

Figures

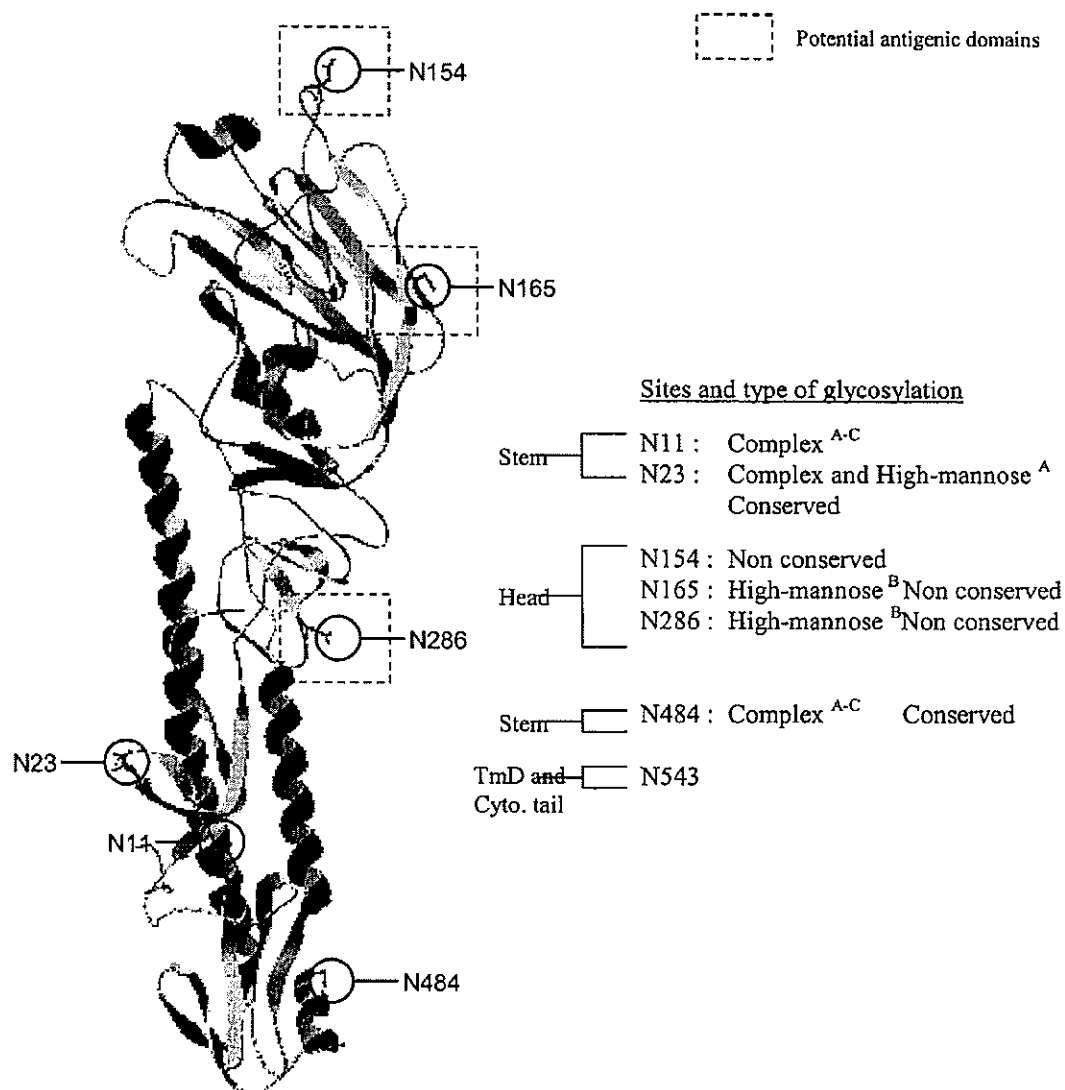


Figure 1A
Representation of the localisation of glycosylation sites on the structure of a monomer from influenza virus HA H5 A/Indonesia/5/05.

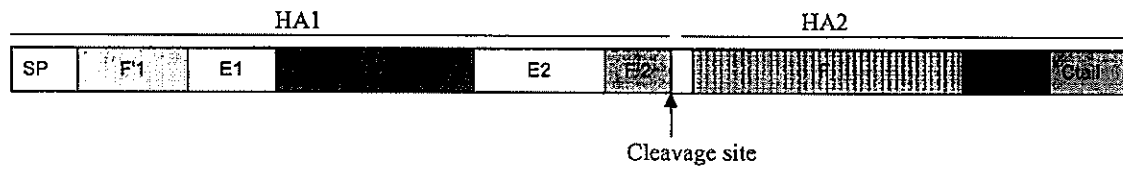


Figure 1B

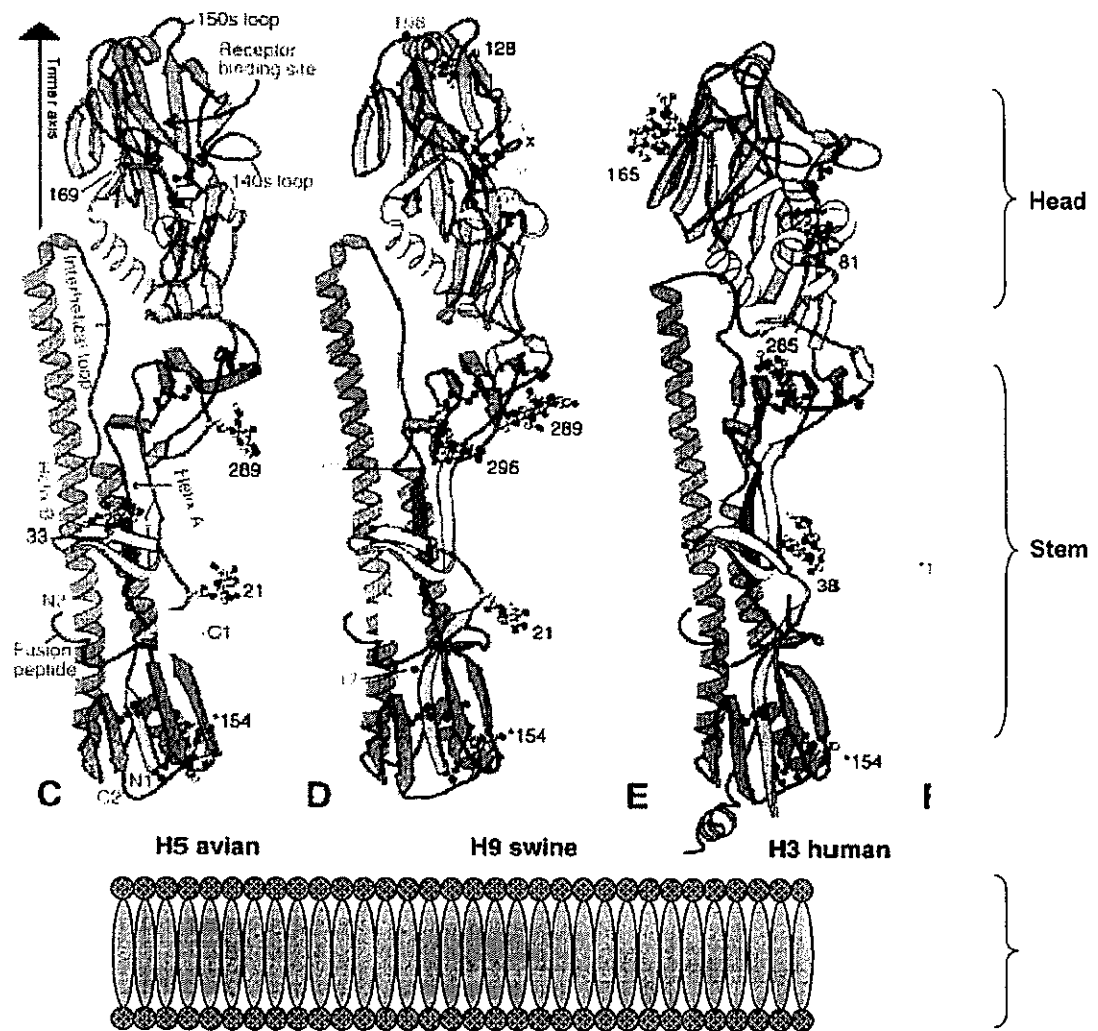


Figure 2

AGAGGTACCCCGGGCTGGTATATTTATATGTTGTCAAATAACTCAAAAACCATA
AAAGTTTAAGTTAGCAAGTGTGTACATTTTTACTTGAACAAAAATATTCACCTAC
TACTGTTATAAATCATTATTAACATTAGAGTAAAGAAATATGGATGATAAGAAC
AAGAGTAGTGATATTTTGACAACAATTTTGTGCAACATTTGAGAAAATTTTGT
GTTCTCTCTTTTCATTGGTCAAAAACAATAGAGAGAGAAAAAGGAAGAGGGAG
AATAAAAACATAATGTGAGTATGAGAGAGAAAGTTGTACAAAAGTTGTACCAAA
ATAGTTGTACAAATATCATTGAGGAATTTGACAAAAGCTACACAAATAAGGGTT
AATTGCTGTAAATAAATAAGGATGACGCATTAGAGAGATGTACCATTAGAGAAT
TTTTGGCAAGTCATTAAAAAGAAAGAATAAATTATTTTTAAAATTTAAAGTTGAG
TCATTTGATTAAACATGTGATTATTTAATGAATTGATGAAAGAGTTGGATTAAAG
TTGTATTAGTAATTAGAATTTGGTGTCAAATTTAATTTGACATTTGATCTTTTCT
ATATATTGCCCATAGAGTCAGTTAACTCATTTTTATTTTCATAGATCAAATAA
GAGAAATAACGGTATATTAATCCCTCCAAAAAACGGTATATTTACTAAA
AAATCTAAGCCACGTAGGAGGATAACAGGATCCCCGTAGGAGGATAACATCCA
ATCCAACCAATCACAACAATCCTGATGAGATAACCCACTTTAAGCCCACGCATC
TGTGGCACATCTACATTATCTAAATCACACATTCTTCCACACATCTGAGCCACA
CAAAAACCAATCCACATCTTTATCACCCATTCTATAAAAAATCACACTTTGTGAG
TCTACACTTTGATTCCCTTCAAACACATACAAAGAGAGAGACTAATTAATTAAT
TAATCATCTTGAGAGAAAATGGCGAAAAACGTTGCGATTTTCGGCTTATTGTT
TCTCTTCTTGTTGGTTCCTTCTCAGATCT

GAGCTCTAAGTTAAATGCTTCTTCGTCTCCTATTTATAATATGGTTTGTTATTG
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TGTATGAGATGAACTGGTGTAAATGAATTCATTTACATAAGTGGAGTCAGAATC
AGAATGTTTCCTCCATAACTAACTAGACATGAAGACCTGCCGCGTACAATTGTC
TTATATTTGAACAACATAAATTGAACATCTTTTGCCACAACCTTTATAAGTGGTTA
ATATAGCTCAAATATATGGTCAAGTTCAATAGATTAATAATGGAAATATCAGTTA
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CTTTGATAAATGATAGTACA

Figure 3

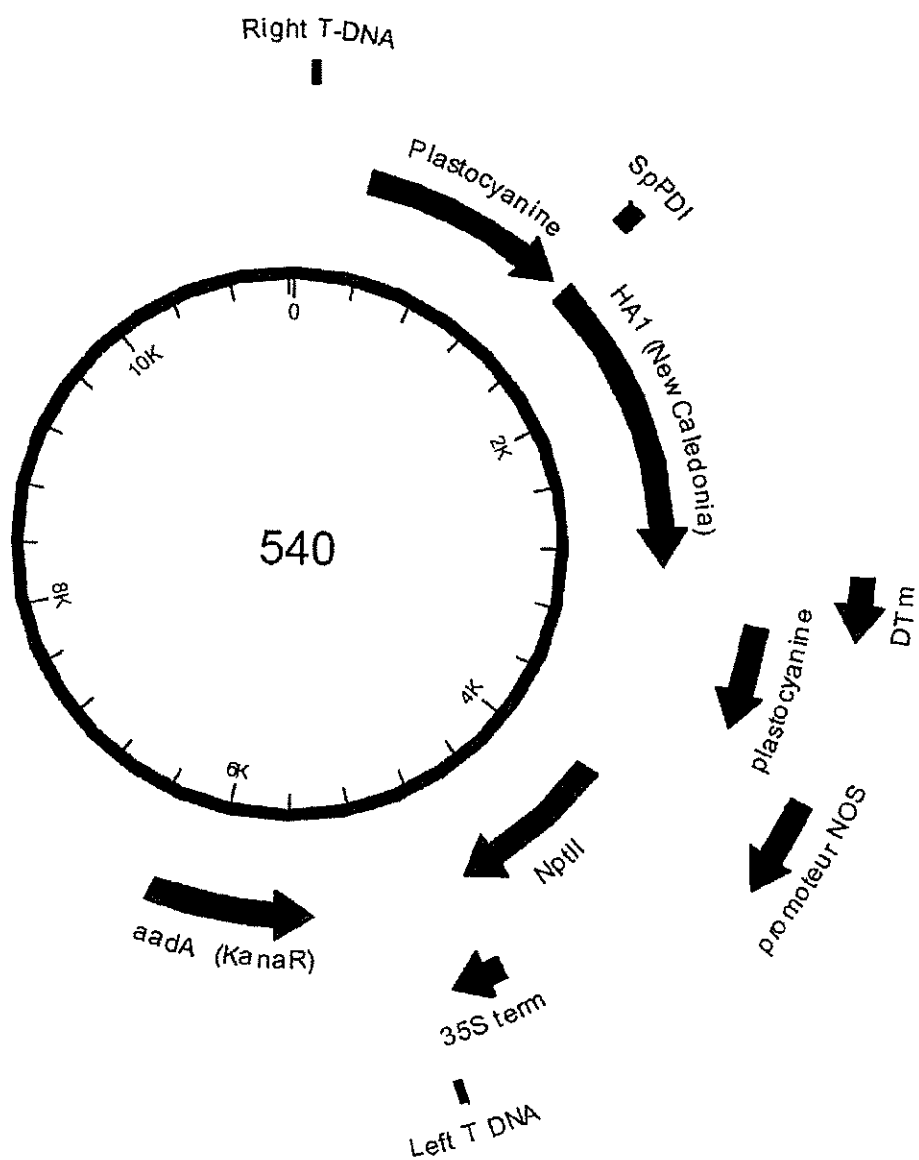


Figure 4

f

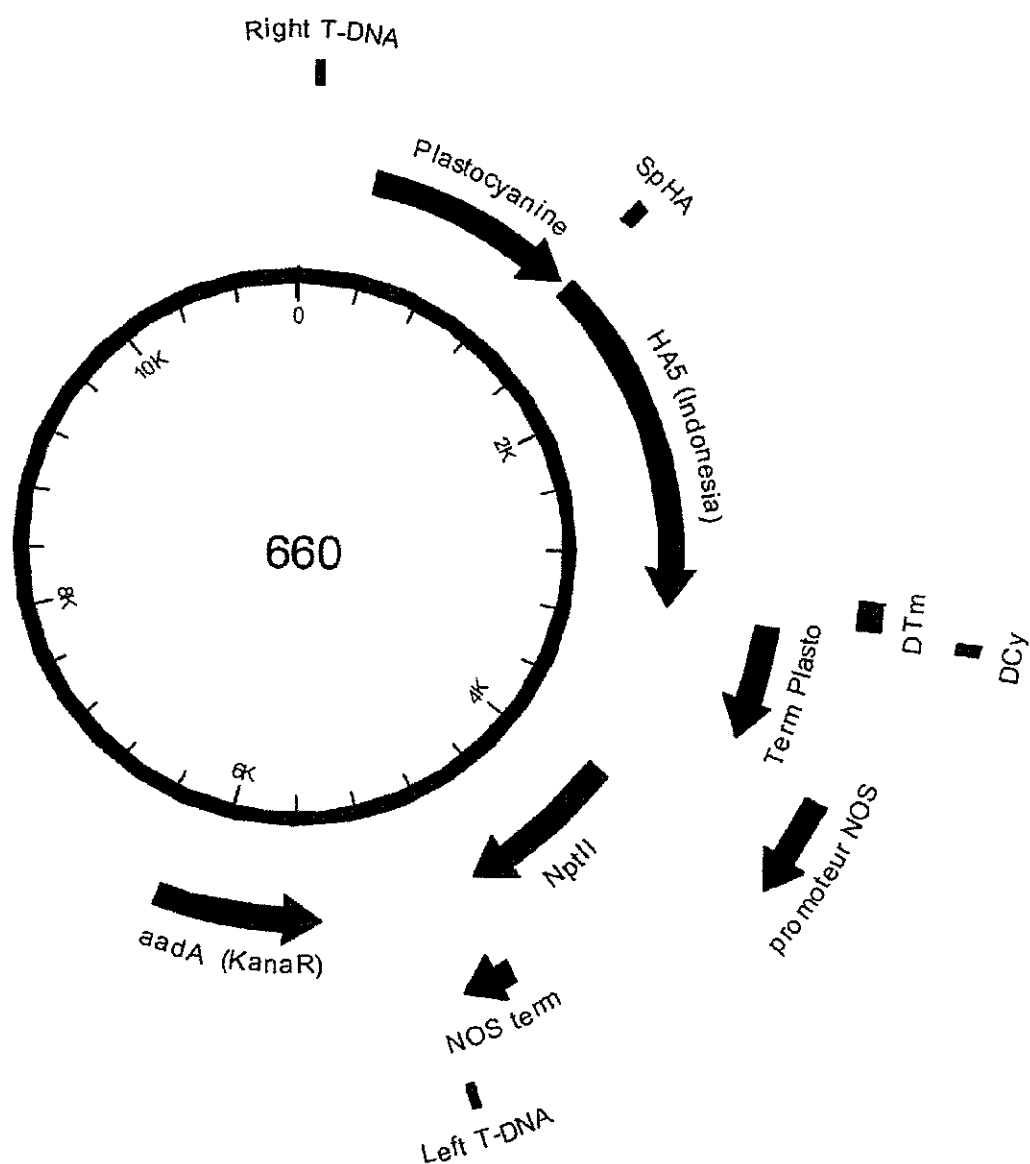


Figure 5

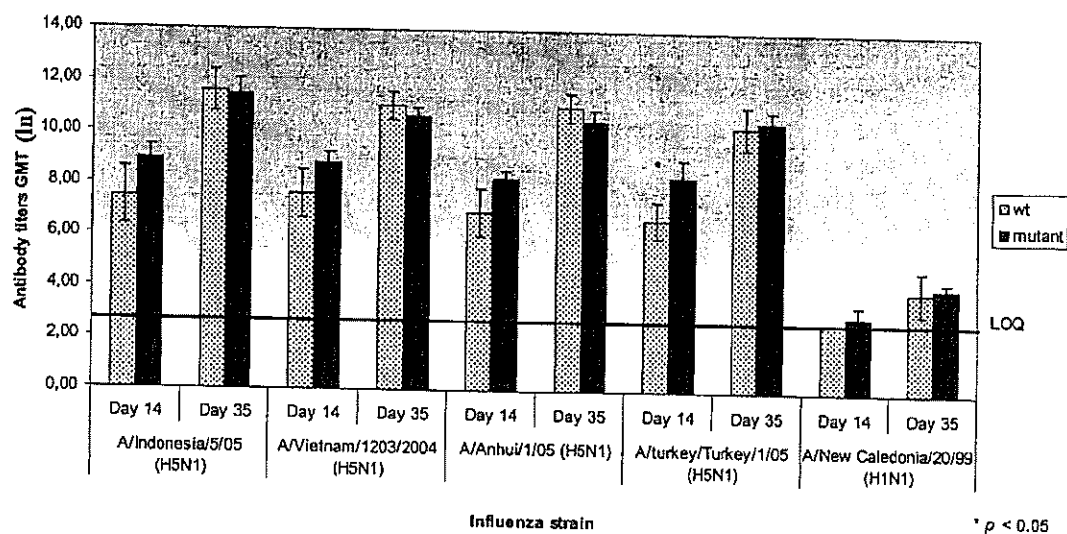


Figure 6
Antibody Titers against Whole Inactivated Viruses (WIV) after first and second dose.

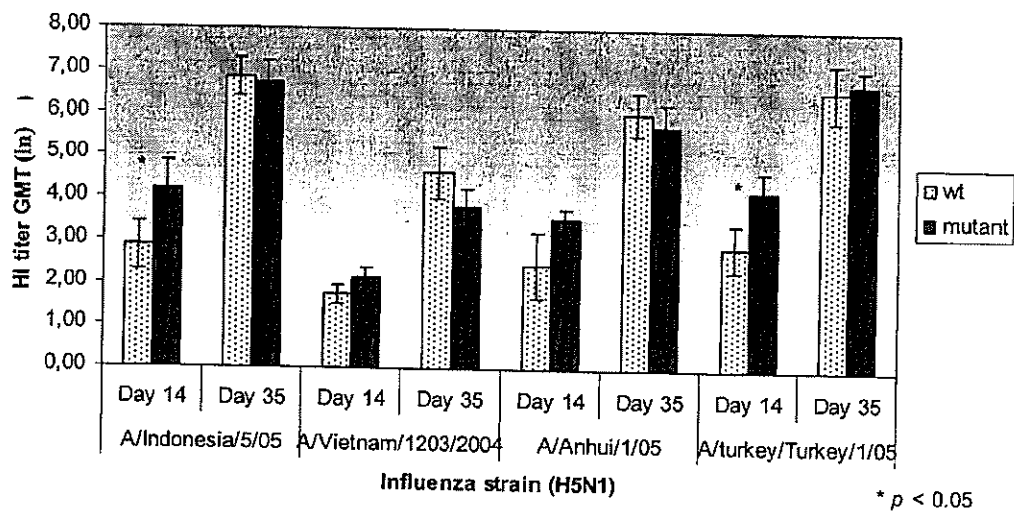


Figure 7
Hemagglutination-inhibition (HI) antibody titers after first and second dose.

SEQ ID NO. 1. HA0 from H1

AGATCTTCGCTGACACAATATGTATAGGCTACCATGCCAACAACCTCAACCGACACTGTTGACA
CAGTACTTGAGAAGAATGTGACAGTGACACACTCTGTCAACCTACTTGAGGACAGTCACAATG
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GGATCTTAGGAAACCCAGAATGCGAATTACTGATTTCCAAGGAATCATGGTCCTACATTGTAG
AAACACCAAATCCTGAGAATGGAACATGTTACCCAGGGTATTTGCGCGACTATGAGGAACTGA
GGGAGCAATTGAGTTCAGTATCTTCATTTGAGAGATTGCGAAATATTTCCCAAAGAAAGCTCAT
GGCCCAACCACACCGTAACCGGAGTATCAGCATCATGCTCCCATATGGGAAAAGCAGTTTTT
ACAGAAATTTGCTATGGCTGACGGGGAAGAATGGTTTGTACCCAAACCTGAGCAAGTCCTATG
TAAACAACAAAGAGAAAGAAGTCCTTGTACTATGGGGTGTTTCATCACCCGCCTAACATAGGGA
ACCAAAGGGCACTCTATCATACAGAAAATGCTTATGTCTCTGTAGTGTCTTCACATTATAGCAG
AAGATTCACCCCAAGAAATAGCCAAAAGACCCAAAGTAAGAGATCAGGAAGGAAGAATCAACTA
CTACTGGACTCTGCTGGAACCTGGGGATACAATAATTTGAGGCAATGGAAATCTAATAGC
GCCATGGTATGCTTTTGCCTGAGTAGAGGCTTTGGATCAGGAATCATCACCTCAAATGCACC
AATGGATGAATGTGATGCGAAGTGTCAAACACCTCAGGGAGCTATAAACAGCAGTCTTCCTTT
CCAGAATGTACACCCAGTCACAATAGGAGAGTGTCCAAAGTATGTCAGGAGTGCAAAATTAAG
GATGGTTACAGGACTAAGGAACATCCCATCCATTCAATCCAGAGGTTTGTGGAGCCATTGC
CGGTTTCATTGAAGGGGGGTGGACTGGAATGGTAGATGGGTGGTATGGTTATCATCATCAGA
ATGAGCAAGGATCTGGCTATGCTGCAGATCAAAAAAGTACACAAAATGCCATTAACGGGATTA
CAACAAGGTCAATTCTGTAATTGAGAAAAATGAACACTCAATTCACAGCTGTGGGCAAGAGT
TCAACAAATTGGAAAGAAGGATGGAAAACCTTAAATAAAAAAGTTGATGATGGGTTTCTAGACAT
TTGGACATATAATGCAGAATTGTTGGTTCTACTGGAAAATGAAAGGACTTTGGATTTCCATGAC
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GAAACGGGTGTTTTGAGTTCATCACAAGTGTAAACAATGAATGCATGGAGAGTGTGAAAAATG
GTACCTATGACTATCCAAAATATTCGAAGAATCAAAGTTAAACAGGGAGAAAATTGATGGAG
TGAAATTGGAATCAATGGGAGTATACCAGATTCTGGCGATCTACTCAACTGTGCGCAGTTCCC
TGTTCTTTTGGTCTCCCTGGGGCAATCAGCTTCTGGATGTGTTCCAATGGGTCTTTGCAGT
GTAGAATATGCATCTAAGAGCTCAGGCCT

Figure 8

SEQ ID NO. 2. subtype H2
 >gi|408516|gb|L11132.1|FLADE88HA Influenza A virus (A/herring gull/DE/677/88 (H2N8))
 hemagglutinin (HA) gene, complete cds

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AGCAAAAGCAGGGGTTATACCATAGACAACCAAGGCAAGACAATGGCCATCATTTATCTAATTTCTCTG
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CCAGAAATGTGATATACTTCTAACTGTGCCAGAAATGGTCATACATAATAGAAAAGAAAATCCAAGGAACG
GCTTGTGCTACCCAGGCAGTTTCAATGATATGAAGAATGAAGCATCTTATCAGCAGCGTGACACATTT
TGAGAAAGTAAAGATTCGCCAGAAATGATGACACAGCATACAACAACCTGGAGGTTACAGGCTTGC
GCAGACTATGTTGGTCCGTCAATCTTCCGGAACATGGTCTGTTGACAAAAGAAAGGTCGAATATATCCAA
TTGCCAAAAGATCTTACAACAATACAAGTGGGGAACAAATGCTGATCATTTGGGGGATACATCACCCCAA
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CGTGGACTATCTTAGATATATGGGACACAAATAAATTTTGAGAGTACTGGCAATCTAATTCACCCAGAATA
TGGTTTCAAAAATATCCAACGAGGTAGTTACAGGGATCATGAACAAGAGAAAACCTTGAAAACCTGCGAG
ACCAAGTGCCAAAATCCTTTGGGAGCAATAAATAACAACATTACCCCTTCAACAATATCCACCCACTGACCA
TTGGTGAGTGCCCCCAAATATGTAAATCGGAAAGATTAGTCTTAGCAACAGGACTAAGAAAACGTCCCTCA
GATTGAGTCAAGGGGATTGTTTGGGGCAATAGCTGGTTTATAGAGGGTGGATGGCAAGGAATGGTTGAT
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TTAAAAACACCCCTTGTCTTCTACT

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Figure 9

SEQ ID No. 3.
subtype H3

>BHB2107299|gb:EF473574|Symbol:HA|Name:hemagglutinin|Organism:Influenza A
virus A/Texas/32/2003|Segment:4|Subtype:H3|Host:Human
CAAAAACCTCCCGGAAATGACAACAGCACGGCAACGCTGTGCCTTGGGCACCATGCAGTACCAACGGAA
CGATAGTGAAACAATCACGAATGACCAAAATTGAAGTTACTAATGCTACTGAGCTGGTACAGAGTTCCTC
AACAGTGGAAATATGGGACAGTCCCTCATCAGATCCTTGATGGAGAAAACTGCACACACTAATAGATGCTCTA
TTGGGAGACCCCTCAGTGTGATGGCTTCCAAAATAAGAAAATGGGACCCTTTTGTGAACGCAGCAAAAGCCT
ACAGCAACTGTTACCCCTTATGATGTCCGGATTATGCCCTCCCTTAGGTCACTAGTTGCCCTCATCCGGCAC
ACTGGAGTTTAAACAATGAAAGCTTCGATTGGACTGGAGTCACCTCAGAATGGAACAAGCTCTGCTTGCAAA
AGGAGATCTAATAAAAGTTTCTTTAGTAGATTGAATTGGTTGACCCACTTAAAAATACAAATACCCAGCAT
TGAACGTGACTATGCCAAACAATGAAAAATTGACAAATTGTACATTTGGGGGGTTTACCACCCCGGTAC
GGACAGTGACCAAAATCAGCCTATATGCTCAAGCATCAGGAAGAATCACAGTCTTACCAAAAAGAAGCCAA
CAAACTGTAAATCCCGAATATCGGATCTAGACCCAGGGTAAGGGATGTCTCCAGCCCGAAATAAGCATCTATT
GGACAATAGTAAACCCGGGAGACATACTTTTGATTAAACAGCACAGGGAATCTAATTGCTCCTCGGGGTTA
CTTCAAAAATACGAAGTGGGAAAAGCTCAATAATGAGATCAGATGCACCCCATTTGGCAAAATGCCAATTCCGAA
TGCATCACTCCAAATGGAAGCATTTCCAAATGACAAAACCATTTCAAAAATGTAAACAGGATCACATATGGGG
CCTGTCCAGATATGTTAAGCAAAAACACTCTGAAATTGGCAACAGGATGCGAAATGTACCAGAGAAACA
AACTAGAGGCATATTTGGCGCAATCGCGGGTTTCATAGAAAAATGGTTGGGAGGGAATGGTGGACGGTTGG
TACGGTTTCAGGCATCAAAAATTCTCAGGGGCACAGGA

Figure 10

SEQ ID NO. 4.
 subtype H4
 >BHB1050162|qb:DQ021859|Symbol:HA|Name:hemagglutinin|Organism:Influenza A Virus
 A/mallard/MN/33/00|Segment:4|Subtype:H4|Host:Avian

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 ACAGTCAAAACAAATGGGAAATCCGGAGCATGCAAAAGAGCAAAATGTGAATGACTTTTTTCAACAGATTGA
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 AACCTGGGAGAGTAACCTGTTTCCACCAAAACCAAGTCAACAAAGTGTGTACCAACACATTGGCAGTAGAC
 CATGGGTAAGAGGCCAAAGCGGCAGGATTAGCTTCTATTGGACAATTTGTGGAGCCAGGAGACCTTCATAGT
 CTTCAACACCATAGGGAATTTAATTGCTCCGAGAGTCAATACAGCTTAACAGTCAAAAAGAGAGCACA
 ATTCTGAATACTGCAATTCCCATAGGATCTTGTGTAGTAAATGTCAACAGATAGGGGTTCAATCTCTA
 CAACCAAAACCCTTTCAGAACATCTCAAGAAATATCAATTGGGGACTGTCCCAAGTATGTCAAAACAGGGATC
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Figure 11

SEQ ID NO. 5.**subtype H5**

>BHB950029|gb:AF501235|Symbol:HA|Name:hemagglutinin|Organism:Influenza A Virus
A/duck/Shanghai/1/2000|Segment:4|Subtype:H5|Host:Avian

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CATACTGGAAAAGACACACAACGGGAAACTCTGCGATCTAGATGGAGTGAAGCCTCTAATTTTGAGAGAT
TGTAAGTGTAGCTGGATGGCTCCTCGGAAACCTATGTGTGACGAATTCATCAATGTGCCGAATGGTCTT
ACATAGTGGAGAAGGCCAGTCCAGCCAATGACCTCTGTTACCCAGGGGATTTCACGACTATGAAGAACT
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CATGAAGCCTCATCAGGGGTGAGCGCAGCATGTCCATACCATGGGAAGCCCTCCTTTTTCAGAAATGTGG
TATGGCTTATCAAAAAGAACAGTGCATACCCAACAATAAAGAGGAGCTACAATAATACCAACCAAGAAGA
TCTTTTGGTACTGTGGGGGATTACCATCCTAATGATGCGGCAGAGCAGACAAAGCTCTATCAAAACCCA
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TTCTGGTTCTCATGGAAATGAGAGAACTCTAGACTTTCATGATTCAAATGTCAAGAACCTTTACAACAA
GGTCCGACTACAGCTTAGGGATAATGCAAAGGAGCTGGGTAATGGTTGTTTCGAGTTCTATCACAAATGT
GATAATGAATGTATGGAAAGTGTAAAAACGGGACGTATGACTACCCGAGTATTCAGAAGAAGCAAGAC
TAAACAGAGAGGAAATAAGTGGAGTAAATTTGGAATCAATGGGAACCTTACCAAATACTGTCAATTTATTC
AACAGTGGCGAGTTCCTAGCACTGGCAATCATGGTAGCTGGTCTATCTTTATGGATGTGCTCCAATGGG
TCGTTACAATGCAGAATTTGCATTTAA

Figure 12

SEQ ID NO. 6.
 subtype H6
 >BHB1049778|gb:DQ021667|Symbol:HA|Name:hemagglutinin|Organism:Influenza A Virus
 A/northern pintail/TX/828189/02|Segment:4|Subtype:H6|Host:Avian

ATGATTGCAATCATTTGTAATAGCGATACTGGCAGCAGCCGGAAAGTCAGACACAAGATCTGCATTTGGGTATC
 ATGCCAACAAATTCACAACACACAGGTGGATACGATACCTTGAGAGAATGTAAACCGTCACACACTCAGTTGA
 ATTGCTGGAGAAATCAGAAAGGAAGAAAGATTCTGCAAGATCTTGAACAAGGCCCTCTCGACCTAAAGGGA
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 GCCAATCCTCTATTTCTGGGGTGTGCACCATCCTCCTGCACCAATGAGCAAAATACTCTGTATGGCTCT
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 CCGCTGTGAATGCCAAAGAGGTGCAATTGATTATTACTGGTCTGTTTAAACCAGGAGAAACCTTGAA
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 GGACCAATAAAACATTTTCAGAAATGTGAGCCCTCTGTGGATAGGAGAAATGCCCCAAGTATGTGAAAAGTGA
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Figure 13

SEQ ID NO. 7.
subtype H7

>BHB940420|gb:AF071776|Symbol:HA|Name:hemagglutinin precursor|Organism:Influenza A
Virus A/chicken/New York/1995|Chromosome:4|Subtype:H7|Host:Avian

GACAAATATATGCTTTGGGCACCATGCTGTGGCAATGGAAACAAAAGTGAACACATTAAACAGAGAGGGGA
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GAGTTTACTCTGATTTGATAATTGAGCGAAGAGAACCCGATGTGTGCTATCCCGGTAAATTCACAA
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CGGCCACAAGTGAATGGACAAATCAGGGAGAAATCGATTTTCACTGGCTACTCCTTGATCCCAATGACACAG
TGACCTTCACTTTCAATGGGGCATTCATAGCCCTGACAGGGCAAGTTTCTTTAGAGGAGAAATCACTAGG
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AGTTCCCTGCCATTCACAAACATCAACCCTAGAACTGTGGGAGATGCCCTCGGTATGTCAACACAGACAA
GCCCTCCTTTTGGCTACAGGAATGAGAAATGTTCCAGAGAAATCCAAAGCCAGAGGCCCTTTTGGAGCAAT
TGCTGGATTCATAGAGAAATGGATGGGAGGTCTCATCGATGATGGTATGGTTTCAGACATCAAAATGCA
CAAGGGGAAGGAACAGCTGACTACAAAGCAGCCCAATCTGCAATAGATCAGATCAGAGCAAAATTTGA
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AATAGGAAATGTCTAATTTGGACACGAGACGCAATGACTGAGGTATGTTGCTGTAATGCTGAGCTGTTG
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GTGCACCATTTGATATAA

Figure 14

SEQ ID NO. 8.**subtype H8**

>gi|221317|dbj|D90304.1|FLAH8N4 Influenza A virus
(A/Turkey/Ontario/6118/68(H8N4)) gene for hemagglutinin precursor, complete
cds

ATGGA AAAAATTCATCGCAATAGCAACCTTGGCGAGCACAAATGCATACGATAGGATATGCATTGGGTACC
AATCAACAACCTCCACAGACACAGTGAACACTCTCATAGAACAGAATGTACCAGTCACCCAAACAATGGA
GCTCGTGGAAACAGAGAAACATCCCGCTTATTGTAACTGATTTAGGTGCCCCATTGGAAGTGGGAGAC
TGCAAGATTGAGGCAGTAATCTATGGGAACCCCAAGTGTGACATCCATCTGAAGGATCAAGGTTGGTCAT
ACATAGTGGAGAGGCCAGCGCACCAGAAGGGATGTGTTACCCTGGATCTGTGGAAAATCTAGAAGAACT
GAGGTTTGTCTTCTCCAGTGTGCATCTTACAAGAGAATAAGACTATTTGACTATTCCAGGTGGAATGTG
ACTAGATCTGGAACGAGTAAAGCATGCAATGCATCAACAGGTGGCCAATCCTTCTATAGGAGCATCAATT
GGTTGACCAAAAAGGAACAGACACTTATGACTTCAATGAAGGAGCTTATGTTAATAATGAAGATGGAGA
CATCATTTTCTTATGGGGATCCATCATCCGCCGACACAAAAGAGCAGACAACACTATATAAAAATGCA
AACACTTTGAGTAGTGTACTACTAACAATAAACAAGGCTTTCAACCAAATATTGGTCCCAGACCAT
TAGTAAGAGGACAGCAAGGGAGGATGGATTACTATTGGGGCATTCTGAAAAGAGGGGAGACTCTGAAGAT
CAGGACCAACGGAAATTTAATCGCACCTGAATTTGGCTATCTGCTCAAAGGTGAAAGCTACGGCAGAATA
ATTCAAAATGAGGATATACCCATCGGGAAGTGTAAACACAAAATGTCAAACATATGCGGGAGCAATCAATA
GCAGCAAACCCCTTTCAGAATGCAAGTAGGCATTACATGGGAGAATGTCCCAAATATGTGAAGAAGGCAAG
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TATAGTTGACAAGATGAACAGGGAGTTTGAAGTTGTGAATCATGAGTTCTCTGAAGTTGAAAAAGAATA
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TCTTAGAGAACCAAGAAAACGCTAGACGAACATGATTCCAATGTCAAAAACCTTTTGTATGAAGTGAAGAG
GAGACTGTCAGCCAATGCAATAGATGCTGGGAACGGTTGCTTTGACATACTTCACAAATGCGACAATGAG
TGTATGGAACTATAAAGAACGGAACCTTACGATCATAAGGAATATGAAGAGGAGGCTAAACTAGAAAGGA
GCAAGATAAATGGAGTAAACTAGAAAGAGAACACCACTTACAAAATCTTAGCATTACAGTACAGTGGC
GGCCAGTCTTTGCTTGGCAATCCTGATTGCTGGAGGTTTAATCCTGGGCATGCAAAATGGATCTTGTAGA
TGCATGTTCTGTATTTGA

Figure 15

SEQ ID NO. 9.**subtype H9**

>BHB954830|gb:AM087218|Symbol:HA|Name:hemagglutinin|Organism:Influenza A Virus
A/shoveler/Iran/G54/03|Segment:4|Subtype:H9|Host:Avian

ATGGAAACAGTATCACTAATGACTATACTACTAGTAGCAACAGCAAGCAATGCAGACAAAATCTGCATCG
GCCACCAGTCAACAACTCCACAGAACTGTGGACACGCTAACAGAAACCAATGTTCTGTGACACATGC
CAAAGAATTGCTCCACACAGAGCACAAATGGAATGCTGTGTGCAACAAATCTGGGACATCCCCTAATCTTA
GACACGTGCACTATTGAAGGACTGATCTATGGTAACCCCTTCTGTGACTTGCTGTTGGGAGGAAGAGAAT
GGTCTACATCGTCGAAAGGTCATCAGCTGTAAATGGAACGTGTTACCCTGGGAATGTAGAGAACCCTAGA
GGAACTCAGGACACTTTTTAGTTCGGCTAGTTCCTACCGAAGAATCCAAATCTTCCCAGACACAATCTGG
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GTGGGGCATAATCACCACCCACTGAAGCTGCACAGACAAATTTGTACACAAGAACCGACACAACAACA
AGCGTGACAACAGAAGACTTAAATAGGATCTTCAAACCGATGGTAGGGCCAAGGCCCTTGTCATATGGTC
TGCAGGGAAGAATTAATTATTATTGGTTCGGTACTAAAACCGAGCCAGACACTGCGAGTAAGATCCAATGG
GAATCTAATTGCTCCATGGTATGGACACATTCTTTCGGGAGGGAGCCATGGAAGAATCCTGAAGACTGAT
TTAAAAAGTAGTAATTGCGTAGTGCAATGTCAGACTGAAAAAGGCGGCTTAAACAGTACATTGCCGTTCC
ACAATATCAGTAAATATGCATTTGGAACTGTCCCAAATATGTTAGAGTTAAAGTCTCAAACCTGGCAGT
AGGGTTGAGGAACGTGCCTGCTAGATCAAGTAGAGGACTATTCCGAGCCATAGCTGGATTATAGAAGGA
GGTTGGCCAGGACTAGTCGCTGGTGGTATGGTTTCCAGCATTCAAATGATCAAGGGGTTGGTATTGCGG
CAGATAGGGATTCAACTCAAAGGCAATTGATAGAATAACAACCAAGGTGAATAATATAGTCGACAAAAT
GAACAAACAATATGAAATAATTGATCATGAATTCAGTGAGGTTGAACTAGGCTCAACATGATCAATAAT
AAGATTGATGACCAAATACAAGACATATGGGCATATAATGCAGAGTTGCTAGTACTACTTGAAAACCAGA
AAACACTCGATGAGCATGACGCAAATGTGAAGA

Figure 16

SEQ ID NO. 10.
subtype H10

>gi|324365|gb|M21647.1|FLAMS84HA Influenza A virus
(A/chicken/Germany/N/1949 (H10N7)) hemagglutinin precursor, gene,
complete cds

AGCAAAAGCAGGGGTCAATGTACAAAGTAGTAGTAATAATGCGCTCCTTGGAGCAGTGAAAGGTCTT
GACAGAATCTGCCCTAGGACACCATGCGGTGGCCAAATGGAACCATTTGTGAAGACCTTTACAAATGAACAAG
AGGAAGTGACCAATGCTACTGAGACGGTAGAGAGCACAATTTGAATMAATTTGTGTATGAAAGCAAGAAG
CTACAAGGACTTGGGCAATGTACACCGGTAGGAATGTTGATAGGAACACCTGTTTGTGATCCGCACCTTG
ACCGGACCTGGGACACTCTCATTTGAGCGAGAGAATGCCATTTGCCACTGTTTATCCAGGGGCAACCATAA
ATGAAGAAGCAATTGAGCAGAAAATAATGGAAGTGGAGGAATCAGCAAGATGAGCACTGGCTTCACCTTA
TGGGTCTTCCATCACTCAGCTGGGACCACTAAGGCATGCATGAGAAATGGAGGAGATAGTTTCTATGCA
GAGCTCAATGGCTAGTGTCAAAGACAAAGGGACAAAATTTCCCTCAGACAAACACCTATCGGAATA
CGGACACAGCAGAACATCTCATATAATGSGGAATTCATCACCTTCCAGCACACAGGAAAAGAAATGACTT
ATACGGAATCAGTCACTATCTATATCATGTTGAGAGTTCTACATATCAGAACAACTTTGTTCCAGTTGTT
GGGCAAGACCTCAGGTCAATGGACAAAGTGGGGAATTGACTTTCATGGACACTAGTACAGCCGGGTG
ACAACATACTTCTCAGACAAATGGAGGTCTAATAGCACCAAGTCGAGTTAGCAAAATTAACCTGGAAGGGA
TTTGGGAATCCAAATCAGAAAGCGTTGATAGACAAACAGTTGTGAATCCAAATGCTTTTGGAGAGGGGTTCT
ATAATACAAAGTCCCTTTTCAAAATCTGTACCCAGAACAGTAGTCAATGCCCCAAATACGTAAATC
AGAGAGTTTACTGCTTGCAACASGGATGAGGAATGTGCCAGAAGTGGTGCAGGGAAGGGTCTGTTTGG
TGCAATAGCAGGGTTCATAGAAAACGGATGGGAAGGAATGGTAGACGGCTGGTATGGTTTCAGACACCAA
AATGCCAGGGCACAGGCCAAGCTGCTGATTACAGAGTACTCAAGCAGCTATTGACCAAAATCACAGGGA
AACTGAACAAGTTGAGAAAGACCAACACTGAGTTTGAGTCAATAGAACTGAAATTCAGTGAGACTGA
GCATCAAAATGGTAACTGTCATTAATTTGGACCAAGATTCAAATACCGACATTTGGACTTACACCGCAGAG
CTATTAGTGGCAATGGAGAAATCAGCACACAATTTGACATGGCTGANTCAGAGATGCTAAATCTGTATGAA
GGTAAAGAAAGCAACTCAGACAGAAATGCAGAAAGAGACGGAAAGGATGTTTTCAGATATATCATACCTTG
TGATGATTCGTGCATGGAGAGTATAAGGAACAATACTTATGACCAATTCACAAATCAGAGAGGAGGCTCTT
CTGAATAGACTGAACATCAACCACTGAACTTTCTTCGGGGTACAAAGACATCATCTTTGTTTGTAGCT
TCGSGGAATCATGCTTGTCTTCTAGCCGTTGTTATGGGTCTTGTCTTCTTCTGCTGAAAAAATGGAAA
CATGCGATGCACAAATCTGTATTTAGTTTAAAAACACCTTGTCTTCTACT

Figure 17

SEQ ID NO. 11.
subtype H11

>gi|221307|dbj|D90306.1|FLA/HAH1N Influenza A virus (A/duck/England/56(H1N6)) gene for hemagglutinin precursor, complete cds

ATGGAGAAAAACACCTGCTATTTGTCAGCTATTTTCCTIIIGTGTGAAAGCAGATGAGATCTGTATCGGGTATT
 TAAGCAACAACACTCGACAGACAAAGTTGACACAATAATTTGAGAACAAATGTCACGGTCACCTAGCTCAGTGGAA
 ACTGGTTGAGACAGAACACACTGGATCATTCIGTTCAATCAATGGAATAACCAATTAAGCCCTTGGAGAT
 TGTTCATTTGCTGGATGGATATTAGGAACCCCTATGTTGATGAACTAATTTGAAAGACTTCATGGTCTT
 ACATTTGTGGAATAACCCCAATCCAACAATGGAATCTGTTACCCAGGAACTTTAGAGAGTGAAGAAGAACT
 AAGACTGAAATTCAGTGGAGTTTGTAGAATTTAACAATTCGAAGTATTCACATCAAAATGGATGGGTGCT
 GTAAATTCAGGAGTAGGAGTAACCGCTGCATGCAAAATTCGGGGTTCATAATCTTTTCGAAACATGG
 TATGGCTGATACACCAATCAGGAACATATCCTGTATAAAGAGAACCCTTAACAACACCAAGGGAGAGA
 TGTACTGATTTGTTGGGAATTCATCATCCIGTACACTGACAGAACATCAAGATCTGTATAAAAGGAC
 AGCTCCTATGTAGCAGTGGTTTCAGAGACCTACAACAGAGATTCACTCCAGAAATCAACACTAGGCCCA
 GAGTCAATGGACAGGCCGGAACGATGACATTCCTACTGGAAGATAGTCAAAACAGGAGAAATCAATAACATT
 CGAATCTAATGGGGCGTTCCTAGCTCCTAGATAATGCTCTACCAAAATGTCAAAACAGAPATAGGAGGAATTAATACGA
 TTCAGGAGCGAACTGAACATTTGAATCATGCTCTACCAAAATGTCAAAACAGAPATAGGAGGAATTAATACGA
 ACAAAAGCTTCCACAATGTTCAACAGAAACACIATCGGGGATTCGCCCAAGTATGTGAATGTCAAAATCCTT
 AAAGCTTGCAACAGGACCTAGAAATGTCCAGCAATAGCATCGAGAGGCTTGTGGAGCAATAGCTGGA
 TTCATAGAAGGGGATGGCTGGACTGATCAATGGATGGTATGGTTCCAAACACAGGACGAAGAAGAA
 CAGGCATTCAGCAGACAAAGGAGTCRACTCAAAAGGCAATAGACCAGATAACATCCAAGGTAAATAACAT
 CGTTGACAGGATGAATACAACTTTGAGTCTGTGCAACACGAATTCAGTGAATAGAGGAAAGAAATAAT
 CAATTATCAAAACACGTAGATGATTCGTGGTTGACATCTGGTCATATAATGCACAGCTTCTCGTTTAC
 TTGAAAATGAGAAGACACTGGACCTCCATGACTCAAAATGTCAAGGAACCTCCATGAGAAAAGTCAGAAGAAT
 GCTAAAGGACAAATGCCAAAGATGAGGGGAACGGATGCTTCACTTTTACCATAAGTGTGACAAATAAATGC
 ATTGAACGAGTTAGAAACGGAACATAATGATCATAAAGAAATTCAGGAGGAATCAAAATCAATCGCCAGG
 AGATTGAAGGGTGAACCTAGATTCTAGTGGGAATGTATAAATACTGTCAATTTACAGCTGCATTGC
 AAGCAGTCTTTGATTGGCAGCACTCATCATGGGCTTCATGTTTGGGCATGCAGTAATGGATCATGTAGA
 TGTACCAATTTGCATTAG

Figure 18

SEQ ID NO. 12.**subtype H12**

>gi|221309|dbj|D90307.1|FLAHAH12N Influenza A virus (A/duck/Alberta/60/76(H12N5)) gene for hemagglutinin precursor, complete cds

ATGGAAAAATTCATCATTTTGAGTACTGTCTTGGCAGCAAGCTTTGCATATGACAAAATTTGCATTGGAT
ACCAAACAAACAACCTCGACTGAAACGGTAAACACACTAAGTGAACAAAACGTTCCGGTGACGCAGGTGGA
AGAACTTGATACATCGTGGGATTGATCCGATCCTGTGTGGAACGGAAC TAGGATCACCCTAGTGCTTGAT
GACTGTTTCATTAGAGGGTCTAATCCTAGGCAATCCCAAATGTGATCTTTATTGTAATGGCAGGGAATGGT
CATACATAGTAGAGAGGCCCAAAGAGATGGAAGGAGTTTGCTATCCAGGGTCAATTGAAAACCAGGAAGA
GCTAAGATCTCTGTTTCTTCCATCAAAAAATATGAAAGAGTGAAGATGTTTGATTTCACCAAATGGAAT
GTCACATACACTGGGACCAGCAAGGCCTGCAATAATACATCAAACCAAGGCTCATTCTATAGGAGCATGA
GATGGTTGACCTTAAATCAGGACAATTTCCAGTCCAAACAGATGAGTACAAGAACACCAGAGATTGAGA
CATTGTATTACCTGGGCCATTACCAACCCACCAACATCTGATGAACAAGTAAATTTATACAAAAATCCT
GATACTCTCTCTTCAGTCACCAACCGTAGAAATCAATAGGAGCTTCAAGCCTAATATAGGGCCAAGACCAC
TCGTGAGAGGACAACAAGGGAGAATGGATTACTACTGGGCTGTTCTTAAACCTGGACAAACAGTCAAAAT
ACAAACCAATGGTAATCTTATTGCACCTGAATATGGTCACTTAATCACAGGGAAATCACATGSCAGGATA
CTCAAGAATAATTTGCCCATGGGACAGTGTGTGACTGAATGTCAATTGAACGAGGGTGTAAATGAACACAA
GCAACCTTTCCAGAACACTAGTAAGCACTATATTGGGAAATGCCCCAAATACATACCATCAGGGAGTTT
AAAATTGGCAATAGGGCTCAGGAATGTCCACAAAGTTCAAGATCGGGGGCTCTTTGGAGCAATTGCAGGT
TTCATAGAAGGCGGATGGCCAGGGCTAGTGGCTGGTTGGTACGGATTTGAGCATCAAAATGCGGAGGGGA
CAGGCATAGCTGCAGACAGAGACAGCACCCAAAGGGCAATAGACAATATGCAAAACAACTCAACAATGT
CATCGACAAAATGAATAAACAATTTGAAGTGGTGAATCATGAGTTTTCAGAAGTGGAAGCAGAATAAAC
ATGATTAATTCCAAAATTGATGATCAGATAACTGACATATGGGCATACAATGCTGAATTGCTTGCTCTAT
TGGAAAATCAGAAGACATTAGATGAGCATGACGCTAATGTAAGGAATCTACATGATCGGGTCAGAAGACT
CCTGAGGGAAAATGCAATTGACACAGGAGACGGCTGCTTTGAGATTTTACATAAATGTGACACAAATTGT
ATGGACACGATTAGAAACGGGACATACAATCACAAAGAGTATGAGGAAGAAAGCAAAATCGAACGACAGA
AAGTCAATGGTGTGAACTTGAGGAGAATTCTACATATAAAATTCTGAGCATCTACAGCAGTGTTCCTC
AAGCITAGTTCTACTGCTCATGATTATTGGGGTTTCATTTTCGGGTGTCAAAATGGAAATGTTCTGTGT
ACTTTCTGTATTTAA

Figure 19

SEQ ID NO. 13.**subtype H13**

```
>gi|221311|dbj|D90308.1|FLAH13N Influenza A virus  
(A/Gull/Maryland/704/77(H13N6)) gene for hemagglutinin precursor, complete cds  
ATGGCTCTAAATGTCATTGCAACTTTGACACTTATAAGTGTATGTGTACATGCAGACAGAATATGCGGTGG  
GGTATCTGAGCACCAATTCATCAGAAAGGGTCGACACGCTCCTTGAAAATGGGGTCCCAGTCACCAGCTC  
CATTGATCTGATTGAGACAAACCACACAGGAACATACTGTTCTCTAAATGGAGTCAGTCCAGTGCATTTG  
GGAGATTGCAGCTTTGAAGGATGGATTGTAGGAAACCCAGCCTGCACCAGCAACTTTGGGATCAGAGAGT  
GGTCATACCTGATTGAGGACCCCGCGCCCCCTCATGGGCTTTGCTACCCTGGAGAATTAAACAACAATGG  
TGAATCAGACACTTGTTCAGTGAATCAGGTCATTAGTAGAACGGAATTGATCCACCTACCTCCTGG  
GGGGAAGTACTTGACGGTACAACATCTGCTTGCAGAGATAACACGGGAACCAACAGCTTCTATCGAAATT  
TAGTTTGGTTTATAAAGAAGAATACTAGATATCCAGTTATCAGTAAGACCTACAACAATACAACGGGAAG  
GGATGTTTTAGTTTTATGGGGAATACATACCCAGTGTCTGTGGATGAGACAAAGACTCTGTATGTCAAT  
AGTGATCCATACACACTGGTTTCCACCAAGTCTTGGAGCGAGAAATATAAACTAGAAACGGGAGTCCGAC  
CTGGCTATAATGGACAGAGGAGCTGGATGAAAATTTATTGGTCTTTGATACATCCAGGGGAGATGATTAC  
TTTCGAGAGTAATGGTGGATTTTTCAGCCCCAAGATATGGGTACATAATTGAAGAATATGGAAAAGGAAGG  
ATTTTCCAGAGTCGCATCAGAAATGTCTAGGTGCAACACCAAGTGCCAGACTTCGGTTGGAGGGATAAACA  
CAAACAGAACGTTCCAAAACATCGATAAGAATGCTCTTGGTGACTGTCCCAAATACATAAACTCTGCCCCA  
ACTCAAGCTAGCCACTGGACTCAGAAATGTGCCAGCTATATCGAATAGAGGATTGTTCCGAGCAATTGCA  
GGGTTCATAGAAGGAGGCTGGCCAGGTTTAATCAATGGTTGGTACGGTTTTTCAGCATCAAAATGAACAGG  
GAACAGGAATAGCTGCAGACAAAGAATCAACACAGAAAGCTATAGACCAGATAACAACCAAAATAAATAA  
CATTATTGATAAAATGAATGGGAATATGATTCAATTAGGGGTGAATTCAATCAAGTTGAGAAGCGTATA  
AACATGCTTGCAGACAGAATAGATGATGCCGTGACGGACATTTGGTCATACAATGCCAAACTTCTTGAT  
TGCTGCAAAATGATAAACTTTAGATATGCATGATGCTAATGTAAAGAATTTACATGAGCAAGTACGAAG  
AGAATGAAGGACAATGCAATTGACGAAGGAAATGGCTGTTTTGAACTCCTTCATAAATGCAATGACTCC  
TGATGGAAACTATAAGAAATGGAACGTATGACCACACTGAGTATGCAGAGGAGTCAAAGTTAAAGAGGC  
AAGAAATCGATGGGATCAAATCAAATCAGAAGACAACGTTTACAAAGCATTATCAATATACAGTTGCAT  
TGCAAGTAGTGTGTACTAGTAGGACTCATACTCTCTTTCATCATGTGGGCCTGTAGTAGTGGGAATTGC  
CGATTCAATGTTTGTATATAA
```

Figure 20

SEQ ID NO. 14.**subtype H14**

>gi|324045|gb|M35997.1|FLAH1424 Influenza A/Mallard/Gurjev/263/82
hemagglutinin subtype H14 gene

AGCAAAAGCAGGGGAAAATGATTGCACTCATATTGGTTGCACTGGCTCTGAGCCACACTGCTTATTCTCA
GATCACAATGGGACAACAGGAAACCCATTATATGCTTGGGGCATCATGCAGTGGAAAACGGCACATCT
GTTAAAACACTAACAGACAATCAGTAGAAGTTGTGTGCTAGCTAAAGAATTAGTTGAGACGAACCACACTG
ATGAACTGTGCCAAGCCCCTTGAAGCTTGTGACGGGCAAGACTGCCACCTCATCAATGGTGCATTGGG
GAGTCCAGGCTGTGACCGTTTGCAGGACACCACTTGGGATGTCTTCATTGAAAGGCCCACTGCAGTAGAC
ACATGTTATCCATTGACGTCCCAGATTACCAGAGTCTCAGAAGCATCCTAGCAAGCAGTGGGAGTTTGG
AGTTCATCGCCGAACAATTCACCTGGAATGGTGTCAAAGTTGACGGATCAAGCAGTGTCTGTTTGAGGGG
CGGTCGCAACAGCTTCTTCTCCCGACTAACTGGCTAACCAAAGCAACAAATGGAACTATGGACCTATT
AACGTCCTAAAGAAAATACGGGCTCTTATGTGACGGCTCTATCTCTGGGGAGTGCATCACCCATCAAGCG
ATAATGAGCAAACGGATCTCTACAAGGTGGCAACAGGGAGAGTAACAGTATCTACCCGCTCGGACCAAAT
CAGTATTGTTCCCAATATAGGAAGTAGACCGAGGGTAAGGAATCAGAGCGGCAGGATAAGCATCTACTGG
ACCCTAGTAACCCAGGGGACTCCATCATTTTCAACAGTATTGGGAATTTGATTGCACCAAGAGGCCACT
ACAAAATAAGCAAATCTACTAAGAGCACAGTGTCTTAAAGTGACAAAAGGATTGGGTGATGCACAAGCCC
TTGCTTAACTGATAAAGGTTGATCCAAAGTGACAAACCTTTTCAGAATGTATCAAGGATTGCTATAGGA
AACTGCCCCGAAATATGTAAAGCAAGGGTCCCTGATGTTAGCAACTGGAATGCGCAACATCCCTGGCAAAC
AGGCAAAGGGCTTATTTGGGGCAATTGCTGGATTCAATTGAAAATGGTTGGCAAGGCCTGATTGATGGGTG
GTATGGATTGAGGCACCAAAATGCTGAAGGAACAGGAACTGCTGCAGACCTGAAGTCAACTCAGGCAGCC
ATTGATCAGATAAATGGCAAGCTGAACAGATTGATAGAGAAGACAAATGAAAATATCACCAAATAGAAA
AGGAATTGCAACAGGTGGAAGGAAGAATACAAGACCTTGAGAAGTACGTTGAGGACACTAAGATTGATTT
GTGGTCATACAATGCTGAATTGCTAGTAGCACTAGAGAATCAGCACACAATAGATGTCACAGACTCCGAA
ATGAACAAGCTTTTTGAAAGAGTAAGAAGGCAATTAAGAGAGAATGCAGAAGATCAAGGCAACGGTTGTT
TCGAGATATTCCATCAGTGTGACAACAATTGTATAGAAAGCATTAGAAACGGAACCTTATGACCACAACAT
CTACAGGGATGAAGCCATCAACAATCGAATCAAAATAAATCCTGTCACTTTGACGATGGGGTACAAGGAC
ATAATCCTGTGGATTCTTTCTCCATGTCATGCTTTGTCTTCGTGGCACTGATTCTGGGATTTGTTCTAT
GGGCTTGTCAAACGGGAATATCCGATGCCAAATCTGTATATAAAGAAAAACACCCCTGTTTCTACTC

Figure 21

SEQ ID NO. 15.**subtype H15**

>gi|1226068|gb|L43916.1|FLAHEMAC Influenza A/duck/Australia/341/83 (H15N8) hemagglutinin mRNA, complete cds

AGCAAAAGCAGGGGATACAAAATGAACACTCAAATCATCGTCATTCTAGTCCTCGGACTGTCGATGGTGA
GATCTGACAAGATTTGTCTCGGGCACCATGCCGTAGCAAATGGGACAAAAGTCAACACACTAACTGAGAA
AGGAGTGGAAGTGGTCAATGCCACGGAGACAGTGGAGATTACAGGAATAAATAAAGTGTGCACAAAAGGG
AAGAAAGCGGTGGACTTGGGATCTTGTGGAATACTGGGAACTATCATTGGGCCTCCACAATGTGACTCTC
ATCTTAAATTCAAAGCTGATCTGATAATAGAAAAGAAGAAATTCAAGTGACATCTGTTACCCAGGGAAATT
CACTAATGAGCAAGCACTGAGACAAATAATCAGAGAATCTGGTGGAAATTGACAAAGAGCCAAATGGGATTT
AGATATTGAGGAATAAAACAGACGGGGCAACCACTGCGTGTAAAGAGAACAGTGTCTCTTTCTACTCAG
AAATGAAATGGCTTTTATCCAGCAAGGCTAACCAAGTGTTCACCAACTGAATCAGACATACAGGAACAA
CAGAAAAGAACCAGCCCTAATTGTTTGGGGAGTACATCATTCAAGTTCCTTGGATGAGCAAAATAAGCTA
TATGGAGCTGGGAACAAGCTGATAACAGTAGGAAGCTCAAAATACCAACAATCGTTTTCACCAAGTCCAG
GGGACAGGCCCAAAGTGAATGGTCAGGCCGGGAGGATCGACTTTCATTGGATGCTATTGGACCCAGGGGA
TACAGTCACTTTACCTTCAATGGTGCATTATAGCCCCAGATAGAGCCACCTTTCTCCGCTCTAATGCC
CCATCGGGAGTTGAGTACAATGGGAAGTCACTGGGAATACAGAGTGATGCACAAATTGATGAATCATGTG
AAGGGGAATGCTTCTACAGTGGAGGGACAATAAACAGCCCTTTGCCATTTCAAACATCGATAGTTGGGC
TGTCGGAAGGTGCCCCAGATATGTAAAGCAATCAAGCCTGCCGCTGGCCTTAGGAATGAAAAATGTACCA
GAGAAAATACATACTAGGGGACTGTTCCGGTGCAATTGCAGGATTCATCGAGAATGGATGGGAAGGACTCA
TTGATGGATGGTATGGATTTAGGCATCAAAATGCACAGGGGCAGGGAACAGCTGCTGACTACAAGAGTAC
TCAGGCTGCAATTGACCAGATAACAGGGAACTTAATAGATTAATTGAAAAAACCAACACAGTTTGAA
CTCATAGACAATGAGTTCAGTGAAGTGGAGCAGCAGATAGGCAATGTAATAAACTGGACAAGGGACTCCT
TGACTGAGATCTGGTCATACAATGCTGAACCTTCTAGTAGCAATGGAAAATCAGCATACAATTGACCTTGC
AGATTCTGAAATGAACAACTCTATGAGAGAGTGAGAAGACAGCTAAGGGAGAATGCCGAGGAGGATGGA
ACTGGATGTTTTGAGATTTTCCACCGATGTGACGATCAATGTATGGAGAGCATACGAAATAATACTTACA
ATCACACTGAATATCGACAGGAAGCCTTACAGAATAGGATAATGATCAATCCGGTAAAGCTTAGTGGTGG
GTACAAAGATGTGATACTATGGTTTAGCTTCGGGGCATCATGTGTAATGCTTCTAGCCATTGCTATGGGT
CTTATTTTCATGTGTGTGAAAAACGGGAATCTGCGGTGCACTATCTGTATATAATTATTTGAAAAACACC
CTTGTTTCTACT

Figure 22

SEQ ID NO. 16.**subtype H16**

>gi|56425020|gb|AY684891.1| Influenza A virus (A/black-headed gull/Sweden/5/99(H16N3)) hemagglutinin (HA) gene, complete cds

AGCAAAAGCAGGGGATATTGTCAAAACAACAGAATGGTGATCAAAGTGCTCTACTTTCTCATCGTATTGT
TAAGTAGGTATTCGAAAGCAGACAAAATATGCATAGGATATCTAAGCAACAACGCCACAGACACAGTAGA
CACACTGACAGAGAACGGAGTTCCAGTGACCAGCTCAGTTGATCTCGTTGAAACAAACCACACAGGAACA
TACTGCTCACTGAATGGAATCAGCCCAATTCATCTTGGTGACTGCAGCTTTGAGGGATGGATCGTAGGAA
ACCCCTTCCTGTGCCACCAACATCAACATCAGAGAGTGGTCTGATCTAAITGAGGACCCCAATGCCCCAA
CAAACCTCTGCTTCCCAGGAGAGTTAGATAATAATGGAGAATTACGACATCTCTCAGCGGAGTGAACTCT
TTTAGCAGAACAGAATTAATAAGTCCCAACAAATGGGGAGACATTCTGGATGAGAGTCACCGCTTCTTGCC
GCGATAATGGGGCAAGCAGTTTTTACAGAAATTTGGTCTGGATAGTGAAGAATAAAAATGGAAAATACCC
TGTCATAAAGGGGGATTACAATAACACAACAGGCAGAGATGTTCTAGTACTCTGGGGCATTCACCATCCG
GATACAGAAACAACAGCCATAAACTTGTACGCAAGCAAAAACCCCTACACATTAGTATCAACAAAGGAAT
GGAGCAAAAGATATGAACTAGAAATTGGCACCAGAATAGGTGATGGACAGAGAAGTTGGATGAAACTATA
TTGGCACCTCATGCGCCCTGGAGAGAGGATAATGTTTGAAAGCAACGGGGGCCCTTATAGCGCCAGATAC
GGATACATCATTGAGAAGTACGGTACAGGACGAATTTTCCAAAGTGGAGTGAGAATGGCCAAATGCAACA
CAAAGTGTCAAACATCATTAGGTGGGATAAACACCAACAAAACCTTTCCAAAACATAGAGAGAAATGCTCT
TGGAGATTGCCCAAAGTACATAAAGTCTGGACAGCTGAAGCTTGCAACTGGGCTGAGAAATGTCCCATCC
GTTGGTGAAAGAGGTTTGTGTTGGTGCAATTGCAGGCTTCATAGAAGGAGGGTGGCCTGGGCTAATTAATG
GATGGTATGGTTTCCAGCATCAGAATGAACAGGGGACTGGCATTGCTGCAGACAAAGCCTCCACTCAGAA
AGCGATAGATGAAATAACAACAAAAATTAACAATATAATAGAGAAGATGAACGGAAACTATGATTCAATA
AGAGGGGAATTCAATCAAGTAGAAAAGAGGATCAACATGCTCGCTGATCGACTGATGATGCAGTAACTG
ACATATGGTTCGTACAATGCTAAACTTCTTGTACTGCTTGAAAATGGGAGAACATTGGACTTACACGACGC
AAATGTCAGGAACTTACACGATCAGGTCAAGAGAATATTGAAAAGTAATGCTATTGATGAAGGAGATGGT
TGCTTCAATCTTCTTCACAAATGTAATGACTCATGCATGGAACTATTAGAAATGGGACCTACAATCATG
AAGATTACAGGGAAGAATCACAACTGAAAAGGCAGGAAATTGAGGGAATAAAATTGAAGTCTGAAGACAA
TGTGTATAAAGTACTGTCGATTTATAGCTGCATTGCAAGCAGTATTGTGCTGGTAGGTCTCATACTTGCG
TTCATAATGTGGGCATGCAGCAATGGAAATTGCCGGTTTAATGTTTGTATATAGTCGGAAAAAATACCC
TGTTTCTACT

Figure 23

SEQ ID NO. 17.

Sequence "wild type"660

GATCAGATTTGCATTGGTTACCATGCAAACAATTCAACAGAGCAGGTTGACACAATCATGGAA
AAGAACGTTACTGTTACACATGCCCAAGACATACTGGAAAAGACACACAACGGGAAGCTCTGC
GATCTAGATGGAGTGAAGCCTCTAATTTTAAGAGATTGTAGTGTAGCTGGATGGCTCCTCGGG
AACCCAATGTGTGACGAATTCATCAATGTACCGGAATGGTCTTACATAGTGGAGAAGGCCAAT
CCAACCAATGACCTCTGTTACCCAGGGAGTTTCAACGACTATGAAGAACTGAAACACCTATTG
AGCAGAATAAACCATTTTGAGAAAATTCAAATCATCCCCAAAAGTTCTTGGTCCGATCATGAA
GCCTCATCAGGAGTTAGCTCAGCATGTCCATACCTGGGAAGTCCCTCCTTTTTAGAAATGTGG
TATGGCTTATCAAAAAGAACAGTACATACCCAACAATAAAGAAAAGCTACAATAATACCAACC
AAGAGGATCTTTTGGTACTGTGGGGAATTCACCATCCTAATGATGCGGCAGAGCAGACAAGGC
TATATCAAAACCCAACCACTATATTTCCATTGGGACATCAACACTAAACCAGAGATTGGTAC
CAAAAATAGCTACTAGATCCAAAGTAAACGGGCAAAAGTGGAAGGATGGAGTTCTTCTGGACA
ATTTTAAAACCTAATGATGCAATCAACTTCGAGAGTAATGGAAATTTTCATTGCTCCAGAATAT
GCATACAAAATTGTCAAGAAAGGGGACTCAGCAATTATGAAAAGTGAATTGGAATATGGTAA
CTGCAACACCAAGTGTCAAACTCCAATGGGGGCGATAAACTCTAGTATGCCATTCCACAACAT
ACACCCTCTCACCATCGGGGAATGCCCAAATATGTGAAATCAAACAGATTAGTCCTTGCAAC
AGGGCTCAGAAATAGCCCTCAAAGAGAGAGCAGAAGAAAAAGAGAGGACTATTTGGAGCTA
TAGCAGGTTTTATAGAGGGAGGATGGCAGGGAATGGTAGATGGTTGGTATGGGTACCACCAT
AGCAATGAGCAGGGGAGTGGGTACGCTGCAGACAAAGAATCCACTCAAAGGCAATAGATGG
AGTCACCAATAAGGTCAACTCAATCATTGACAAAATGAACACTCAGTTTGAGGCCGTTGGAAG
GGAATTTAATAACTTAGAAAGGAGAATAGAGAATTTAAACAAGAAGATGGAAGACGGGTTTC
TAGATGTCTGGACTTATAATGCCGAACCTCTGGTTCTCATGGAAAATGAGAGAACTCTAGACT
TTCATGACTCAAATGTTAAGAACCTCTACGACAAGGTCCGACTACAGCTTAGGGATAATGCAA
AGGAGCTGGGTAACGGTTGTTTCGAGTTCTATCACAAATGTGATAATGAATGTATGGAAAGTA
TAAGAAACGGAACGTACAACATATCCGCAGTATTCAGAAGAAGCAAGATTAAAAAGAGAGGAA
ATAAGTGGGGTAAAATTGGAATCAATAGGAACTTACCAAATACTGTCAATTTATTCAACAGTG
GCGAGTTCCCTAGCACTGGCAATCATGATGGCTGGTCTATCTTTATGGATGTGCTCCAATGGAT
CGTTACAATGCAGAATTTGCATT

Figure 24Plast-443c (25 mers) **SEQ ID NO. 18**

5'- GTATTAGTAATTAGAATTTGGTGTGTC-3'

Figure 25AHA5-T156A.r (50-mers) **SEQ ID NO. 19**

5'-TTGTAGCTTTTCTTTATTGTTGGGTATGCACTGTTCTTTTGGATAAGCCA-3'

Figure 25BHA5-T167A.c (50-mers) **SEQ ID NO. 20**5'-ACCCAACAATAAAGAAAAGCTACAATAATGCCAACCAAGAGGATCTTTTG-
3'**Figure 25C**

HA5-S288A.r (50 mers) **SEQ ID NO. 21**

5'-GTGAGAGGGTGTATGTTGTGGAATGGCATAGCAGAGTTTATCGCCCCCAT-
3'

Figure 25D

HA5-S288A.c (50 mers) **SEQ ID NO. 22**

5'-ATGGGGGCGATAAACTCTGCTATGCCATTCCACAACATACACCCTCTCAC-
3'

Figure 25E

HA(Ind)-SacI.r (38 mers) **SEQ ID NO. 23**

5'-ACTTTGAGCTCTTAAATGCAAATTCTGCATTGTAACGA-3'

Figure 25F

SEQ ID NO. 24.

5'-AGTTCCCCGGGCTGGTATATTTATATGTTGTC-3'

Figure 25G

SEQ ID NO. 25.

5'-AATAGGAGCTCCATTTTCTCTCAAGATGATTAATTAATTAATTAGTC-3

Figure 25H

SEQ ID NO. 26.

5'-AATAGGAGCTCGTAAATGCTTCTTCGTCTCCTATTTATAATATGG-3'

Figure 25I

SEQ ID NO. 27.

5'-
TTACGAATTCTCCTTCCTAATTGGTGTACTATCATTTATCAAAGGGGA-3'

Figure 25J

SEQ ID. NO. 28

AAGCTTATGGAGAAATAGTGCTCTCTTGAATAGTCAGTCTTGTTAAAGTGATCAGATTTGCATTGG
 TTACCATGCAACAATTCAACAGAGCAGGTTGACACAATCATGGAAGAACGTTACTGTTACACATGCC
 CAAGACATACTGGAAAGACACACACGGAAGCTCTGCGATCTAGATGGAGTGAAGCCTCTAATTTTA
 AGAGATTGTAGTAGCTGGATGGCTCTCGGAACCCCAATGTGTACGAATTCATCAATGTACCGGAA
 TGGCTTACATAGTGGAGAGGCCAATCCAACCAATGACCTCTGTTACCCAGGGAGTTTCAACGACTAT
 GAAGAACTGAAACACCTATTGAGCAGAAATAACCAATTTGAGAAATTCAAATCATCCCCAAAAGTTCTTG
 GTCCGATCATGAAGCCTCATCAGGAGTTAGCTCAGCATGTCCATACCTGGGAAGTCCCTCTTTTITAGA
 AATGTGTATGGCTTATCAAAAAGAACAGTACATACCCAACAATAAGAAAGCTACAATAATACCAACCA
 AGAGGATCTTTTGGTACTGTGGGAATTCACCATCTTAATGATCGGCAGAGCAGACAAGGCTATATCA
 AAACCCAAACCACTATATTCCATTGGGACATCAACACTAAACAGAGATTGGTACCAAAATAGCTACT
 AGATCCAAAGTAAACGGCAAGTGAAGGATGGAGTTCTTCTGGACAATTTTAAACCTAATGATGCAA
 TCAACTTCGAGAGTAATGGAAATTTTCATTGCTCCAGAAATATGCATACAAAATGTCAAGAAAGGGGACTC
 AGCAATTATGAAAAGTGAATTGGAATATGGTAATGTAAGTCAACACCAAGTGTCAAACTCCAATGGGGCGATA
 AACTCTAGTAGCCATTCCACAACATACACCCTCTCACCATCGGGGAATGCCCCAAATATGTGAATCAA
 ACAGATTAGTCCITGCAACAGGGCTCAGAAATAGCCCTCAAGAGAGAGAGCAGAAAGAAAGAGAGGAC
 TATTTGGAGCTATAGCAGGTTTATAGAGGGAGGATGGCAGGGAATGGTAGATGGTTGGTATGGTACC
 ACCATAGCAATGAGCAGGGGAGTGGTACGCTGCAGACAAGAAATCCACTCAAAAGGCAATAGATGGA
 GTCACCAATAAGGTCAACTCAATCATTGACAAAATGAACACTCAGTTTGAGGCCGTTTGAAGGGAATTTA
 ATAACCTAGAAAAGGAGAAATAGAGAAATTAACAAGAAAGATGGAAGACGGGTTTCTAGATGTCTGGACTTA
 TAATGCCGAACCTTCTGGTTCTCATGGAAAATGAGAGAACTCTAGACTTTTCATGACTCAATGTTAAGAAC
 CTCTACGACAAGGTCCGACTACAGCTTAGGGATAATGCAAGGAGCTGGGTAAACGGTTGTTTCGAGTTC
 TATCACAATGTGTAATGAATGTATGGAAAGTATAGAAACGGAAACGTACAACACTCCGCAAGTATTCAG
 AAGAAGCAAGATTAAAAGAGAGGAAATAGTGGGGTAAATTTGGAATCAATAGGAACCTACCAATACT
 GTCAAATTTATCAACAGTGGCGAGTCCCTAGCACTGGCAATCATGATGGCTGGTCTAICTTTATGGATG
 TGCTCCAAATGGATCGTTACAAATGCAGAAATTTGCATTAAAGAGCTC

Figure 26

SEQ ID No.29.

« Triple Mutant » sequence 680 (modifications with respect to sequence 660 appear in bold-underlined)

GATCAGATTTGCATTGGTTACCATGCAAACAATTCAACAGAGCAGGTTGACA
CAATCATGGAAAAGAACGTTACTGTTACACATGCCCCAAGACATACTGGAAAA
GACACACAACGGGAAGCTCTGCGATCTAGATGGAGTGAAGCCTCTAATTTTA
AGAGATTGTAGTGTAGCTGGATGGCTCCTCGGGAACCCAATGTGTGACGAAT
TCATCAATGTACCGGAATGGTCTTACATAGTGGAGAAGGCCAATCCAACCAA
TGACCTCTGTTACCCAGGGAGTTTCAACGACTATGAAGAACTGAAACACCTA
TTGAGCAGAATAAACCATTTTGAGAAAAATTCAAATCATCCCCAAAAGTTCTT
GGTCCGATCATGAAGCCTCATCAGGAGTTAGCTCAGCATGTCCATACCTGGG
AAGTCCCTCCTTTTTTAGAAATGTGGTATGGCTTATCAAAAAGAACAGT**GCAT**
ACCCAACAATAAAGAAAAGCTACAATAAT**GCCA**ACCAAGAGGATCTTTTGGT
ACTGTGGGGAATTCACCATCCTAATGATGCGGCAGAGCAGACAAGGCTATAT
CAAAACCCAACCACCTATATTTCCATTGGGACATCAACACTAAACCAGAGAT
TGGTACCAAAAATAGCTACTAGATCCAAAGTAAACGGGCAAAGTGGAAGGA
TGGAGTTCTTCTGGACAATTTTAAACCTAATGATGCAATCAACTTCGAGAGT
AATGGAAATTTCAATTGCTCCAGAATATGCATACAAAATTGTCAAGAAAGGGG
ACTCAGCAATTATGAAAAGTGAATTGGAATATGGTAACTGCAACACCAAGTG
TCAAACCTCAATGGGGGCGATAAACTCT**GCT**ATGCCATTCCACAACATACAC
CCTCTCACCATCGGGGAATGCCCCAAATATGTGAAATCAAACAGATTAGTCC
TTGCAACAGGGCTCAGAAATAGCCCTCAAAGAGAGAGCAGAAGAAAAAAGA
GAGGACTATTTGGAGCTATAGCAGGTTTTATAGAGGGAGGATGGCAGGGAAT
GGTAGATGGTTGGTATGGGTACCACCATAGCAATGAGCAGGGGAGTGGGTAC
GCTGCAGACAAAGAATCCACTCAAAAGGCAATAGATGGAGTCACCAATAAG
GTCAACTCAATCATTGACAAAATGAACACTCAGTTTGAGGCCGTTGGAAGGG
AATTTAATAACTTAGAAAGGAGAATAGAGAATTTAAACAAGAAGATGGAAG
ACGGGTTTCTAGATGTCTGGACTTATAATGCCGAACCTCTGGTTCTCATGGAA
AATGAGAGAACTCTAGACTTTTCATGACTCAAATGTTAAGAACCTCTACGACA
AGGTCCGACTACAGCTTAGGGATAATGCAAAGGAGCTGGGTAACGGTTGTTT
CGAGTTCTATCACAAATGTGATAATGAATGTATGGAAAGTATAAGAAACGGA
ACGTACAACCTATCCGCAGTATTCAGAAAGAAGCAAGATTAAGAAAGAGAGGAA
ATAAGTGGGGTAAAATTGGAATCAATAGGAACTTACCAAATACTGTCAATTT
ATTCAACAGTGGCGAGTTCCCTAGCACTGGCAATCATGATGGCTGGTCTATCT
TTATGGATGTGCTCCAATGGATCGTTACAATGCAGAATTTGCATT

Figure 27

SEQ ID NO. 30.

5'-GTATTAGTAATTAGAATTTGGTGTC-3'

Figure 28A

SEQ ID NO. 31.

5'-GCAAGAAGAAGCACTATTTTCTCCATTTTCTCTCAAGATGATTA-3'

Figure 28B

SEQ ID NO. 32.

5'-TTAATCATCTTGAGAGAAAATGGAGAAAATAGTGCTTCTTCTTGC-3'

Figure 28C

SEQ ID NO. 33.

5'-ACTTT**GAGCTC**TTAAATGCAAATTCTGCATTGTAACGA-3'

Figure 28D

SEQ ID NO.34

Amino acid sequence of H5 from A/Vietnam/1194/04

DQICIGYHANNSTEQVDTIMEKNVTVTTHAQDILEKTHNGKLCDLGDKPLILRDC
SVAGWLLGNPMCDEFINPEWSYIVEKANPVNDLCYPGDFNDYEELKHLLSRIN
HFEKIQHPKSSWSSHEASLGVSSACPYQGKSSFFRNVVWLIKKNSTYPTIKRSYNN
TNQEDLLVLWGIHPNDAAEQTKLYQNPTTYISVGTSTLNQRLVPRIATRSKVNG
QSGRMEFFWTILKPNDAINFESNGNFIAPYAYKIVKKGDSTIMKSELEYGNCNTK
CQTPMGAINSSMPFHNIHPLTIGECPKYVKSRLVATGLRNSPQRERRRKKRGLF
GAAGFIEGGWQGMVDGWYGYHHSNEQSGYAADKESTQKAIDGVTNKVNSII
DKMNTQFEAVGREFNNLERRIENLNKKMEDGFLDVWTYNAELLVLMENERTLD
FHDSNVKNLYDKVRLQLRDNALGNGCFEFYHKCDNECMESVRNGTYDYPQY
SEEARLKREEISGVKLESIGIYQILSIYSTVASSLALAIMVAGLSLWMCNGLQCRI
CI

Figure 29

SEQ ID NO.35

Nucleotide sequence of a gene coding for HA from strain B/Florida/4/2006

ATGAAGGCAATAATTGTACTACTCATGGTAGTAACATCCAATGCAGATCGAA
TCTGCACTGGAATAACATCTTCAAACCTCACCTCATGTGGTCAAAACAGCCACT
CAAGGGGAGGTCAATGTGACTGGTGTGATACCACTAACAACAACACCAACAA
AATCTTATTTTGCAAATCTCAAAGGAACAAGGACCAGAGGGAAACTATGCCC
AGACTGTCTCAACTGCACAGATCTGGATGTGGCTTTGGGCAGACCAATGTGT
GTGGGGACCACACCTTCGGCGAAGGCTTCAATACTCCACGAAGTCAAACCTG
TTACATCCGGGTGCTTTCCTATAATGCACGACAGAACAAAAATCAGGCAACT
ACCCAATCTTCTCAGAGGATATGAAAATATCAGGCTATCAACCCAAAACGTC
ATCGATGCGGAAAAGGCACCAGGAGGACCCTACAGACTTGGAACCTCAGGA
TCTTGCCCTAACGCTACCAGTAAGAGCGGATTTTTTCGCAACAATGGCTTGGGC
TGTCCCAAAGGACAACAACAAAAATGCAACGAACCCACTAACAGTAGAAGT
ACCATACATTTGTACAGAAGGGGAAGACCAATCACTGTTTGGGGGTTCCAT
TCAGATAACAAAACCCAAATGAAGAACCTCTATGGAGACTCAAATCCTCAAA
AGTTCACCTCATCTGCTAATGGAGTAACCACACACTATGTTTCTCAGATTGGC
AGCTTCCAGATCAAACAGAAGACGGAGGACTACCACAAAGCGGCAGGATT
GTTGTTGATTACATGATGCAAAAACCTGGGAAAAACAGGAACAATTGTCTACC
AAAGAGGTGTTTTGTTGCCTCAAAAGGTGTGGTGC GCGAGTGGCAGGAGCAA
AGTAATAAAAGGGTCCTTGCTTTAATTGGTGAAGCAGATTGCCTTCATGAAA
AATACGGTGGATTAAACAAAAGCAAGCCTTACTACACAGGAGAACATGCAA
AAGCCATAGGAAATTGCCCAATATGGGTGAAAACACCTTTGAAGCTCGCCAA
TGGAACCAATATAGACCTCCTGCAAAACTATTAAAGGAAAGGGGTTTCTTC
GGAGCTATTGCTGGTTTCCTAGAAGGAGGATGGGAAGGAATGATTGCAGGCT
GGCACGGATACACATCTCACGGAGCACATGGAGTGGCAGTGGCGGCGGACCT
TAAGAGTACGCAAGAAGCTATAAACAAGATAACAAAAAATCTCAATTCTTTG
AGTGAGCTAGAAGTAAAGAATCTTCAAAGACTAAGTGGTGCCATGGATGAAC
TCCACAACGAAATACTCGAGCTGGATGAGAAAGTGGATGATCTCAGAGCTGA
CACTATAAGCTCGCAAATAGAACTTGCAGTCTTGCTTTCCAACGAAGGAATA
ATAAACAGTGAAGATGAGCATCTATTGGCACTTGAGAGAAAACTAAAGAAA
ATGCTGGGTCCCTCTGCTGTAGAGATAGGAAATGGATGCTTCGAAACCAAAC
ACAAGTGCAACCAGACCTGCTTAGACAGGATAGCTGCTGGCACCTTTAATGC
AGGAGAATTTTCTCTCCCACTTTTGATTCACTGAACATTACTGCTGCATCTTT
AAATGATGATGGATTGGATAACCATACTATACTGCTCTATTACTCAACTGCTG
CTTCTAGTTTGGCTGTAACATTGATGCTAGCTATTTTTATTGTTTATATGGTCT
CCAGAGACAACGTTTCATGCTCCATCTGTCTA

Figure 30A

SEQ ID NO.36

Amino acid sequence of mature HA from strain B/Florida/4/2006

DRICTGITSSNSPHVVKTATQGEVNVTGVIPLTTTPTKSYFANLKGTRTRGKLCPD
CLNCTDLVALGRPMC VGTTPSAKASILHEVKPVTSGCFPIMHDRTKIRQLPNLL
RGYENIRLSTQNVIDAEKAPGGPYRLGTSGSCP NATSKSGFFATMAWAVPKDNN
KNATNPLTVEVPYICTEGEDQITVWGFHSDNKTQMKNLYGDSNPQKFTSSANGV
TTHYVSQIGSFDPDQTEDGGLPQSGRIVVDYMMQKPGKTGTIVYQRGVLLPQKVW
CASGRSKVIKGSPLIGEADCLHEKYGGLNKS KPYTGEHAKAIGNCPIWVKTPL
KLANGTKYRPPAKLLKERGFFGAIAGFLEGGWEGMIAGWHGYTSHGAHGVA
ADLKSTQEAINKITKNLSLSELEVKNLQRLSGAMDELHNEILELDEKVDDL RAD
TISSQIELAVLLSNEGIINSEDEHLLALERK LKKMLGPSAVEIGNGCFETKHKCNQT
CLDRIAAGTFNAGEFSLPTFDSL NITAASLNDDGLDNHTILLYYSTAASSLAVTLM
LAIFIVYMVSRDNVSCSICL

Figure 30B