatgat aagacaggca 1020

gttgtggtcc agtatcgtct aatggagcaa atggagtaaa agggttttca ttcaaatacg 1080

gcaatggtgt ttggataggg agaactaaaa gcattagttc aagaaacggt tttgagatga 1140

tttgggatcc gaacggatgg actgggacag acaataactt ctcaataaag caagatatcg 1200

taggaataaa tgagtggtca ggatatagcg ggagttttgt tcagcatcca gaactaacag 1260

ggctggattg tataagacct tgcttctggg ttgaactaat cagagggcga cccaaagaga 1320

acacaatctg gactagcggg agcagcatat ccttttgtgg tgtaaacagt gacactgtgg 1380

gttggtcttg gccagacggt gctgagttgc catttaccat tgacaagtaa tttgttcaaa 1440

aaactccttg tttctact 1458

<210> 6
<211> 549
<212> PRT
<213> Haemophilus influenzae

<400> 6

Asp Thr Leu 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 Lys His Asn Gly Lys Leu Cys Lys Leu Arg Gly Val Ala
35 40 45

Pro Leu His Leu Gly Lys Cys Asn Ile Ala Gly Trp Ile Leu Gly Asn
50 55 60

Pro Glu Cys Glu Ser Leu Ser Thr Ala Ser Ser Trp Ser Tyr Ile Val
65 70 75 80

Glu Thr Pro Ser Ser Asp Asn Gly Thr Cys Tyr Pro Gly Asp Phe Ile
85 90 95

Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe Glu
100 105 110

Arg Phe Glu Ile Phe Pro Glu Thr Ser Ser Trp Pro Asn His Asp Ser
115 120 125

Asn Lys Gly Val Thr Ala Ala Cys Pro His Ala Gly Ala Lys Ser Phe
130 135 140

Tyr Lys Asn Leu Ile Trp Leu Val Lys Lys Gly Asn Ser Tyr Pro Lys

145 150 155 160

Leu Ser Lys Ser Tyr Ile Asn Asp Lys Gly Lys Glu Val Leu Val Leu
165 170 175

Trp Gly Ile His His Pro Ser Thr Ser Asp Asp Gln Gln Ser Leu Tyr
180 185 190

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

Lys Phe Lys Pro Glu Ile Ala Ile Arg Pro Lys Val Arg Gly Gln Glu
210 215 220

Gly Arg Met Asn Tyr Tyr Trp Thr Leu Val Glu Pro Gly Asp Lys Ile
225 230 235 240

Thr Phe Glu Ala Thr Gly Asn Leu Val Val Pro Arg Tyr Ala Phe Ala
245 250 255

Met Glu Arg Asn Ala Gly Ser Gly Ile Ile Ile Ser Asp Thr Pro Val
260 265 270

His Asp Cys Asn Thr Thr Cys Gln Thr Pro Lys Gly Ala Ile Asn Thr
275 280 285

Ser Leu Pro Phe Gln Asn Ile His Pro Ile Thr Ile Gly Lys Cys Pro
290 295 300

Lys Tyr Val Lys Ser Thr Lys Leu Arg Leu Ala Thr Gly Leu Arg Asn
305 310 315 320

Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe
325 330 335

Ile Glu Gly Gly Trp Thr Gly Met Val Asp Gly Trp Tyr Gly Tyr His
340 345 350

His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Leu Lys Ser Thr
355 360 365

Gln Asn Ala Ile Asp Glu Ile Thr Asn Lys Val Asn Ser Val Ile Glu
370 375 380

Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn His Leu
385 390 395 400

Glu Lys Arg Ile Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe Leu
405 410 415

Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Glu
420 425 430

Arg Thr Leu Asp Tyr His Asp Ser Asn Val Lys Asn Leu Tyr Glu Lys
435 440 445

Val Arg Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly Cys
450 455 460

Phe Glu Phe Tyr His Lys Cys Asp Asn Thr Cys Met Glu Ser Val Lys
465 470 475 480

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

Arg Glu Glu Ile Asp Gly Val Lys Leu Glu Ser Thr Arg Ile Tyr Gln
500 505 510

Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Val Val
515 520 525

Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln
530 535 540

Cys Arg Ile Cys Ile
545

<210> 7
<211> 1777
<212> DNA
<213> Haemophilus influenzae

<400> 7
agcaaaagca ggggaaaaca aaagcaacaa aaatgaaggc aatactagta gttctgctat 60

atacatttgc aaccgcaaat gcagacacat tatgtatagg ttatcatgcg aacaattcaa 120

cagacactgt agacacagta ctagaaaaga atgtaacagt aacacactct gttaaccttc 180

tagaagacaa gcataacggg aaactatgca aactaagagg ggtagcccca ttgcatttgg 240

gtaaatgtaa cattgctggc tggatcctgg gaaatccaga gtgtgaatca ctctccacag 300

caagctcatg gtcctacatt gtggaaacac ctagttcaga caatggaacg tgttacccag 360

gagatttcat cgattatgag gagctaagag agcaattgag ctcagtgtca tcatttgaaa 420

ggtttgagat attccccgag acaagttcat ggcccaatca tgactcgaac aaaggtgtaa 480

cggcagcatg tcctcatgct ggagcaaaaa gcttctacaa aaatttaata tggctagtta 540

aaaaaggaaa ttcataccca aagctcagca aatcctacat taatgataaa gggaaagaag 600

tcctcgtgct atggggcatt caccatccat ctactagtga tgaccaacaa agtctctatc 660

agaatgcaga tgcatatgtt tttgtggggt catcaagata cagcaagaag ttcaagccgg 720

aaatagcaat aagacccaaa gtgaggggtc aagaagggag aatgaactat tactggacac 780

tagtagagcc gggagacaaa ataacattcg aagcaactgg aaatctagtg gtaccgagat 840

atgcattcgc aatggaaaga aatgctggat ctggtattat catttcagat acaccagtcc 900

acgattgcaa tacaacttgt caaacaccca agggtgctat aaacaccagc ctcccatttc 960

agaatataca tccgatcaca attggaaaat gtccaaaata tgtaaaaagc acaaaattga 1020

gactggccac aggattgagg aatatcccgt ctattcaatc tagaggccta tttggggcca 1080

ttgccggttt cattgaaggg gggtggacag ggatggtaga tggatggtac ggttatcacc 1140

atcaaaatga gcaggggtca ggatatgcag ccgacctgaa gagcacacag aatgccattg 1200

acgagattac taacaaagta aattctgtta ttgaaaagat gaatacacag ttcacagcag 1260

taggtaaaga gttcaaccac ctggaaaaaa gaatagagaa tttaaataaa aaagttgatg 1320

atggtttcct ggacatttgg acttacaatg ccgaactgtt ggttctattg gaaaatgaaa 1380

gaactttgga ctaccacgat tcaaatgtga agaacttata tgaaaaggta agaagccagc 1440

taaaaaacaa tgccaaggaa attggaaacg gctgctttga attttaccac aaatgcgata 1500

acacgtgcat ggaaagtgtc aaaaatggga cttatgacta cccaaaatac tcagaggaag 1560

caaaattaaa cagagaagaa atagatgggg taaagctgga atcaacaagg atttaccaga 1620

ttttggcgat ctattcaact gtcgccagtt cattggtact ggtagtctcc ctgggggcaa 1680

tcagtttctg gatgtgctct aatgggtctc tacagtgtag aatatgtatt taacattagg 1740

atttcagaag catgagaaaa acacccttgt ttctact 1777

<210> 8
<211> 549
<212> PRT
<213> Haemophilus influenzae

<400> 8

Asp Thr Leu 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 Lys His Asn Gly Lys Leu Cys Lys Leu Arg Gly Val Ala
35 40 45

Pro Leu His Leu Gly Lys Cys Asn Ile Ala Gly Trp Ile Leu Gly Asn
50 55 60

Pro Glu Cys Glu Ser Leu Ser Thr Ala Ser Ser Trp Ser Tyr Ile Val
65 70 75 80

Glu Thr Pro Ser Ser Asp Asn Gly Thr Cys Tyr Pro Gly Asp Phe Ile
85 90 95

```
Asp Tyr Glu Glu Leu Arg Glu Gln Leu Ser Ser Val Ser Ser Phe Glu
            100                 105                 110

Arg Phe Glu Ile Phe Pro Lys Thr Ser Ser Trp Pro Asn His Asp Ser
        115                 120                 125

Asn Lys Gly Val Thr Ala Ala Cys Pro His Ala Gly Ala Lys Ser Phe
    130                 135                 140

Tyr Lys Asn Leu Ile Trp Leu Val Lys Lys Gly Asn Ser Tyr Pro Lys
145                 150                 155                 160

Leu Ser Lys Ser Tyr Ile Asn Asp Lys Gly Lys Glu Val Leu Val Leu
                165                 170                 175

Trp Gly Ile His His Pro Ser Thr Ser Asp Asp Gln Gln Ser Leu Tyr
            180                 185                 190

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

Lys Phe Lys Pro Glu Ile Ala Ile Arg Pro Lys Val Arg Asp Arg Glu
    210                 215                 220

Gly Arg Met Asn Tyr Tyr Trp Thr Leu Val Glu Pro Gly Asp Lys Ile
225                 230                 235                 240

Thr Phe Glu Ala Thr Gly Asn Leu Val Val Pro Arg Tyr Ala Phe Ala
                245                 250                 255

Met Glu Arg Asn Ala Gly Ser Gly Ile Ile Ile Ser Asp Thr Pro Val
            260                 265                 270

Tyr Asp Cys Asn Thr Thr Cys Gln Thr Pro Lys Gly Ala Ile Asn Thr
        275                 280                 285

Ser Leu Pro Phe Gln Asn Ile His Pro Ile Thr Ile Gly Lys Cys Pro
    290                 295                 300

Lys Tyr Val Lys Ser Thr Lys Leu Arg Leu Ala Thr Gly Leu Arg Asn
305                 310                 315                 320

Ile Pro Ser Ile Gln Ser Arg Gly Leu Phe Gly Ala Ile Ala Gly Phe
                325                 330                 335

Ile Glu Gly Gly Trp Thr Gly Met Val Asp Gly Trp Tyr Gly Tyr His
            340                 345                 350

His Gln Asn Glu Gln Gly Ser Gly Tyr Ala Ala Asp Leu Lys Ser Thr
        355                 360                 365
```

Gln Asn Ala Ile Asp Glu Ile Thr Asn Lys Val Asn Ser Val Ile Glu
370 375 380

Lys Met Asn Thr Gln Phe Thr Ala Val Gly Lys Glu Phe Asn His Leu
385 390 395 400

Glu Lys Arg Ile Glu Asn Leu Asn Lys Lys Val Asp Asp Gly Phe Leu
405 410 415

Asp Ile Trp Thr Tyr Asn Ala Glu Leu Leu Val Leu Leu Glu Asn Glu
420 425 430

Arg Thr Leu Asp Tyr His Asp Ser Asn Val Lys Asn Leu Tyr Glu Lys
435 440 445

Val Arg Ser Gln Leu Lys Asn Asn Ala Lys Glu Ile Gly Asn Gly Cys
450 455 460

Phe Glu Phe Tyr His Lys Cys Asp Asn Thr Cys Met Glu Ser Val Lys
465 470 475 480

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

Arg Glu Glu Ile Asp Gly Val Lys Leu Glu Ser Thr Arg Ile Tyr Gln
500 505 510

Ile Leu Ala Ile Tyr Ser Thr Val Ala Ser Ser Leu Val Leu Val Val
515 520 525

Ser Leu Gly Ala Ile Ser Phe Trp Met Cys Ser Asn Gly Ser Leu Gln
530 535 540

Cys Arg Ile Cys Ile
545

<210> 9
<211> 1777
<212> DNA
<213> Haemophilus influenzae

<400> 9
agcaaaagca ggggaaaaca aaagcaacaa aaatgaaggc aatactagta gttctgctat 60

atacatttgc aaccgcaaat gcagacacat tatgtatagg ttatcatgcg aacaattcaa 120

cagacactgt agacacagta ctagaaaaga atgtaacagt aacacactct gttaaccttc 180

tagaagacaa gcataacggg aaactatgca aactaagagg ggtagcccca ttgcatttgg 240

gtaaatgtaa cattgctggc tggatcctgg gaaatccaga gtgtgaatca ctctccacag 300

caagctcatg gtcctacatt gtggaaacac ctagttcaga caatggaacg tgttacccag 360

gagatttcat cgattatgag gagctaagag agcaattgag ctcagtgtca tcatttgaaa 420

ggtttgagat attccccaag acaagttcat ggcccaatca tgactcgaac aaaggtgtaa 480

cggcagcatg tcctcatgct ggagcaaaaa gcttctacaa aaatttaata tggctagtta 540

aaaaaggaaa ttcataccca aagctcagca aatcctacat taatgataaa gggaaagaag 600

tcctcgtgct atggggcatt caccatccat ctactagtga tgatcaacaa agtctctatc 660

agaatgcaga tgcatatgtt tttgtggggt catcaagata cagcaagaag ttcaagccgg 720

aaatagcaat aagacccaaa gtgagggatc gagaagggag aatgaactat tactggacac 780

tagtagagcc gggagacaaa ataacattcg aagcaactgg aaatctagtg gtaccgagat 840

atgcattcgc aatggaaaga aatgctggat ctggtattat catttcagat acaccagtct 900

acgattgcaa tacaacttgt caaacaccca agggtgctat aaacaccagc ctcccatttc 960

agaatataca tccgatcaca attggaaaat gtccaaaata tgtaaaaagc acaaaattga 1020

gactggccac aggattgagg aatatcccgt ctattcaatc tagaggccta tttggggcca 1080

ttgccggttt cattgaaggg gggtggacag ggatggtaga tggatggtac ggttatcacc 1140

atcaaaatga gcaggggtca ggatatgcag ccgacctgaa gagcacacag aatgccattg 1200

acgagattac taacaaagta aattctgtta ttgaaaagat gaatacacag ttcacagcag 1260

taggtaaaga gttcaaccac ctggaaaaaa gaatagagaa tttaaataaa aaagttgatg 1320

atggtttcct ggacatttgg acttacaatg ccgaactgtt ggttctattg gaaaatgaaa 1380

gaactttgga ctaccacgat tcaaatgtga agaacttata tgaaaaggta agaagccagc 1440

taaaaaacaa tgccaaggaa attggaaacg gctgctttga attttaccac aaatgcgata 1500

acacgtgcat ggaaagtgtc aaaaatggga cttatgacta cccaaaatac tcagaggaag 1560

caaaattaaa cagagaagaa atagatgggg taaagctgga atcaacaagg atttaccaga 1620

ttttggcgat ctattcaact gtcgccagtt cattggtact ggtagtctcc ctgggggcaa 1680

tcagtttctg gatgtgctct aatgggtctc tacagtgtag aatatgtatt taacattagg 1740

atttcagaag catgagaaaa acacccttgt ttctact 1777