

Supplementary Materials and Methods:*HA-NA concatenated phylogenetic tree*

The HA and NA sequences of naturally occurring pandemic 2009 (H1N1) influenza A virus infecting human hosts that were released from Genbank 2009 to 16 May 2011 were downloaded from the NCBI Influenza Virus Resource [<http://www.ncbi.nlm.nih.gov/pubmed/17942553>]. To 3706 strains from Genbank, we added 127 new strains from our laboratories as well as 21 strains with the NA-S247N mutation from **GISAID (Global Initiative on Sharing All Influenza Data)**, see detailed list below). The vaccine strain A/California/07/2009 and the strains from our laboratories carrying the NA-S247N mutation were set aside and redundancy was removed from the remaining strains with Cd-hit [<http://www.ncbi.nlm.nih.gov/pubmed/16731699>] by allowing a maximal sequence identity of 99.6% to reduce the set to 372 non-redundant strains. The nucleotide sequences for these strains were concatenated such that a single sequence contains nucleotide sequences encoding both the HA and NA proteins in order to increase the evolutionary signal for strain differences of these almost identical sequences. The redundancy-corrected representative set was aligned with the vaccine strain and NA-S247N strains from our laboratories using MAFFT [<http://www.ncbi.nlm.nih.gov/pubmed/15661851>] with the FFT-NS-2 option. After fragmentary sequences and sequences flanking the coding region were removed from the alignment, the resulting 266 strains were used for the phylogenetic analysis. A maximum likelihood tree was created using PhyML [<http://www.ncbi.nlm.nih.gov/pubmed/14530136>] with the approximate likelihood ratio test, the HKY85 substitution model and gamma distributed sites rates (to allow different rates for positions in HA and NA) using 4 categories. A shape parameter of 0.46 was estimated for the gamma distribution by the program. The resulting trees were displayed and marked using the MEGA software package [<http://www.ncbi.nlm.nih.gov/pubmed/17488738>].

List of accessions of strains with NA-S247N mutations in GISAID and their respective submitting labs

EPI_ISL_87985	A/Croatia/18576-1/2010	National Institute for Medical Research Croatian Institute of Public Health
EPI_ISL_80092	A/Athens/INS342/2009	(Genbank)
EPI_ISL_75102	A/Athens/INS161/2009	(Genbank)
EPI_ISL_85534	A/England/94280035/2009	(Genbank)
EPI_ISL_68109	A/California/VRDL4/2009	(Genbank)
EPI_ISL_66533	A/Latvia/11-1410cs/2009	National Institute for Medical Research "State Agency, Infectology Center of Latvia"
EPI_ISL_73521	A/Texas/JMS390/2009	(Genbank)
EPI_ISL_84164	A/Bangladesh/3938/2010	Centers for Disease Control and Prevention
EPI_ISL_88114	A/Montana/03/2011	Centers for Disease Control and Prevention
EPI_ISL_84225	A/Austria/533700/2009	National Institute for Medical Research University of Vienna
EPI_ISL_71958	A/North Carolina/05/2010	Centers for Disease Control and Prevention (also in Genbank)
EPI_ISL_71413	A/North Carolina/03/2010	Centers for Disease Control and Prevention
EPI_ISL_76615	A/Victoria/2132/2009	WHO Collaborating Centre for Reference and Research on Influenza Victorian Infectious Diseases Reference Laboratory
EPI_ISL_77658	A/Massachusetts/02/2010	Centers for Disease Control and Prevention
EPI_ISL_73406	A/Minnesota/02/2010	Centers for Disease Control and Prevention

EPI_ISL_88011	A/Slovenia/234/2011	National Institute for Medical Research "Laboratory for Virology, National Institute of Public Health"
EPI_ISL_74952	A/Jiangxi-Donghu/SWL131/2010	WHO Chinese National Influenza Center
EPI_ISL_77273	A/TOCHIGI/654/2010	National Institute of Infectious Diseases (NIID) Tochigi Prefectural Institute of Public Health and Environmental Science
EPI_ISL_80244	A/Athens/INS350/2009	(Genbank)
EPI_ISL_68104	A/California/VRDL34/2009	(Genbank)
EPI_ISL_75064	A/Jiangxi-Donghu/SWL157/2010	WHO Chinese National Influenza Center

List of accessions of strains by our labs for this study

Philippines/5232/10	Singapore/GP4660/10	Singapore/KK117/11
South_Australia/435/10	Singapore/GP4565/10	Singapore/KK68/11
Sri_Lanka/21/10	Singapore/GP4444/10	Singapore/TT138/11
Townsville/72/10	Singapore/KK724/10	Singapore/TT127/11
Townsville/64/10	Singapore/GP4633/10	Singapore/GP677/11
Sydney/517/10	Singapore/KK738/10	Singapore/GP582/11
Victoria/663/10	Singapore/GP4588/10	Singapore/GP479/11
Victoria/662/10	Singapore/GP4549/10	Singapore/GP618/11
Victoria/502/11	Singapore/TT495/10	Singapore/KK85/11
Victoria/670/10	Singapore/GP4640/10	Singapore/GP511/11
Darwin/165/10	Singapore/GP4610/10	Singapore/GP730/11
Darwin/156/10	Singapore/TT491/10	Singapore/CGH02/11
Darwin/150/10	Singapore/KK734/10	Singapore/KK26/11
Darwin/143/10	Singapore/KK750/10	Singapore/TT157/11
Darwin/146/10	Singapore/TT489/10	Singapore/KK105/11
Darwin/140/10	Singapore/GP4670/10	Singapore/TT5/11
Sydney/31/10	Singapore/GP4653/10	Singapore/GP496/11
Fiji/45/10	Singapore/GP4406/10	Singapore/CGH01/11
Fiji/40/10	Singapore/KK744/10	Singapore/GP627/11
Darwin/178/10	Singapore/GP4678/10	Singapore/SGH02/11
Victoria/1204/10	Singapore/GP4682/10	Singapore/GP382/11
Darwin/75/11	Singapore/TT488/10	Singapore/GP536/11
Darwin/1/11	Singapore/TT496/10	Singapore/GP655/11
Perth/29/11	Singapore/TT474/10	Singapore/SGH01/11
Darwin/2/11	Singapore/TT58/11	Singapore/KK111/11
Perth/30/11	Singapore/KK124/11	Singapore/KK75/11
Darwin/74/11	Singapore/GP394/11	Singapore/EN1/11
Darwin/10/11	Singapore/GP39/11	Singapore/TT72/11
Darwin/70/11	Singapore/GP414/11	Singapore/TT117/11
Brunei/1/11	Singapore/TT164/11	Singapore/TT108/11
Singapore/TT459/10	Singapore/GP715/11	Singapore/GP596/11
Singapore/GP4307/10	Singapore/GP4/11	Singapore/GP433/11
Singapore/EN193/10	Singapore/GP62/11	Singapore/EN34/11
Singapore/GP4215/10	Singapore/KK11/11	Singapore/SGH03/11
Singapore/GP4217/10	Singapore/TT134/11	Singapore/KK12/11
Singapore/GP4220/10	Singapore/TT160/11	
Singapore/GP4236/10	Singapore/KK35/11	
Singapore/GP4244/10	Singapore/TT89/11	
Singapore/GP4255/10	Singapore/KK19/11	
Singapore/GP4266/10	Singapore/TT67/11	
Singapore/GP4276/10	Singapore/TT142/11	
Singapore/GP4281/10	Singapore/GP20/11	
Singapore/GP4300/10	Singapore/KTPH1/11	
Singapore/GP4344/10	Singapore/GP81/11	
Singapore/GP4523/10	Singapore/GP448/11	
Singapore/GP4511/10	Singapore/GP46/11	