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Northern Hemisphere Vaccine Recommendation Meeting for 2012-13 influenza season.

Summary of NIMR Results.

Final Report for WHO meeting: 20-22 February 2012.

Influenza Activity in the European region, October 2011 – February 2012

Influenza activity has remained low across Europe during the first eighteen weeks of weekly surveillance reporting for the 2011-2012 influenza season. Activity started late compared to the 2010-2011 season, but has increased slowly over consecutive weeks since week 52/2011 though remaining well below, 4-fold or greater in all weeks so far, the numbers of influenza virus detections in 2010-2011 (**Figure 1**). Approximately 6500 influenza detections have been reported across the whole WHO Euro region with type A detections (94.6%) predominating over type B (5.4%). Although low in numbers, type B detections as a percentage of total detections are higher in the Eastern countries (12.9%) compared to those in the West (3.6%). This pattern may change as type B activity often increases later in the influenza season, but influenza B detections as a percentage of total influenza detections is running at 5.4% compared to 29.1% in the previous season (**Figure 2**). Within type A, the H3 subtype (95.8%) is predominating over H1pdm09 viruses (4.2%) by a 23-fold margin across the WHO Euro region (**Figures 1 & 2**): this represents a total reversal of the situation in 2010-11 despite the late start and low intensity of the 2011-2012 season (**Figure 2**). The low intensity is exemplified by the UK HPA/QSurveillance National Syndromic Surveillance System based on a population sample of 20 x 10^6 in England, Wales and Northern Ireland: ILI has remained low and stable since the start of the 2011-2012 season (**Figure 3**).

Antigenic and genetic characteristics of influenza viruses collected between 01 September 2011 and February 2012

Influenza positive specimens received at NIMR

Samples, viruses or clinical samples, with collection dates after 01 September 2011 have been received from 31 countries in Europe, Africa, the Middle East and the Far East. The majority were A(H3N2) viruses (72%) with smaller numbers of influenza B viruses (13.3%) and H1N1pdm09 viruses (7.8%). A number of type A and type B viruses have yet to be subtyped (**Table 1**). The proportions received are representative of the types/subtypes in circulation in Europe. **Table 2** shows the isolation rates for samples received since 01 September 2011. **Table 3** summarises the number of viruses of the A(H1N1), A(H3N2) subtypes, and the two B-lineages that showed ≥8-fold reductions in HI titres with post-infection ferret antisera compared with the titres against the homologous vaccine/reference viruses.

Influenza A(H1N1)pdm09 virus analysis.

Table 4 summarises the antigenic results for the H1N1 viruses received; all were of the 2009 pandemic lineage.

All of the H1N1 viruses were antigenically similar to the vaccine virus (**Table 4**) with three viruses showing a 4-fold reduction in HI titre compared with the titre of the vaccine virus (A/California/7/2009) with its homologous post-infection ferret antiserum. The results are shown in **Tables 5 and 6**. Nine of the 11 viruses analysed in HI assays had been subjected to HA, NA and M gene sequence analysis at the time of compilation of this report.

Figure 4 shows a phylogenetic tree of the HA genes of representative H1N1 viruses. Amino acid substitutions or polymorphisms between residues 153 and 157 are marked on the tree; no viruses analysed by HI assay showed amino acid substitutions or polymorphism in this region. Substitutions or polymorphism at position 223, associated with egg adaptation, are also marked.

The HA genes of H1N1 viruses cluster into eight genetic groups, previously described, defined by the following amino acid substitutions in HA1:

(2) **N31D, S162N** (resulting in the gain of a glycosylation site) **& A186T**, e.g. A/Czech Republic/32/2011;

(3) **A134T & S183P**, e.g. A/Hong Kong/3934/2011;

(4) **N125D,** e.g. A/Christchurch/16/2010;

(5) **D97N, R205K, I216V & V249L**, e.g. A/Astrakhan/1/2011;

(6) **D97N & S185T**, e.g. A/St Petersburg/27/2011;

(7) **D97N, S143G, S185T & A197T,** e.g. A/St Petersburg/100/2011;

(8) **A186T & V272A,** e.g. A/Ghana/763/2011.

Viruses received fell into genetic groups 5, 6, 7 and 8, which are marked on **Tables 5 and 6**.

Amino acid alignment of the HAs for a selected group of viruses is shown in **Figure 5**: the vaccine virus is shown in red, glycosylation motifs are highlighted and the reference viruses are coloured blue.

Figure 6 illustrates the location of amino acid residues, defining the genetic groups, on the structure of the H1 HA.

Figure 7 shows a phylogenetic tree for NA genes of representative H1N1 viruses and **Figure 8** shows an amino acid alignment for a selected group of these viruses. The HA and NA phylogenetic trees are generally congruent.

Figure 9 shows a phylogenetic tree of representative H1N1 M genes. All showed resistance to amantadine due to the S31N substitution in the M2 ion-channel protein. Amino acid substitutions in M1 and M2 are highlighted.

Antiviral analysis.

All viruses analysed were sensitive to the neuraminidase inhibitors zanamivir and oseltamivir, although analysis of H1N1 samples collected since 2011-09-01is awaited (**Table 30**).

Conclusion.

Of the small number of viruses received all, including three showing a 4-fold reduction in HI tests, were antigenically similar to the vaccine virus.

Influenza A(H3N2) virus analysis.

Influenza A(H3N2) viruses have been received from Europe, Africa, the Middle-East and the Far-East. As described previously, these viruses have continued to be difficult to characterise antigenically by HI assay due to variable agglutination of red blood cells from guinea pig, turkey and humans. Those viruses with sufficient titre in HA assays using guinea pig red blood cells in the presence of 20 nM oseltamivir, to circumvent the NA-mediated binding of H3N2 viruses to the red blood cells, were analysed by HI assay. Approximately 75% of viruses propagated retained sufficient HA titre in the presence of oseltamivir to allow HI analysis (**Table 1**). Virus neutralisation assays were used to complement HI.

A summary of the results is shown in **Table 7.** The results of HI assays are shown in **Tables 8 to 14.** The results from the plaque reduction-based virus neutralisation assays on MDCK-SIAT1 cells are shown in **Tables 15 to 19**. In the HI assays two different sera raised against the vaccine virus were used. Overall, 75% of viruses recovered with sufficient titre for the HI assay showed ≥8-fold lower reactivity with antiserum raised against the vaccine virus A/Perth/16/2009 compared with the titre against the homologous virus (**Table 7**). For those viruses analysed with ferret antiserum F35/11 raised against A/Perth/16/2009, the proportion of viruses with ≥8-fold lower reactivity was in the order of 80%. The majority of viruses that showed reduced activity with this antiserum showed improved titres with some of the other antisera, relative to that with the homologous viruses against which the antisera were raised: notably the antisera raised against A/Alabama/5/2010, A/Hong Kong/3969/2011 and A/Stockholm/18/2011. Low reactivity was generally seen with antisera raised against A/Victoria/208/2009, A/Victoria/210/2009 and A/Iowa/19/2010 compared with the titres of the homologous viruses.

Virus neutralisation assays were carried out on groups of viruses that were able to be stably propagated and grew to sufficient titre (**Tables 15 to 19**). The end point in these assays is either approximately 50% (**Table 15**) or approximately 80% (**Tables 16 to 19**) reduction in plaque number. As in the HI analyses antiserum raised against A/Perth/16/2009 (F35/11) reacted with a titre of ≥8-fold lower with approximately 60% of the test viruses, compared with the titre against the homologous virus. In the small single test using ferret antiserum F30/09 both viruses also showed reduced neutralisation compared with the homologous virus (**Table 15**). The reactivity of the test viruses with antisera raised against A/Hong Kong/3969/2011and A/Perth/10/2011 was closer to that seen with the homologous viruses. In **Tables 8 to 19** viruses for which HA gene sequences have been determined are highlighted and the genetic group in which the HA gene clusters is indicated.

Phylogenetic analysis of the HA genes of representative H3N2 viruses is shown in **Figure 10**. The HA genes fell into the A/Victoria/208 genetic clade and predominantly into genetic groups 3, 5 and 6. Group 3 can be sub-divided into three groups 3A, 3B and 3C. The seven genetic groups are defined by the following amino acid substitutions in HA1.

In the Perth/16 genetic clade:

(1) **P162S, I260M, R261Q**, e.g. A/Victoria/210/2009;

(2) **N133D** (resulting in the loss of a glycosylation site), **R142G, T212A & V213A**, e.g. A/Norway/1330/2010.

In the Victoria/208 genetic clade which all carry the substitutions: K62E, K144N (resulting in the gain of a glycosylation site, and T212A with respect to viruses of the Perth/16 genetic clade:

(3A) **N144D** (resulting in the loss of a glycosylation site), **N145S, V223I & D487N**, e.g. A/Stockholm/18/2011;

(3B) **N145S, A198S, V223I, N312S & D487N**, e.g. A/England/259/2011;

(3C) **S45N** (resulting in the gain of a glycosylation site) **T48I, A198S, V223I & N312S**, e.g. A/Hong Kong/3969/2011, with some viruses also carrying the substitutions D53N, or N278K, sometimes combined with Q33R, with a sub-set carrying L3I or I522T;

(4) **N312S**, e.g. A/Serbia/71/2011;

(5) **D53N, Y94H, I230V & E280A**, e.g. A/Perth/10/2011;

(6) **D53N, Y94H, S199A, I230V & E280A**, e.g. A/Iowa/19/2010;

(7) **S45N** (resulting in the gain of a glycosylation site), e.g. A/Alabama/04/2011.

Figure 11 shows an HA amino acid alignment for a selection of the viruses represented in the phylogeny. The current vaccine virus, A/Perth/16/2009, is shown in red, glycosylation motifs are highlighted and the reference viruses are coloured blue. The genetic group to which each of the sequences belongs is also shown.

Both HI assays and virus neutralisation assays showed that a minority of viruses in each of the predominating genetic groups (groups 3A, 3B, 3C, 5 and 6) retained good reactivity, no more than 4-fold reduction, with ferret antiserum raised against A/Perth/16/2009. However, the majority of viruses showed good reactivity in HI and virus neutralisation assays with ferret antisera raised reference viruses with HA genes in genetic groups 3 and 5.

Figure 12 shows the location on the H3 HA structure of amino acid substitutions that define genetic groups 3A, 3B, 3C, 5 and 6. Several of the substitutions that have accumulated are exposed and could influence the antigenicity of the virus.

Figure 13 shows a NA phylogenetic tree for representative viruses with the HA clades and genetic groups indicated. **Figure 14** shows and amino acid alignment for a selected group of these viruses. A/Perth/16/2009 is shown in red, glycosylation motifs are highlighted, the reference viruses are coloured blue and the genetic group to which the corresponding HA gene sequences belong is also shown.

The HA and NA phylogenetic trees are generally congruent but it is noteworthy that the viruses of the predominating genetic groups all carry the dual substitutions S367N and K369T in their NA which results in the addition of a glycosylation site at residue 367. Other glycosylation sites are lost at residues 402 and 329 in some genetic sub-groups. **Figure 15** localises these variable sites on the structure of an N2 NA with zanamivir in the active site.

Figure 16 shows a phylogenetic tree of representative H3N2 M genes. All showed resistance to amantadine due to S31N substitution in the M2 ion-channel protein. Amino acid substitutions in M1 and M2 are highlighted.

Antiviral resistance.

All 161 viruses collected after 2011-09-01 and analysed were sensitive to both the neuraminidase inhibitors (**Table 30**).

Conclusion.

The majority of recent viruses analysed show reduced reactivity with antisera raised against the vaccine virus A/Perth/16/2009 in both virus neutralisation and HI assays, with the latter being carried out in the presence of oseltamivir, notably so with one of the two sera raised against A/Perth/16/2009. Not all viruses in each genetic group showed reduced reactivity with the antisera raised against the vaccine virus but in each group low reactivity predominated.

Influenza B viruses.

Only a small number of influenza B viruses have been received (**Table 1**). The number of viruses received was slightly greater for the B/Yamagata lineage compared to the B/Victoria lineage.

B/Victoria lineage.

Influenza B viruses of the B/Victoria lineage were received from countries in Europe, Africa, the Middle East (Israel) and from Hong Kong SAR. The collection details and summary results are shown in **Table 20**.

HI results of the propagated viruses are shown in **Tables 21 to 24**. Virus sequences included on the phylogenetic trees are highlighted. The majority of cell-propagated viruses displayed low reactivity with sera raised against the egg-propagated vaccine virus B/Brisbane/60/2008. They all showed good reactivity with sera raised against viruses genetically closely related to the vaccine virus but propagated in cells. In the tables included here these sera were raised against B/Paris/1762/2008, B/Odessa/3886/2010 and B/Hong Kong/514/2009 and these viruses are considered as surrogate cell-propagated antigens representing the egg-propagated vaccine strain. The reactivity of viruses with antiserum raised against B/Malta/MV636714/2011, an egg isolate, was similar to their reactivity with antiserum raised against the vaccine virus.

Phylogenetic analysis of the HA1 coding region of the HA gene of representative B/Victoria lineage viruses is shown in **Figure 16** and an alignment of the HA glycoproteins of a selection of these viruses is shown in **Figure 17**. The HA genes of all recently collected viruses fall into Clade 1, the B/Brisbane/60 clade. **Figure 18** shows a phylogenetic tree for the NA gene and **Figure 19** shows a corresponding alignment for a selection of NA glycoproteins. Highlighted in the trees are intra-clade reassortants between the HA gene from clade 1 and the NA gene of clade 3, exemplified by B/Attecoube/GR887/2011. In the HI assays, two of three such reassortant viruses showed lower HI titres (4-fold reductions compared to the titre with the homologous virus) with some ferret antisera.

B/Yamagata lineage.

Influenza B viruses of the B/Yamagata lineage were received from countries in Europe, Africa (Ghana and Cote d'Ivoire), the Middle East (Turkey and Israel) and from Hong Kong SAR. The collection details and results are summarised in **Table 25**.

The results of HI analysis of the propagated viruses of the B/Yamagata lineage are shown in **Tables 26 to 29**. A small proportion of viruses showed reduced reaction (≥8-fold reduced titre compared with the titre against the homologous reference virus) with antisera raised against the prototype virus B/Bangladesh/3333/2007and a slightly larger proportion showed reduced reactivity with antiserum raised against the reference virus B/Wisconsin/1/2010. Of the viruses tested using antiserum derived from the egg-propagated virus B/Stockholm/12/2011, all showed good reactivity compared with the titre against the homologous virus.

Figure 20 shows a phylogenetic analysis of the HA1 coding region of the HA gene of representative B/Yamagata lineage viruses and an alignment of a selection of the HA glycoproteins is shown in **Figure 21**. The HA genes of the majority of recently collected viruses fall into the B/Bangladesh/3333/2007 clade (Clade 3), with a small number falling in the B/Brisbane/3/2007 clade (Clade 2). **Figure 22** shows a phylogenetic tree of the NA gene and **Figure 23** shows a corresponding alignment for selected NA glycoproteins.

The HA and NA gene of all the viruses received at the London WHO CC, with collection dates after 01 September 2011, clustered in the B/Bangladesh/3333/2007 & B/Wisconsin/1/2010 clade, Clade 3. For the HA gene, Clade 3 can be sub-divided into two to four genetic groups: a group similar to B/Wisconsin/1/2010, defined by the amino acid substitution N202S, a group defined by the substitution T181K (e.g. B/Ireland/M1522/2012), and two groups defined by the substitution M251V with either the substitutions T181A and K253R (e.g. B/Serbia/1894/2011) or with the substitutions V29A and L172Q (e.g. B/Stockholm/12/2011). A similar grouping can be adduced for the NA gene.

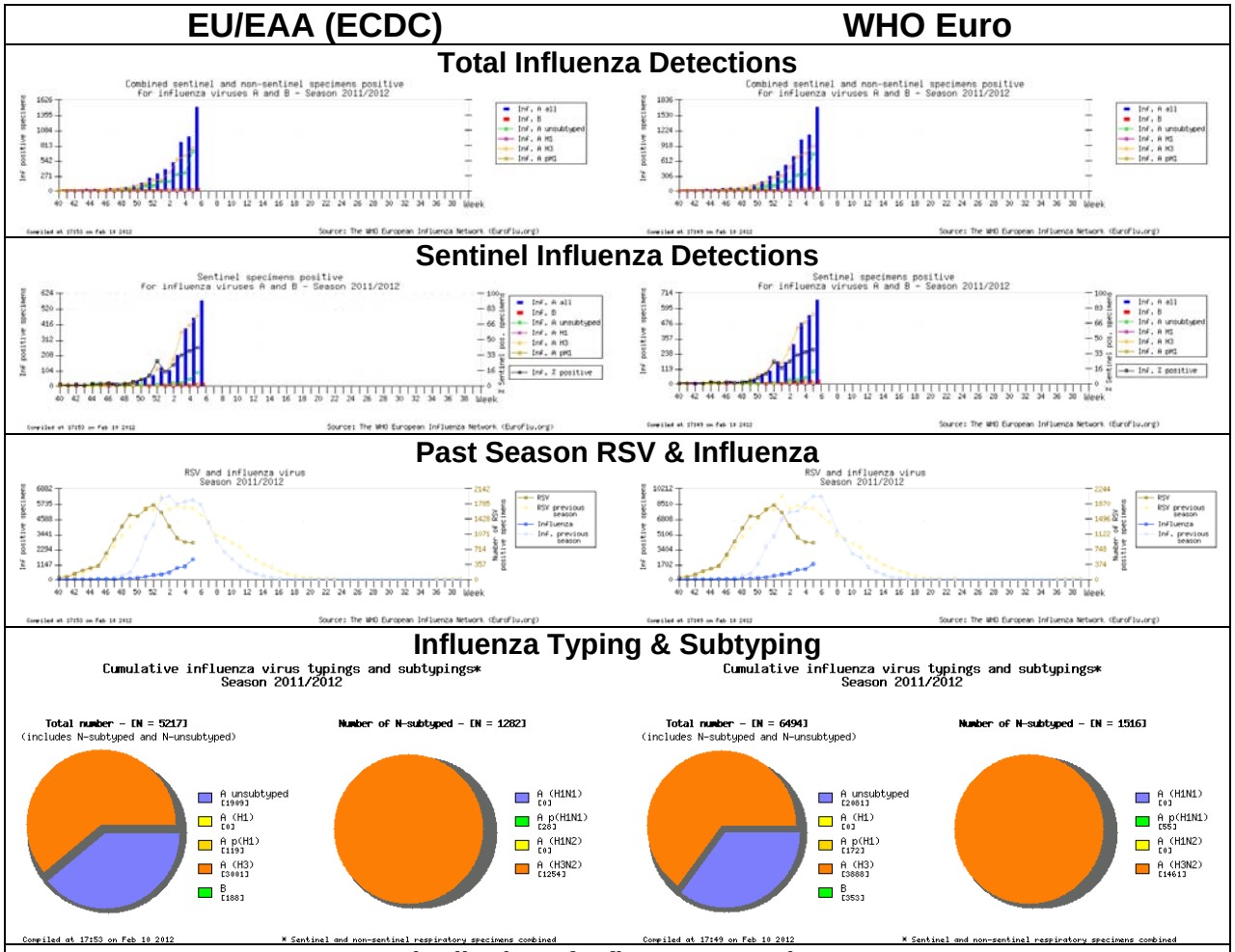
Antiviral Analysis.

A single virus collected since 2011-09-01 was analysed and it was sensitive to the neuraminidase inhibitors zanamivir and oseltamivir **(Table 30);** further analyses of samples collected since 2011-09-01are awaited.

Conclusion.

The number of influenza B viruses analysed has been low. Within these small numbers neither lineage clearly predominated. For viruses of the B/Victoria lineage most were antigenically similar to the current influenza B vaccine virus, B/Brisbane/60/2008, or viruses closely related to it. For the B/Yamagata lineage viruses a significant proportion of viruses showed some reduced activity with antiserum raised against a relatively recent reference virus, A/Wisconsin/1/2010, but showed better reactivity with an antiserum raised against an egg-propagated virus, B/Stockholm/12/2011.

Figure 1. Influenza Activity in Europe: 2011-12 Season (weeks 40-05)



Distribution of Influenza Detections

	Western(ECDC)	WHO Euro	Eastern
A	5029(96.4%)	6141(94.6%)	1112(87.1%)
H1pdm09	119	172	53
H3*	3001-25.2x	3888-22.6x	887-16.7x
Not subtyped	1909	2081	172
B	188(3.6%)	353(5.4%)	165(12.9%)
Total	5217	6494	1277

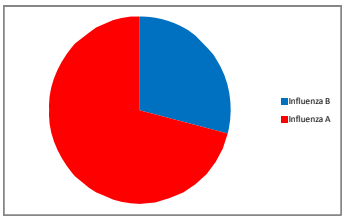
* Ratios for H3:H1pdm09 viruses are shown (x)

Figure 2. Comparison of 2010-11 & 2011-12 Influenza Seasons in Europe

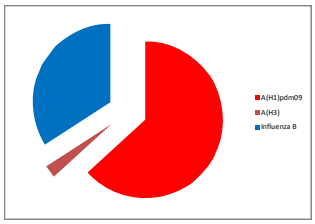
Influenza Detections 2010-11 season

	WHO Euro
Total	84903
A (subtype?)	12316
A(H1)pdm09	45956 (96.0%)
A(H3)	1936 (4.0%)
Influenza B	24695 (29.1%)

Influenza A/B

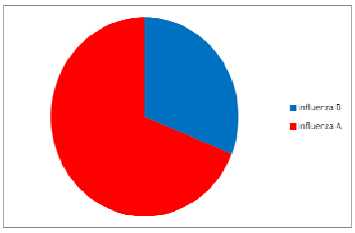


Subtyped influenza A

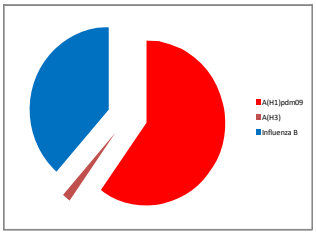


	ECDC (EU/EAA)
Total	56632
A (subtype?)	10954
A(H1)pdm09	27304 (97.3%)
A(H3)	771 (2.7%)
Influenza B	17603 (31.1%)

Influenza A/B



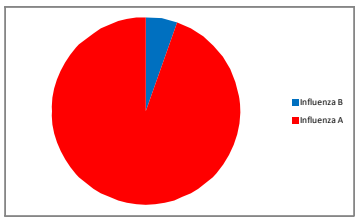
Subtyped influenza A



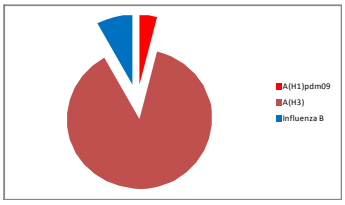
Influenza Detections 2011-12 season (to week 05/2012)

	WHO Euro
Total	6494
A (subtype?)	2081
A(H1)pdm09	172 (4.2%)
A(H3)	3888 (95.8%)
Influenza B	353 (5.4%)

Influenza A/B

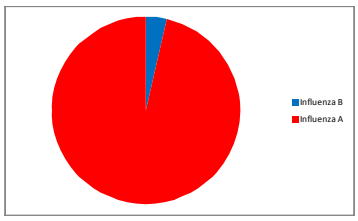


Subtyped influenza A



	ECDC (EU/EAA)
Total	5217
A (subtype?)	1909
A(H1)pdm09	119 (3.8%)
A(H3)	3001 (96.2%)
Influenza B	188 (3.6%)

Influenza A/B



Subtyped influenza A

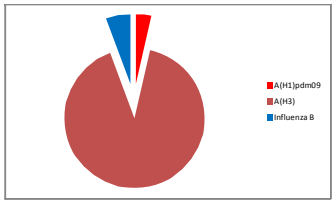
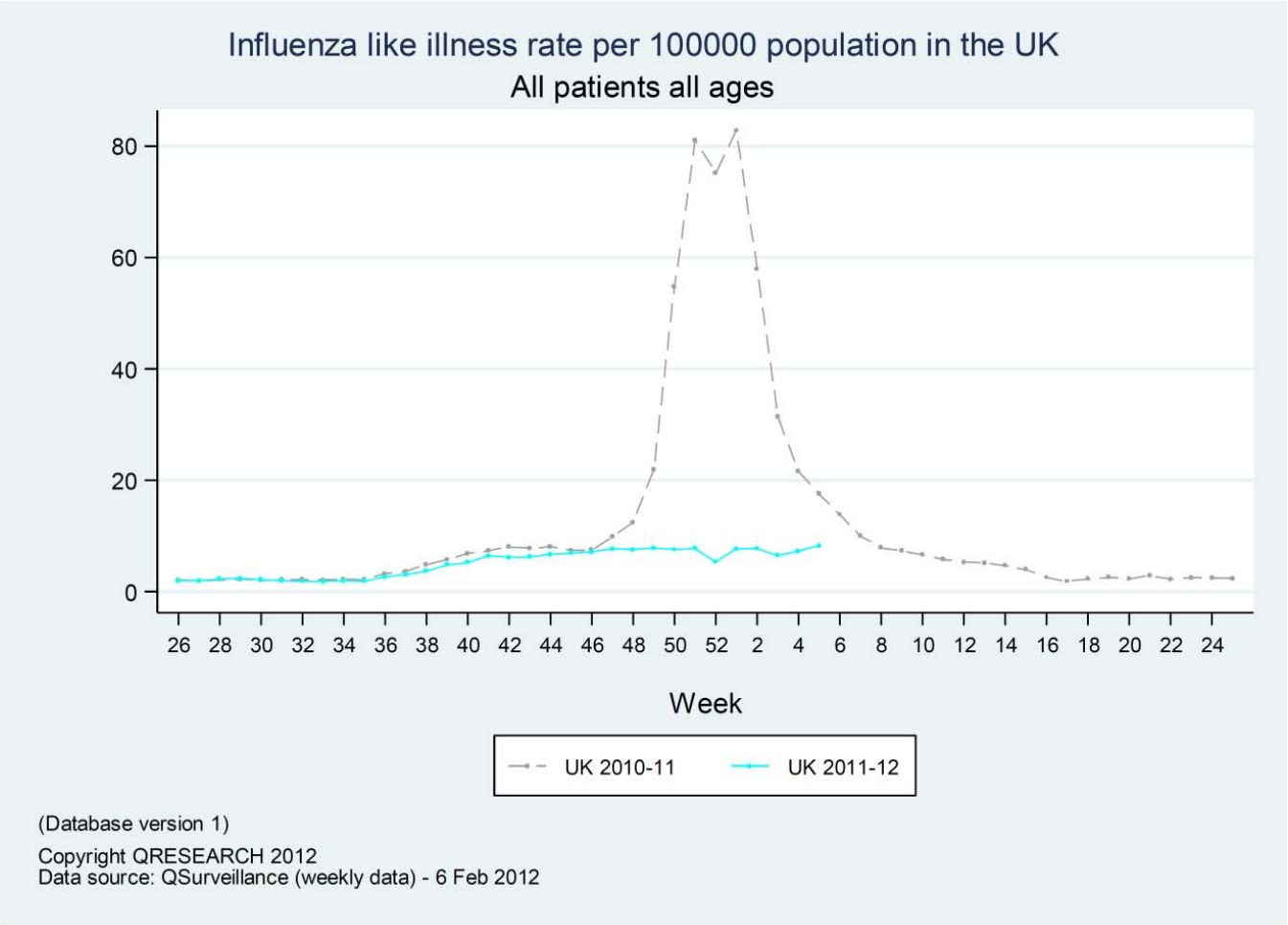


Figure 3. Influenza-like illness estimated from the UK HPA/Q-surveillance syndromic surveillance system.



NOTE: Weekly QSurveillance national thresholds for ILI incidence rates are: <20 per 100,000 (baseline activity); 20-70 (normal seasonal activity); 70-130 (above average activity); >130 (exceptional activity).

Table 1. Summary of clinical samples and isolates received, with collection dates since 2011-09-01

MONTH	A Untyped *	H1N1pdm09		H3N2		B Untyped *	B Yamagata lineage		B Victoria lineage	
Country		Number received	Number propagated	Number received	Number propagated		Number received	Number propagated	Number received	Number propagated
SEPTEMBER										
Cote d'Ivoire (4 mixed) +		1	1	3	2	4	6	6	2	2
Denmark				1	1					
France		1	1						1	1
Jordan				2	2					
Senegal		2	in progress	8	in progress	7	3	3		
Spain				1	1					
Sweden				3	3					
United Kingdom				1	1					
OCTOBER										
Albania		1	0			1				
Algeria				2	2					
Belgium						1				
Cote d'Ivoire (2 mixed) +				3	3		1	1	1	0
Egypt	7	1	0			1				
France				1	1					
Germany									1	1
Ghana		2	2	1	0		1	1		
Hong Kong SAR							1	1		
Jordan				1	1					
Morocco				1	1					
Norway				2	2				1	1
Senegal		4	in progress	5	in progress	7				
Sweden		1	1	2	2					
United Kingdom				3	3		1	1		
NOVEMBER										
Albania				1	0	1				
Algeria				2	2					
Belgium		1	0	1	1					
Cote d'Ivoire	1			6	4					
Denmark				1	1					
Egypt (2 mixed) +	23					2				
Finland				1	1					
France				1	1		2	2		
Germany				3	2					
Ghana				1	1		2	2		
Hong Kong SAR				2	2					
Iran		1	0	8	6					
Ireland				2	0	1				
Israel									1	1
Italy				4	4					
Jordan				3	2					
Morocco				3	3					
Netherlands							1	1		
Norway				3	3					
Portugal				1	1					
Slovakia				2	2					
Spain				7	in progress		1	1		
Sweden		2	1	4	4		2	2		
Switzerland									1	1
Tunisia				2	1					
Turkey				3	in progress					
United Kingdom				2	2					
DECEMBER										
Belgium				6	3					
Cote d'Ivoire (4 mixed) +				5	0	1				
Egypt	10									
Finland				1	in progress					
France				14	14					
Germany				12	12		1	1		
Hong Kong SAR		1	1	2	2		1	1	2	2
Iran				5	4					
Ireland				6	6					
Israel				11	7		1	1	2	2
Italy				21	19					
Jordan				13	8					
Latvia				1	1					
Morocco				9	8	4				
Netherlands				3	3					
Norway		2	1	21	21				2	2
Romania				4	in progress					
Slovenia				2	2					
Spain				25	in progress		3	in progress		
Sweden		2	in progress	8	8					
Switzerland				1	1					
Turkey				62	in progress		1	1		
JANUARY										
Albania				8	in progress	1				
Austria				4	4		1	in progress	1	1
Finland				3	in progress					
France				4	4					
Germany				14	13				1	1
Iran				6	6					
Ireland				7	in progress		1	1	1	1
Italy				1	1					
Jordan				1	0					
Kazahkstan	2	24	in progress	7	in progress					
Latvia				6	in progress					
Netherlands				2	2					
Norway				5	5					
Portugal				3	2					
Romania				3	3					
Slovenia				1	1					
Spain		1	0	10	in progress		2	in progress		
Sweden		2	in progress	5	5		1	1		
Switzerland				8	7				1	1
Turkey				12	11					
United Kingdom				3	3		1	1		
FEBRUARY										
Albania				2	in progress					
Russia				1	in progress					
Total Received = 626	43	49	8	451	254	31	34	28	18	17
	6.9%	7.8%		72.0%		5.0%	5.4%		2.9%	

* All type A and B viruses that were not subtyped by NICs are in progress

\+ NICs reported mixed infections based on rtRTPCR (additional to those classified in the rest of the table) - in progress

Table 2. Isolation rates for samples collected after 2011-09-01

	Clinical sample			Virus isolate		
	number positive	number negative	percent recovered	number positive	number negative	percent recovered
H1	3	7	30%	10	6	63%
H3	65	23	74%	299	36	89%
B Victoria	6	5	55%	13	0	100%
B Yamagata	10	0	100%	18	0	100%

Table 3. Frequencies of intermediate and low reactor viruses in HI assays for viruses collected since 2011-09-01

Virus type /subtype	Total assayed	[a]≤2 fold	[a]4 fold (intermediate)	[a]≥8 fold (low)	Comment
A(H1N1)pdm09					
A/California/07/2009	12	9 (75.0%)	3 (25.0%)	0	Current vaccine virus
A(H3N2)					
A/Perth/16/2009[1]	331	30 (9.1%)	52 (15.7%)	249 (75.2%)	Current vaccine virus
A/Perth/16/2009[2]	46	6 (13.1%)	11 (23.9%)	29 (63.0%)	Current vaccine virus
B-Victoria lineage					
B/Brisbane/60/2008[3]	18	16 (88.9%)	2 (11.1%)	0	Current vaccine virus
B-Yamagata lineage					
B/Florida/4/2006	30	1 (3.3%)	10 (33.3%)	19 (63.4%)	Previous vaccine virus
B/Bangladesh/3333/2007	30	15 (50.0%)	12 (40.0%)	3 (10.0%)	Early Clade 3 representative
B/Wisconsin/01/2010	30	13 (43.3%)	8 (26.7%)	9 (30.0%)	Later Clade 3 representative

[a] Reduction in titre, compared to the homologous titre, with post-infection ferret serum raised against the virus indicated

[1] HA and HI assays conducted in the presence of 20nM oseltamivir to overcome agglutination caused by NA

[2] Plaque reduction Virus Neutralisation tests conducted in the absence of oseltamivir

[3] Compared to homologous titres for ferret antisera raised against at least one of three tissue-culture grown B/Brisbane/60/2008-like equivalents (B/Paris/1762/2008, B/Hong Kong/514/2009 and B/Odessa/3886/2010)

Table 4. Summary of influenza A (H1N1)pdm09 samples received, collected since 2011-09-01

MONTH Country	H1N1			
	Number propagated	≤2 fold*	4 fold*	≥8 fold*
SEPTEMBER				
Cote d'Ivoire	1	1		
France	1	1		
Senegal	1	1		
OCTOBER				
Spain	1		1	
Sweden	1	1		
NOVEMBER				
Ghana	2	2		
Sweden	1	1		
DECEMBER				
Hong Kong SAR	1		1	
Norway	1	1		
JANUARY				
Sweden	1		1	
Total	11	8	3	0
		72.7%	27.3%	0%

* Reduction in HI titre with ferret antiserum raised against A/California/7/2009 (egg grown vaccine virus)

Table 5. Antigenic analyses of A(H1N1)pdm09 influenza viruses - 2012-01-11

				Haemagglutination inhibition titre[1]							
				Post infection ferret sera							
Viruses		Collection date	Passage History	A/Cal 7/09 F29/11	A/Bayern 69/09 F11/11	A/Lviv N6/09 C4/34/09	A/C'church 16/10 F30/10	A/HK 3934/11 F21/11	A/Astrak 1/11 F22/11	A/St. P'burg 27/11 F23/11	A/St. P'burg 100/11 F24/11
Genetic group				group 1	group 1	group 1	group 4	group 3	group 5	group 6	group 7
REFERENCE VIRUSES											
A/California/7/2009		2009-04-09	E1/E2	2560	2560	2560	640	640	640	640	640
A/Bayern/69/2009		2009-07-01	MDCK4/MDCK2	160	640	320	80	40	80	80	80
A/Lviv/N6/2009		2009-10-27	MDCK4/SIAT1/MDCK2	640	2560	1280	160	80	160	320	160
A/Christchurch/16/2010		2010-07-12	E2/E1	2560	5120	2560	5120	1280	2560	2560	5120
A/Hong Kong/3934/2011		2011-03-29	MDCK2/MDCK2	1280	320	640	640	2560	1280	1280	2560
A/Astrakhan/1/2011		2011-02-28	MDCK1/MDCK2	2560	1280	2560	1280	2560	1280	2560	5120
A/St. Petersburg/27/2011		2011-02-14	E1/E2	2560	2560	2560	1280	2560	2560	2560	5120
A/St. Petersburg/100/2011		2011-03-14	E1/E2	2560	1280	1280	640	1280	1280	1280	5120
TEST VIRUSES											
A/Stockholm/27/2011	7	2011-10-18	MDCK2/MDCK1	1280	1280	640	640	1280	640	640	2560
A/Stockholm/36/2011	5	2011-11-27	MDCK2/MDCK1	2560	640	2560	1280	5120	2560	2560	5120

1. < = <40

Vaccine virus

Sequences in phylogenetic trees

Table 6. Antigenic analyses of A(H1N1)pdm09 influenza viruses - 2012-01-31/2012-02-14

				Haemagglutination inhibition titre[1]							
				Post infection ferret sera							
Viruses		Collection date	Passage History	A/Cal 7/09 F29/11	A/Bayern 69/09 F11/11	A/Lviv N6/09 C4/34/09	A/C'church 16/10 F30/10	A/HK 3934/11 F21/11	A/Astrak 1/11 F22/11	A/St. P'burg 27/11 F23/11	A/St. P'burg 100/11 F24/11
Genetic group				group 1	group 1	group 1	group 4	group 3	group 5	group 6	group 7
REFERENCE VIRUSES											
A/California/7/2009		2009-04-09	E1/E2	2560	2560	1280	640	640	1280	640	1280
A/Bayern/69/2009		2009-07-01	MDCK5	160	320	160	80	40	80	80	40
A/Lviv/N6/2009		2009-10-27	M4/S1/M2	640	2560	640	160	80	160	160	80
A/Christchurch/16/2010		2010-07-12	E2/E2	2560	2560	1280	5120	1280	1280	1280	2560
A/Hong Kong/3934/2011		2011-03-29	M2/M2	640	160	320	320	640	640	640	1280
A/Astrakhan/1/2011		2011-02-28	M1/M4	1280	1280	1280	1280	2560	2560	1280	2560
A/St. Petersburg/27/2011		2011-02-14	E1/E2	1280	1280	1280	1280	1280	1280	1280	2560
A/St. Petersburg/100/2011		2011-03-14	E1/E2/E1	1280	640	1280	640	1280	1280	1280	2560
TEST VIRUSES											
A/Abobo/GR753/2011	8	2011-09-12	MDCK2	2560	640	1280	1280	1280	2560	1280	5120
A/Grenoble/1772/2011	7	2011-09-21	MDCK3/MDCK1	2560	640	1280	1280	2560	2560	2560	5120
A/Ghana/ARI1181/2011	8	2011-10-11	C3/MDCK2	1280	1280	1280	1280	2560	2560	2560	2560
A/Wisconsin/26/2011	7	2011-10-16	C1/MDCK1	1280	1280	1280	1280	1280	1280	1280	2560
A/Ghana/FS-11-1803/2011	8	2011-10-19	C1/MDCK1	2560	1280	2560	1280	2560	2560	2560	5120
A/Norway/2379/2011	7	2011-12-08	MDCK2/MDCK2	1280	640	1280	640	2560	1280	1280	2560
A/Hong Kong/5089/2011	6	2011-12-14	MDCK3/MDCK2	640	320	320	320	640	640	640	1280
A/Dakar/28/2011		2011-09-15	SIAT2	1280	640	640	640	1280	1280	1280	2560
A/Pais Vasco/RR8716/2011		2011-10-19	P2 Allantoic Fluid/E3	640	640	640	320	640	640	640	2560
A/Stockholm/1/2012	6	2012-01-02	3/MDCK1	640	1280	640	160	160	160	80	160

1. < = <40

Vaccine virus

Sequences in phylogenetic trees

Figure 4. Phylogenetic comparison of influenza A(H1N1)pdm09 HA genes

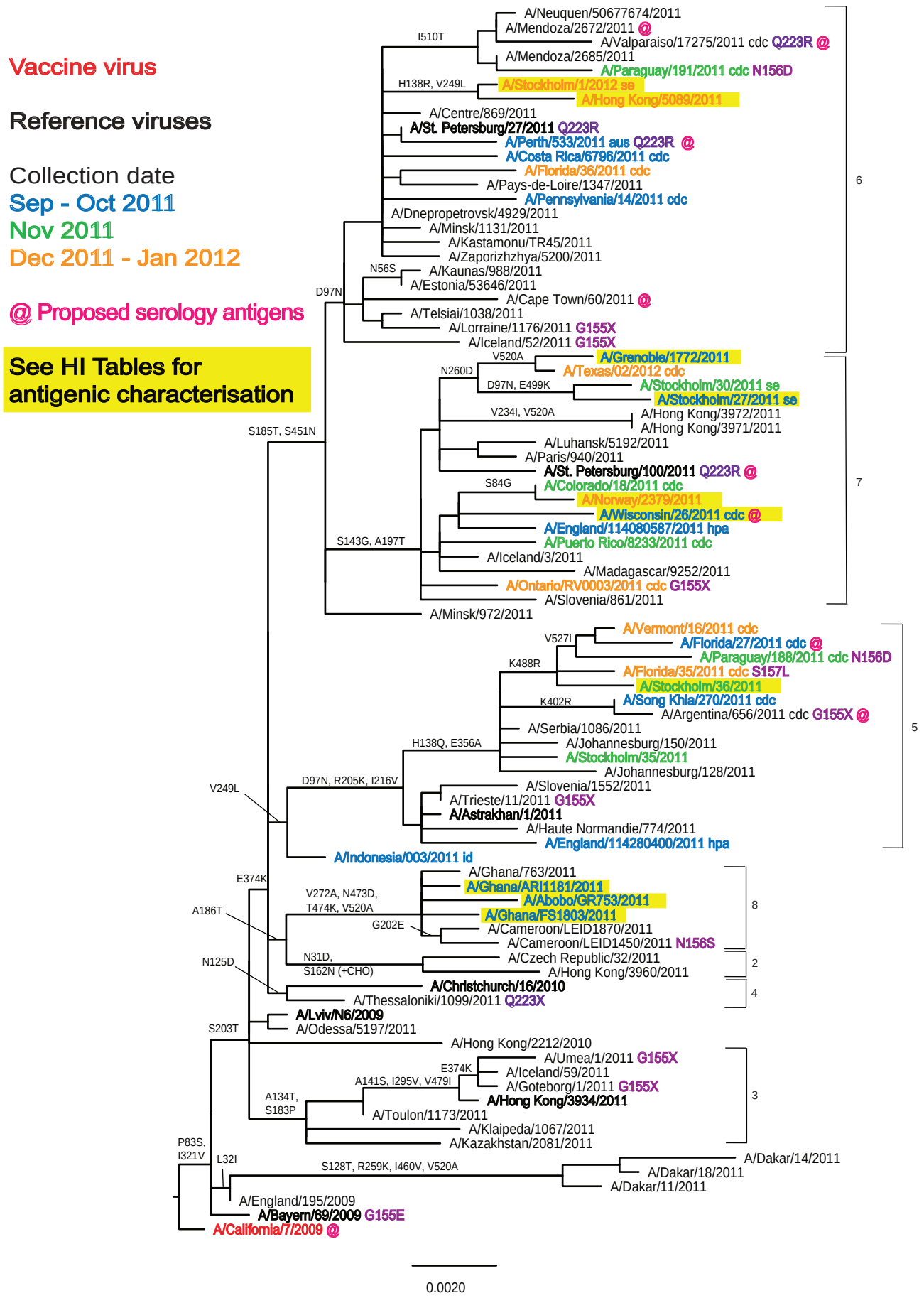


Figure 5. HA protein alignment for A(H1N1)pdm09 viruses.

Reference Viruses | Vaccine Virus | Genetic group | Potential N-linked glycosylation sites

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                                HA1       10        20        30        40        50        60        70        80        90       100
                                ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009             DTLCIGYHANNSTDTVDTVLEKNVTVTHSVNLLEDKHNGKLCKLRGVAPLHLGKCNIAGWILGNPECESLSTASSWSYIVETPSSDNGTCYPGDFIDYEE
A/Bayern/69/2009                ..........................................................................S.....................
A/Dakar/18/2011                 ......X...................I...............V..................................S.....................
A/Klaipeda/1067/2011            ..........................................................................S..................... 3
A/Hong Kong/3934/2011           ..........................................................................S..................... 3
A/Lviv/N6/2009                  ..........................................................................S.....................
A/Christchurch/16/2010          ..........................................................................S.........N........... 4
A/Czech Republic/32/2011        ...........................D..............................................S..................... 2
A/Cameroon/LEID1450/2011        ..........................................................................S..................... 8
A/Abobo/GR753/2011              ..........................................................................S..................... 8
A/England/114280400/2011        ..........................................................................S.............N..... 5
A/Astrakhan/1/2011              ..........................................................................S.............N..... 5
A/Stockholm/35/2011             ..........................................................................S.............N..... 5
A/Argentina/656/2011            ..........................................................................S.............N..... 5
A/Stockholm/36/2011             ..........................................................................S.............N..... 5
A/Florida/27/2011               ..........................................................................S.............N..... 5
A/Ontario/RV0003/2011           ..........................................................................S..................... 7
A/Wisconsin/26/2011             ..........................................................................S..................... 7
A/Norway/2379/2011              ..........................................................................SG.................... 7
A/St. Petersburg/100/2011       ..........................................................................S..................... 7
A/Hong Kong/3971/2011           ..........................................................................S..................... 7
A/Stockholm/27/2011             ..........................................................................S.............N..... 7
A/Grenoble/1772/2011            ..........................................................................S..................... 7
A/Cape Town/60/2011             ..........................................................................S.............N..... 6
A/Pennsylvania/14/2011          ...........................................I..............................S.............N..... 6
A/Florida/36/2011               ...............................N..........................................SN............N..... 6
A/Perth/533/2011                ...............................................E..........................S.............N..... 6
A/St. Petersburg/27/2011        ..........................................................................S.............N..... 6
A/Hong Kong/5089/2011           ..........................................................................S.............N..... 6
A/Valparaiso/17275/2011         ..........................................................................SN............N..... 6
A/Mendoza/2672/2011             ..........................................................................S.............N..... 6

                                        110       120       130       140       150       160       170       180       190       200
                                ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009             LREQLSSVSSFERFEIFPKTSSWPNHDSNKGVTAACPHAGAKSFYKNLIWLVKKGNSYPKLSKSYINDKGKEVLVLWGIHHPSTSADQQSLYQNADAYVF
A/Bayern/69/2009                ...................................................E.......................................
A/Dakar/18/2011                 ...........................T...........................................................
A/Klaipeda/1067/2011            ...............................T..........................................P...................
A/Hong Kong/3934/2011           ................X..............T......S.....................................P...................
A/Lviv/N6/2009                  ..........................................................................................
A/Christchurch/16/2010          .......................D................................T..........................................
A/Czech Republic/32/2011        ...................................................N........................T...............
A/Cameroon/LEID1450/2011        ...................................................S..........................T...............
A/Abobo/GR753/2011              ...................................................N........................T...............
A/England/114280400/2011        ...................................................................T......................................
A/Astrakhan/1/2011              ..........................................................................................
A/Stockholm/35/2011             ...................................Q......................................................
A/Argentina/656/2011            ...................................Q...............X......................................
A/Stockholm/36/2011             ...................................Q......................................................
A/Florida/27/2011               ...................................Q.....................................................I.........
A/Ontario/RV0003/2011           ......................................G...........X.........................XT...........T...
A/Wisconsin/26/2011             ......................................G.......................................TS..........T...
A/Norway/2379/2011              ......................................G.......................................T...........T...
A/St. Petersburg/100/2011       ......................................G.......................................T...........T...
A/Hong Kong/3971/2011           ......................................G.......................................T...........T...
A/Stockholm/27/2011             ...................N..................G.......................................T...........T...
A/Grenoble/1772/2011            ......................................G.......................................T...........T...
A/Cape Town/60/2011             ........................X.........................................................T...............
A/Pennsylvania/14/2011          ...............M...........................................................T...............
A/Florida/36/2011               ...................................................N........................T...............
A/Perth/533/2011                ..........................................................................T...............
A/St. Petersburg/27/2011        ..........................................................................T...............
A/Hong Kong/5089/2011           ...................................R......................................T...............
A/Valparaiso/17275/2011         ..........................................................................T...............
A/Mendoza/2672/2011             ..........................................................................T...............

                                        210       220       230       240       250       260       270       280       290       300
                                ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009             VGSSRYSKKFKPEIAIRPKVRDQEGRMNYYWTLVEPGDKITFEATGNLVVPRYAFAMERNAGSGIIISDTPVHDCNTTCQTPKGAINTSLPFQNIHPITI
A/Bayern/69/2009                ..........................................................................................
A/Dakar/18/2011                 ...................................................K......................................
A/Klaipeda/1067/2011            ..T.......................................................................................
A/Hong Kong/3934/2011           ..T..................N.....................................................................V.....
A/Lviv/N6/2009                  ..T..................G.......................................................................
A/Christchurch/16/2010          ..T..................N.........................A.............................................
A/Czech Republic/32/2011        ..T...........T...........................................................................
A/Cameroon/LEID1450/2011        .ET.......................................................A.....................................
A/Abobo/GR753/2011              ..T.......................................................A.....................................
A/England/114280400/2011        ..T.K.........V...............................L.............................................
A/Astrakhan/1/2011              ..T.K.........XV..............................L.............................................
A/Stockholm/35/2011             ..T.K.........V...............................L........D....................................
A/Argentina/656/2011            ..T.K.........V...............................L.............................................
A/Stockholm/36/2011             ..T.K.........V...............................L.............................................
A/Florida/27/2011               ..T.K.........V...............................L.............................................
A/Ontario/RV0003/2011           ..T.......................................................T...............................
A/Wisconsin/26/2011             ..T.......................................................................................
A/Norway/2379/2011              ..T...........T...........................................................................
A/St. Petersburg/100/2011       ..T..................R....................................................................
A/Hong Kong/3971/2011           ..T...............................I.......................................................
A/Stockholm/27/2011             ..T...................................................D..........S.......................
A/Grenoble/1772/2011            ..T...........E...........................................D...............................
A/Cape Town/60/2011             ..T...................................................H...............................
A/Pennsylvania/14/2011          ..T.......................................................................................
A/Florida/36/2011               ..T.......................................................................................
A/Perth/533/2011                ..T..................R...I.................................................................
A/St. Petersburg/27/2011        ..T..................R....................................................................
A/Hong Kong/5089/2011           ..T...........V...........................L...............................................
A/Valparaiso/17275/2011         ..T..................R...........K.....................V...............................
A/Mendoza/2672/2011             ..T.......................................................................................
```

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                                  310       320       HA2       340       350       360       370       380       390       400
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009       GKCPKYVKSTKLRLATGLRNIPSIQSRGLFGAIAGFIEGGWTGMVDGWYGYHHQNEQGSGYAADLKSTQNAIDEITNKVNSVIEKMNTQFTAVGKEFNHL
A/Bayern/69/2009          ....................V.......................................................................
A/Dakar/18/2011           ....................V.......................................................................
A/Klaipeda/1067/2011      ....................V.......................................................G...............
A/Hong Kong/3934/2011     ....................V.......................................................................
A/Lviv/N6/2009            ....................V.......................................................................
A/Christchurch/16/2010    ....................V.......................................................K...............
A/Czech Republic/32/2011  ....................V.......................................................K...............
A/Cameroon/LEID1450/2011  ....................V.......................................................K...............
A/Abobo/GR753/2011        ....................V.......................................................K.....................G....
A/England/114280400/2011  ....................V.......................................................K...............
A/Astrakhan/1/2011        ....................V.......................................................K...............
A/Stockholm/35/2011       ....................V...............................A.......................K...............
A/Argentina/656/2011      ...................................................A.......................K...............
A/Stockholm/36/2011       ....................V..............................A.......................K...............
A/Florida/27/2011         ....................V..............................A.......................K...............
A/Ontario/RV0003/2011     ....................V.......................................................K...............
A/Wisconsin/26/2011       ....................V.......................................................K...............
A/Norway/2379/2011        ....................V.......................................................K...............
A/St. Petersburg/100/2011 ....................V.......................................................K...............
A/Hong Kong/3971/2011     ....................V.......................................................K...............
A/Stockholm/27/2011       ....................V.......................................................K...............
A/Grenoble/1772/2011      ....................V.......................................................K...............
A/Cape Town/60/2011       ....................V.......................................................K...............
A/Pennsylvania/14/2011    ....................V.......................................................K...............
A/Florida/36/2011         ....................V.......................................................K...............
A/Perth/533/2011          ....................V.......................................................K...............
A/St. Petersburg/27/2011  ....................V.......................................................K...............
A/Hong Kong/5089/2011     ....................V.......................................................K...............
A/Valparaiso/17275/2011   ....................V.......................................................K...............
A/Mendoza/2672/2011       ....................V.......................................................K...............

                                  410       420       430       440       450       460       470       480       490       500
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009       EKRIENLNKKVDDGFLDIWTYNAELLVLLENERTLDYHDSNVKNLYEKVRSQLKNNAKEIGNGCFEFYHKCDNTCMESVKNGTYDYPKYSEEAKLNREEI
A/Bayern/69/2009          ..................................................................................................
A/Dakar/18/2011           ...................................................V..............................................
A/Klaipeda/1067/2011      ..................................................................................................
A/Hong Kong/3934/2011     ...................................................................I..............................
A/Lviv/N6/2009            ..................................................................................................
A/Christchurch/16/2010    ..................................................................................................
A/Czech Republic/32/2011  ...............................................N..................................................
A/Cameroon/LEID1450/2011  ...............................................................DK.................................
A/Abobo/GR753/2011        ...............................................................DK.................................
A/England/114280400/2011  ..................................................................................................
A/Astrakhan/1/2011        ..................................................................................................
A/Stockholm/35/2011       ..................................................................................................
A/Argentina/656/2011      .R................................................................................................
A/Stockholm/36/2011       ..................................................................................R.............
A/Florida/27/2011         ..................................................................................R.............
A/Ontario/RV0003/2011     ..............................X.....X..........N.............................................K.
A/Wisconsin/26/2011       ...............................................N..................................................
A/Norway/2379/2011        ...............................................N..................................................
A/St. Petersburg/100/2011 ...............................................N..................................................
A/Hong Kong/3971/2011     ...............................................N..................................................
A/Stockholm/27/2011       ...............................................N.................................................K.
A/Grenoble/1772/2011      ...............................................N..................................................
A/Cape Town/60/2011       ...............................................N..................................................
A/Pennsylvania/14/2011    ...............................................N..................................................
A/Florida/36/2011         ...............................................N..................................................
A/Perth/533/2011          ...............................................N..................................................
A/St. Petersburg/27/2011  ...............................................N..................................................
A/Hong Kong/5089/2011     ...............................................N..................................................
A/Valparaiso/17275/2011   ...............................................N..................................................
A/Mendoza/2672/2011       ...............................................N..................................................

                                  510       520       530       540       550
                          ....|....|....|....|....|....|....|....|....|....|
A/California/7/2009       DGVKLESTRIYQILAIYSTVASSLVLVVSLGAISFWMCSNGSLQCRICI*
A/Bayern/69/2009          ...................................................*
A/Dakar/18/2011           ...................A...............................*
A/Klaipeda/1067/2011      ........M.................I.........................*
A/Hong Kong/3934/2011     ...................................................*
A/Lviv/N6/2009            ...................................................*
A/Christchurch/16/2010    ...................................................*
A/Czech Republic/32/2011  ...................................................*
A/Cameroon/LEID1450/2011  ...................A...............................*
A/Abobo/GR753/2011        ...................A...............................*
A/England/114280400/2011  .........V.........................................*
A/Astrakhan/1/2011        ...................................................*
A/Stockholm/35/2011       ...................................................*
A/Argentina/656/2011      ...................................................*
A/Stockholm/36/2011       ........................A..........................*
A/Florida/27/2011         ........................I..........................*
A/Ontario/RV0003/2011     ...................................................*
A/Wisconsin/26/2011       ...................................................*
A/Norway/2379/2011        ...................................................*
A/St. Petersburg/100/2011 ...................................................*
A/Hong Kong/3971/2011     ...................A...............................*
A/Stockholm/27/2011       ...................................................*
A/Grenoble/1772/2011      ...................A...............................*
A/Cape Town/60/2011       ...................................................*
A/Pennsylvania/14/2011    ...................................................*
A/Florida/36/2011         ...................................................*
A/Perth/533/2011          ...................................................*
A/St. Petersburg/27/2011  ...................................................*
A/Hong Kong/5089/2011     ...................................................*
A/Valparaiso/17275/2011   .........T......................G..................*
A/Mendoza/2672/2011       .........T..........................................*
```

Figure 6. H1-HA locations of genetic cluster defining amino acid substitutions.

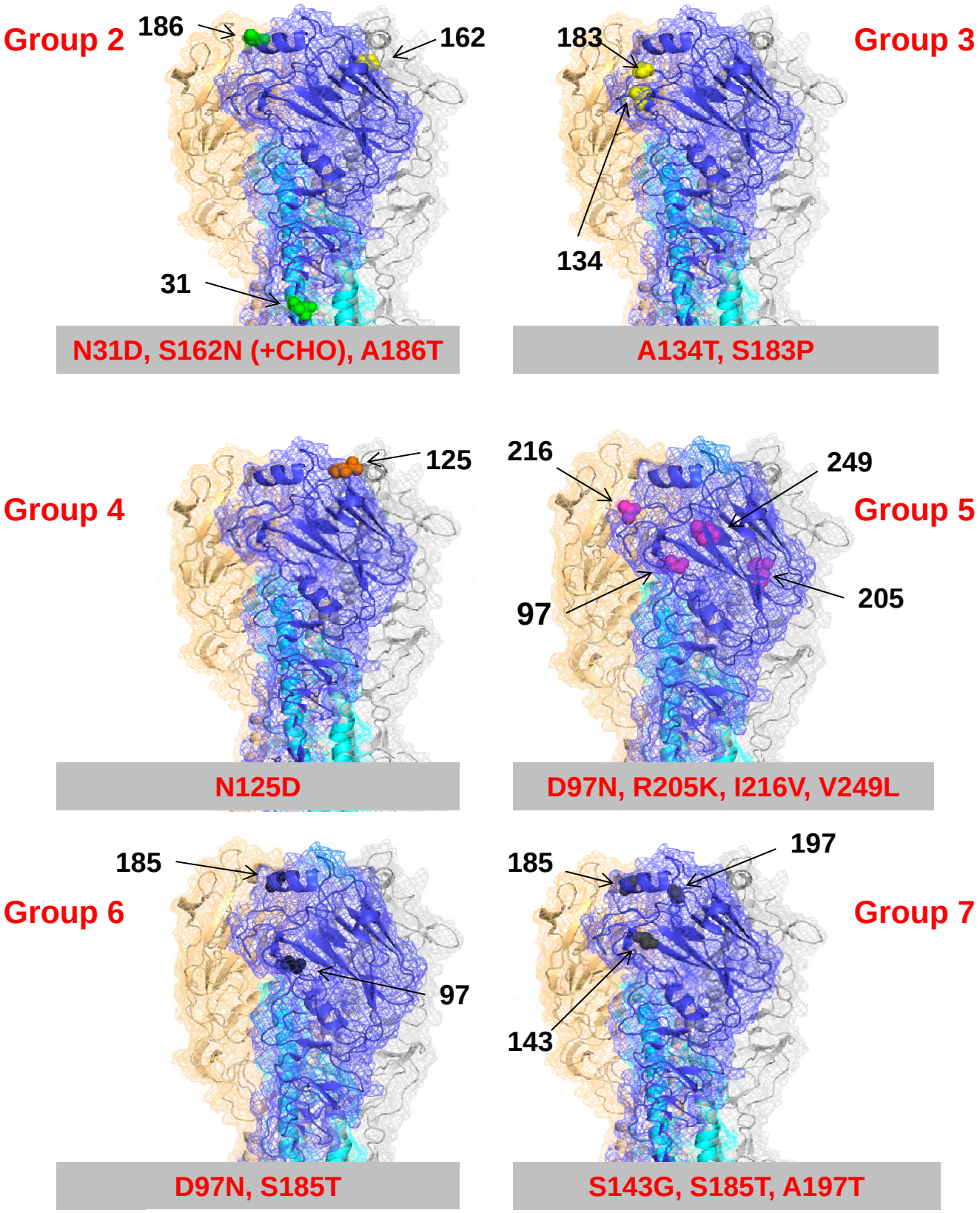

Figure 7. Phylogenetic comparison of influenza A(H1N1)pdm09 NA genes

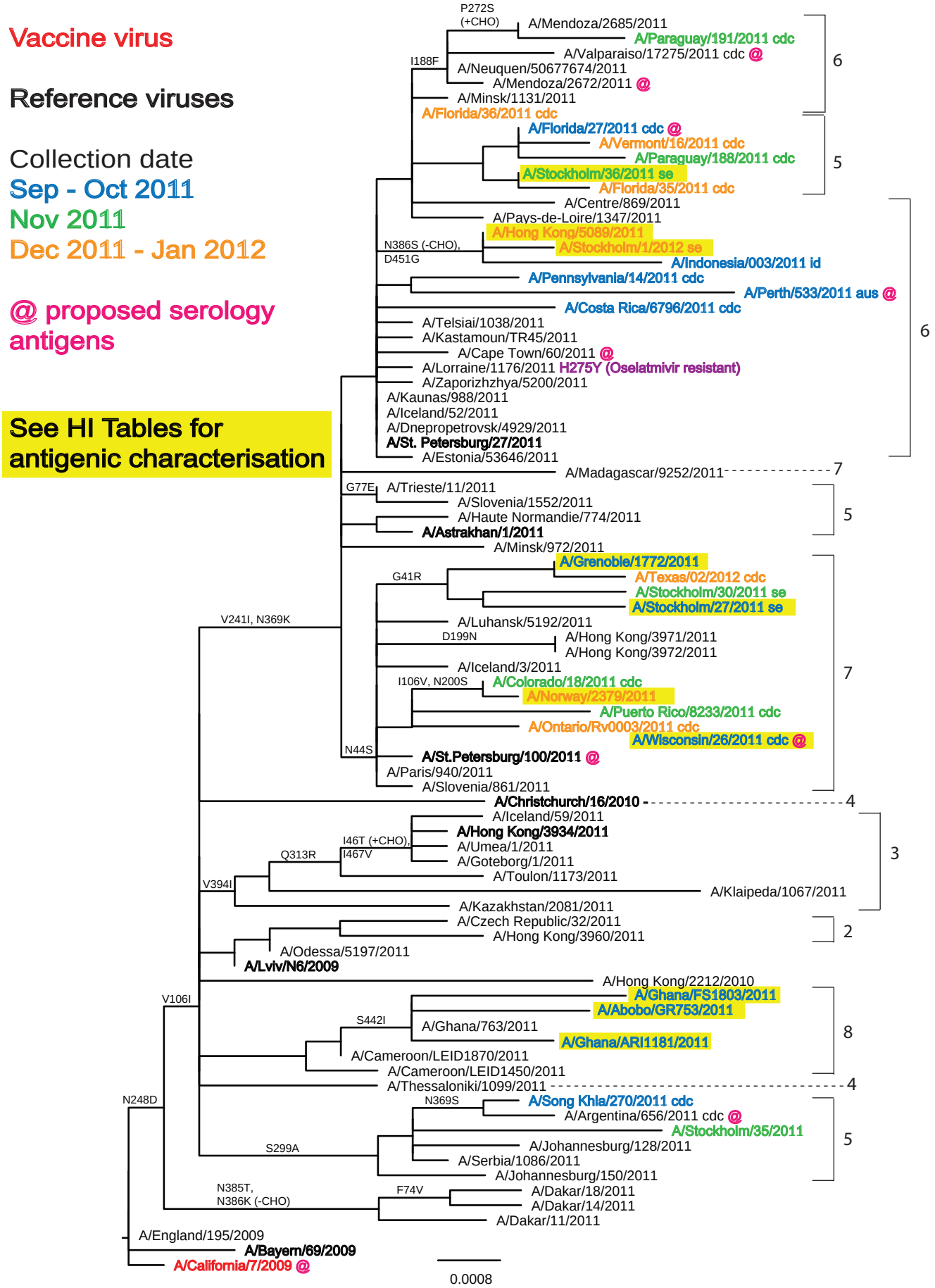

Figure 8. NA protein alignment for A(H1N1)pdm09 viruses.

Reference Viruses | Vaccine Virus | Genetic group | Potential N-linked glycosylation sites

```
                                         10        20        30        40        50        60        70        80        90       100
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009              MNPNQKIITIGSVCMTIGMANLILQIGNIISIWISHSIQLGNQNQIETCNQSVITYENNTWVNQTYVNISNTNFAAGQSVVSVKLAGNSSLCPVSGWAIY
A/Bayern/69/2009                 ..................................................................................................
A/Dakar/18/2011                  ..................................................................V...............................
A/Klaipeda/1067/2011             .................................................................................................. 3
A/Hong Kong/3934/2011            ...........................................T........................................................ 3
A/Lviv/N6/2009                   ..................................................................................................
A/Christchurch/16/2010           ...I..........I.......................................................................................... 4
A/Czech Republic/32/2011         .................................................................................................. 2
A/Cameroon/LEID1450/2011         ..................................................R.................................................. 8
A/Abobo/GR753/2011               ..................L.S.............................................................V..................... 8
A/Astrakhan/1/2011               .................................................................................................. 5/7
A/Stockholm/35/2011              .................................................................................................. 5
A/Argentina/656/2011             ................X..........D.......................................................................... 5
A/Stockholm/36/2011              .................................................................................................. 5/6
A/Florida/27/2011                .................................................................................................. 5/6
A/Ontario/RV0003/2011            ........................................S.......................................................... 7
A/Wisconsin/26/2011              ........................................S.......N...............................P..................... 7
A/Norway/2379/2011               ....................T...................S.......................................................... 7
A/St. Petersburg/100/2011        ........................................S.......................................................... 7
A/Hong Kong/3971/2011            ........................................S.......................................................... 7
A/Stockholm/27/2011              ......................................R..S.......................................................... 7
A/Grenoble/1772/2011             ......................................R..S.......................................................... 7
A/Cape Town/60/2011              .................................................................................................. 6
A/Pennsylvania/14/2011           .................................................................................................. 6
A/Florida/36/2011                .................................................................................................. 6
A/Perth/533/2011                 ..................................................................L..E.......................... 6
A/St. Petersburg/27/2011         .................................................................................................. 6
A/Hong Kong/5089/2011            .................................................................................................. 6
A/Valparaiso/17275/2011          .................................................................................................. 6
A/Mendoza/2672/2011              .................................................................................................. 6

                                         110       120       130       140       150       160       170       180       190       200
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009              SKDNSVRIGSKGDVFVIREPFISCSPLECRTFFLTQGALLNDKHSNGTIKDRSPYRTLMSCPIGEVPSPYNSRFESVAWSASACHDGINWLTIGISGPDN
A/Bayern/69/2009                 ..................................................................................................
A/Dakar/18/2011                  ...............................................................X..................................
A/Klaipeda/1067/2011             .....I............................................................................................
A/Hong Kong/3934/2011            .....I............................................................................................
A/Lviv/N6/2009                   .....I............................................................................................
A/Christchurch/16/2010           .....I.......................................................................S....................
A/Czech Republic/32/2011         .....I............................................................................................
A/Cameroon/LEID1450/2011         .....I............................................................................................
A/Abobo/GR753/2011               .....I............................................................................................
A/Astrakhan/1/2011               .....I............................................................................................
A/Stockholm/35/2011              .....I............................................................................................
A/Argentina/656/2011             .....I.....................................R......................................................
A/Stockholm/36/2011              .....I............................................................................................
A/Florida/27/2011                .....I............................................................................................
A/Ontario/RV0003/2011            .....I.............................S..............................................................
A/Wisconsin/26/2011              .....I............................................................................................
A/Norway/2379/2011               ..................................................................................................S
A/St. Petersburg/100/2011        .....I............................................................................................
A/Hong Kong/3971/2011            .....I...........................................................................................N.
A/Stockholm/27/2011              .....I............................................................................................
A/Grenoble/1772/2011             .....I............................................................................................
A/Cape Town/60/2011              .....I............................................................................................
A/Pennsylvania/14/2011           .....I............................................................................................
A/Florida/36/2011                .....I............................................................................................
A/Perth/533/2011                 .....I............................................................................................
A/St. Petersburg/27/2011         .....I............................................................................................
A/Hong Kong/5089/2011            .....I............................................................................................
A/Valparaiso/17275/2011          .....I.......................................................................F....................
A/Mendoza/2672/2011              .....I.......................................................................F....................

                                         210       220       230       240       250       260       270       280       290       300
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009              GAVAVLKYNGIITDTIKSWRNNILRTQESECACVNGSCFTVMTDGPSNGQASYKIFRIEKGKIVKSVEMNAPNYHYEECSCYPDSSEITCVCRDNWHGSN
A/Bayern/69/2009                 ...........................................................................G......................
A/Dakar/18/2011                  ...................................D..............................................................
A/Klaipeda/1067/2011             ...........................V.......D..............................................................
A/Hong Kong/3934/2011            ...................................D..............................................................
A/Lviv/N6/2009                   ...................................D..............................................................
A/Christchurch/16/2010           ...................................D..............................................................
A/Czech Republic/32/2011         ...................................D..............................................................
A/Cameroon/LEID1450/2011         ...................................D..............................................................
A/Abobo/GR753/2011               ...................................D..............................................................
A/Astrakhan/1/2011               ...............................I...D..............................................................
A/Stockholm/35/2011              ...................................ND.............................................................A.
A/Argentina/656/2011             ...................................D..............................................................A.
A/Stockholm/36/2011              ...............................I...D..............................................................
A/Florida/27/2011                ...............................I...D..............................................................
A/Ontario/RV0003/2011            ...............................I...D..............................................................
A/Wisconsin/26/2011              ...............................I...D..............................................................
A/Norway/2379/2011               ...............................I...D..............................................................
A/St. Petersburg/100/2011        ...............................I...D..............................................................
A/Hong Kong/3971/2011            ...............................I...D..............................................................
A/Stockholm/27/2011              ...............................I...D.......................H......................................
A/Grenoble/1772/2011             ...............................I...D..............................................................
A/Cape Town/60/2011              ...............................I...D..............................................................
A/Pennsylvania/14/2011           ...............................I...D..............................................................
A/Florida/36/2011                ...............................I...D..............................................................
A/Perth/533/2011                 ...............................I...D..............................................................
A/St. Petersburg/27/2011         ...............................I...D..............................................................
A/Hong Kong/5089/2011            ...............................I...D..............................................................
A/Valparaiso/17275/2011          ...............................I...D..............................................................
A/Mendoza/2672/2011              ...............................I...D...........X..................................................
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                                  310       320       330       340       350       360       370       380       390       400
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009       RPWVSFNQNLEYQIGYICSGIFGDNPRPNDKTGSCGPVSSNGANGVKGFSFKYGNGVWIGRTKSISSRNGFEMIWDPNGWTGTDNNFSIKQDIVGINEWS
A/Bayern/69/2009          ..................................................................................................
A/Dakar/18/2011           ...................................................................................TK.............
A/Klaipeda/1067/2011      ...................................................................................V....I......
A/Hong Kong/3934/2011     ............R.......................................................................I......
A/Lviv/N6/2009            ..................................................................................................
A/Christchurch/16/2010    ...................................................................I..............................
A/Czech Republic/32/2011  ..................................................................................S.............
A/Cameroon/LEID1450/2011  ..................................................................................S.............
A/Abobo/GR753/2011        ..................................................................................S.............
A/Astrakhan/1/2011        ...............................................................K..................S.............
A/Stockholm/35/2011       ..................................................................................S.............
A/Argentina/656/2011      ...............................................................S..................S.............
A/Stockholm/36/2011       ...............................................................K..................S.............
A/Florida/27/2011         ...............................................................K..................S.............
A/Ontario/RV0003/2011     ...............................................................K..................Y.............
A/Wisconsin/26/2011       ...............................................................K..................S.............
A/Norway/2379/2011        ...............................................................K..................S.............
A/St. Petersburg/100/2011 ...................................................I..........K..................S.............
A/Hong Kong/3971/2011     ...............................................................K..................S.............
A/Stockholm/27/2011       ...............................................................K..................S.............
A/Grenoble/1772/2011      ...............................................................K..................S.............
A/Cape Town/60/2011       ...............................................................K..................S.............
A/Pennsylvania/14/2011    ...........................H...................................K..................S.............
A/Florida/36/2011         ...............................................................K..................S.............
A/Perth/533/2011          ...............................................................K..................S.....V.......
A/St. Petersburg/27/2011  ...............................................................K..................S.............
A/Hong Kong/5089/2011     ...............................................................K..................S.............
A/Valparaiso/17275/2011   ...............................................................K..................S.............
A/Mendoza/2672/2011       ...............................................................K..................S.............

                                  410       420       430       440       450       460       470
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/California/7/2009       GYSGSFVQHPELTGLDCIRPCFWVELIRGRPKENTIWTSGSSISFCGVNSDTVGWSWPDGAELPFTIDK*
A/Bayern/69/2009          ...................................................................*
A/Dakar/18/2011           ...................................................................*
A/Klaipeda/1067/2011      ...................................................................*
A/Hong Kong/3934/2011     ...............................................................V...*
A/Lviv/N6/2009            ...................................................................*
A/Christchurch/16/2010    ...................................................................*
A/Czech Republic/32/2011  ...................................................................*
A/Cameroon/LEID1450/2011  ...................................................................*
A/Abobo/GR753/2011        ......................................I............................*
A/Astrakhan/1/2011        ...................................................................*
A/Stockholm/35/2011       ...................................................................*
A/Argentina/656/2011      ...................................................................*
A/Stockholm/36/2011       ...................................................................*
A/Florida/27/2011         ...................................................................*
A/Ontario/RV0003/2011     ...................................................................*
A/Wisconsin/26/2011       ...............................................E....................*
A/Norway/2379/2011        ...................................................................*
A/St. Petersburg/100/2011 ...................................................................*
A/Hong Kong/3971/2011     ...................................................................*
A/Stockholm/27/2011       ...................................................................*
A/Grenoble/1772/2011      ...................................................................*
A/Cape Town/60/2011       ...................................................................*
A/Pennsylvania/14/2011    ...................................................................*
A/Florida/36/2011         ...................................................................*
A/Perth/533/2011          ...................................................................*
A/St. Petersburg/27/2011  ...................................................................*
A/Hong Kong/5089/2011     ...............................................G....................*
A/Valparaiso/17275/2011   ...................................................................*
A/Mendoza/2672/2011       ...................................................................*
```

Figure 9. Phylogenetic comparison of influenza A(H1N1)pdm09 M genes

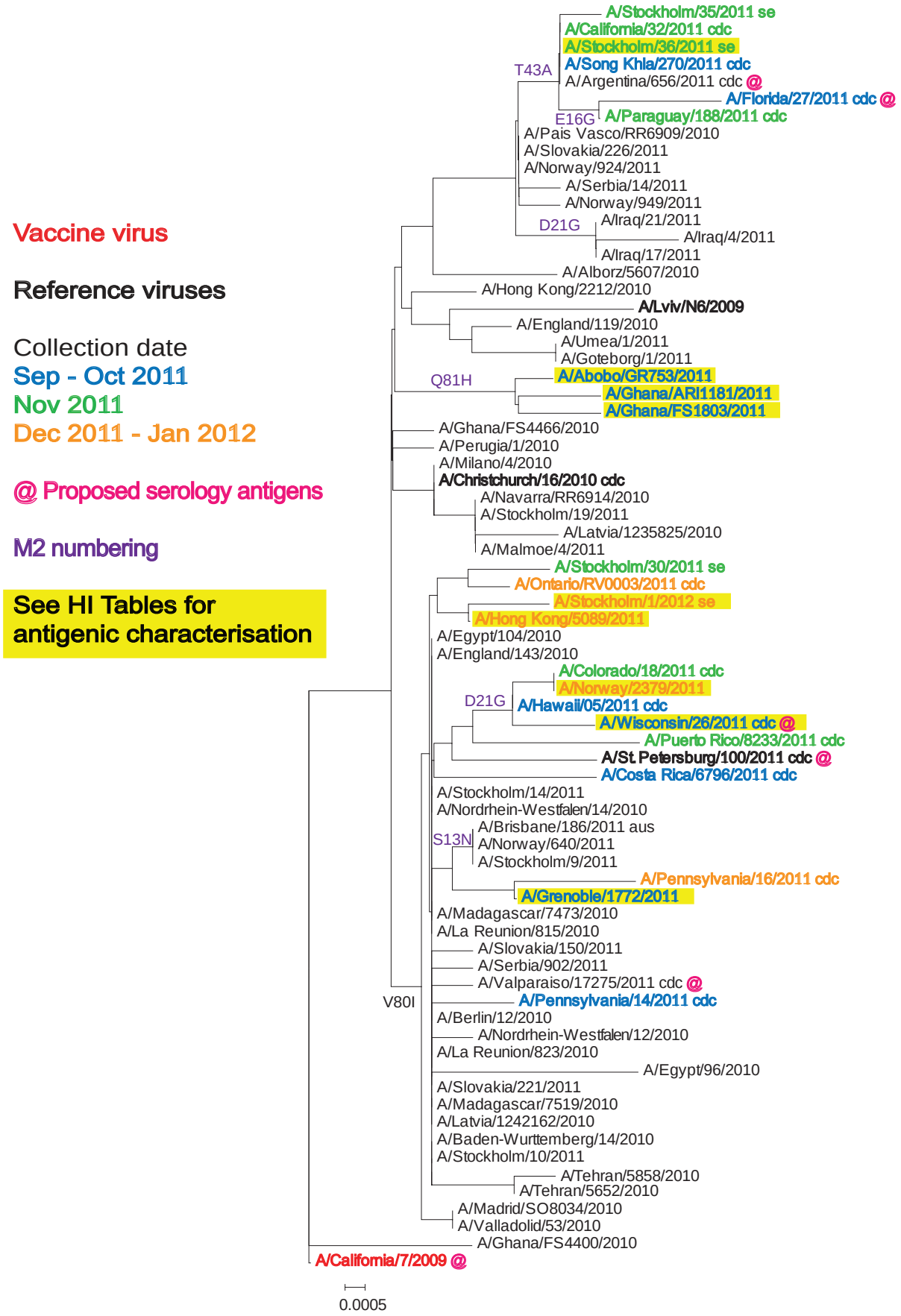


Table 7. Summary of influenza A (H3N2) samples received, collected since 2011-09-01

MONTH	H3N2			
Country	Number propagated	≤2 fold*	4 fold*	≥8 fold*
SEPTEMBER				
Cote d'Ivoire	2		1	1
Denmark	1			1
Jordan	2		1	1
Senegal	1			1
Sweden	2			2
United Kingdom	1		1	
OCTOBER				
Algeria	2			2
Cote d'Ivoire	3			3
France	1			1
Ghana	0			
Jordan	1		1	
Morocco	1			1
Norway	2	1	1	
Senegal	1			1
Sweden	2			2
United Kingdom	3			3
NOVEMBER				
Albania	0			
Algeria	2			2
Belgium	1			1
Cote d'Ivoire	4			4
Denmark	1			1
Finland	1			1
France	1			1
Germany	2		1	1
Ghana	1			1
Hong Kong SAR	2			2
Iran	6	1	4	1
Ireland	0			
Italy	4			4
Jordan	2			2
Morocco	3			3
Norway	3		1	2
Portugal	1			1
Slovakia	2	2		
Spain	2			2
Sweden	4		1	3
Tunisia	1			1
Turkey	2			2
United Kingdom	2			2
DECEMBER				
Belgium	3			3
France	14		2	12
Germany	12	1	9	2
Hong Kong SAR	2			2
Iran	4			4
Ireland	6			6
Israel	7			7
Italy	19		3	16
Jordan	8		1	7
Latvia	1			1
Morocco	8			8
Netherlands	3			3
Norway	21	3	2	16
Romania	3		3	
Slovenia	2	1	1	
Spain	10	4	2	4
Sweden	8		4	4
Switzerland	1			1
Turkey	41	1	5	35
JANUARY				
Austria	4		1	3
Finland	2	1		1
France	4			4
Germany	13	2	5	6
Iran	6			6
Ireland	2			2
Italy	1			1
Jordan	0			
Latvia	5		1	4
Netherlands	2	1		1
Norway	5	2		3
Portugal	2			2
Romania	3		2	1
Slovenia	1			1
Spain	4			4
Sweden	5	1	2	2
Switzerland	7			7
Turkey	11			11
United Kingdom	3		1	2
Total	325	21	56	248
		6.5%	17.2%	76.3%

* Reduction in HI titre with ferret antiserum raised against A/Perth/16/2009 (egg grown vaccine virus) - results only for those viruses that could be tested in the presence of oseltamivir are presented

Table 8. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) - 2011-12-09

Viruses		Collection Date	Passage History	Haemagglutination inhibition titre[1] Post infection ferret sera								
				A/Bris 10/07 F18/07	A/Perth 16/09 F35/11	A/Vic 208/09 F7/10	A/Vic 210/09 F11/10	A/Ala 5/10 F27/10	A/Perth 10/10 F03/11	A/HK 3969/11 F27/11	A/Stock 18/11 F28/11	A/Iowa 19/10 F15/11
Genetic group							group 1	group 5	group 5	group 3C	group 3A	group 6
REFERENCE VIRUSES												
A/Brisbane/10/2007		2007-02-06	E2/E1	5120	80	40	80	<	80	320	40	40
A/Perth/16/2009		2009-07-04	E3/E1	<	640	40	160	80	160	320	160	160
A/Victoria/208/2009		2009-06-02	E3/E2	1280	640	2560	2560	1280	2560	2560	1280	5120
A/Victoria/210/2009		2009-06-02	E2/E3	640	1280	1280	2560	320	1280	1280	640	1280
A/Alabama/5/2010		2010-07-13	MK2/M2/SIAT5	80	80	40	40	320	320	640	160	320
A/Perth/10/2010		2010-05-25	E2/E1	640	320	1280	2560	640	1280	2560	1280	1280
A/Hong Kong/3969/2011		2011-05-19	MDCK3	320	160	160	320	320	640	1280	320	640
A/Stockholm/18/2011		2011-03-28	MDCK2/SIAT2	160	80	40	40	80	160	640	320	160
A/Iowa/19/2010		2010-12-30	E3/E1	160	320	1280	1280	640	1280	2560	1280	5120
TEST VIRUSES												
A/England/253/2011	3C	2011-09-11	SIAT1/SIAT1	160	160	160	160	320	640	1280	640	640
A/England/257/2011	3B	2011-10-10	SIAT1/SIAT1	160	80	160	160	320	320	640	640	320
A/England/256/2011	3B	2011-10-12	SIAT1/SIAT1	160	80	160	160	160	320	640	320	320
A/England/255/2011	3B	2011-10-14	SIAT1/SIAT1	80	40	80	160	160	160	320	320	160
A/Bratislava/31/2011	3C	2011-11-03	SIAT2	160	160	320	640	640	640	1280	640	640
A/Bratislava/31/2011	3C	2011-11-03	MDCK2/SIAT1	160	160	160	160	320	320	640	320	320
A/England/258/2011	3C	2011-11-07	SIAT1/SIAT1	80	80	80	80	160	320	640	320	320
A/Tunisia/15685/2011	3B	2011-11-09	SIAT2	80	80	80	80	80	160	640	320	320
A/England/259/2011	3B	2011-11-16	SIAT1/SIAT1	80	80	80	80	160	320	640	320	160
A/Finland/190/2011	3C	2011-11-25	SIAT3/SIAT3	160	80	80	80	160	160	640	320	160

1. < = <40

Vaccine virus

Sequences in HA/NA phylogenetic trees

Sequences in M phylogenetic tree

Table 9. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2012-01-11

Viruses		Collection Date	Passage History	Haemagglutination inhibition titre[1]								
				Post infection ferret sera								
				A/Bris 10/07	A/Perth 16/09	A/Vic 208/09	A/Vic 210/09	A/Ala 5/10	A/Perth 10/10	A/HK 3969/11	A/Stock 18/11	A/Iowa 19/10
				F29/09	F35/11	F7/10	F11/10	F27/10	F03/11	F27/11	F28/11	F15/11
Genetic group							group 1	group 5	group 5	group 3C	group 3A	group 6
REFERENCE VIRUSES												
A/Brisbane/10/2007		2007-02-06	E2/E1	640	40	40	<	<	80	160	<	40
A/Perth/16/2009		2009-07-04	E3/E2	<	640	40	160	160	160	640	160	160
A/Victoria/208/2009		2009-06-02	E3/E1	320	640	2560	2560	1280	2560	2560	2560	2560
A/Victoria/210/2009		2009-06-02	E2/E3	320	2560	2560	5120	640	2560	2560	1280	1280
A/Alabama/5/2010		2010-07-13	MK1/C2/SIAT2	<	80	40	40	320	320	640	320	320
A/Perth/10/2010		2010-05-25	E2/E2	320	640	1280	2560	1280	2560	2560	1280	1280
A/Hong Kong/3969/2011		2011-05-19	MDCK2/SIAT4	80	160	80	160	320	320	1280	320	320
A/Stockholm/18/2011		2011-03-28	MDCK2/SIAT3	80	80	80	160	320	320	1280	640	320
A/Iowa/19/2010		2010-12-30	E3/E1	320	640	2560	2560	2560	2560	2560	2560	2560
TEST VIRUSES												
A/Brisbane/299/2011	6	2011-08-13	E5/E1	160	160	640	1280	320	640	1280	640	1280
A/Stockholm/23/2011	3B	2011-09-05	C1/SIAT1	<	40	80	80	80	160	320	160	80
A/Stockholm/24/2011	3B	2011-09-05	C1/SIAT1	<	40	80	80	160	320	320	320	320
A/Stockholm/26/2011	3A	2011-10-05	C1/SIAT1	<	40	80	80	160	160	320	320	160
A/Norway/2047/2011	6	2011-10-10	MDCK1/SIAT1	40	160	160	160	320	640	1280	320	640
A/Norway/2125/2011	6	2011-10-26	SIAT1/SIAT1	80	320	320	320	640	1280	2560	640	1280
A/Algeria/G04/2011	3B	2011-10-30	C0/SIAT1	<	80	160	160	160	320	640	320	320
A/Stockholm/29/2011	3B	2011-10-31	C1/SIAT1	<	40	80	80	160	160	640	320	160
A/Algeria/G05/2011	3B	2011-10-31	C1/SIAT1	<	40	80	80	80	160	320	160	160
A/Norway/2146/2011	3B	2011-11-02	MDCK1/SIAT1	<	40	80	80	160	160	320	160	160
A/Algeria/G10/2011	3A	2011-11-03	C0/SIAT1	<	80	160	160	160	320	640	640	320
A/Algeria/G36/2011	3A	2011-11-13	C0/SIAT1	<	80	160	160	160	320	640	640	320
A/Bayern/87/2011	3B	2011-11-16	MDCK2/SIAT1	<	80	160	160	160	320	640	320	320
A/Stockholm/33/2011	3B	2011-11-19	C2/SIAT1	<	80	80	160	160	320	640	320	320
A/Stockholm/32/2011	3C	2011-11-27	C2/SIAT1	40	160	160	160	320	640	1280	640	640
A/Stockholm/34/2011	3B	2011-11-27	C1/SIAT1	40	40	80	80	160	160	320	160	160
A/Netherlands/702/2011	6	2011-12-02	MDCK4/SIAT1	<	80	80	80	160	320	640	160	320
A/Berlin/85/2011	3C	2011-12-07	MDCK2/SIAT1	40	160	160	160	320	640	1280	640	640
A/Berlin/86/2011	3C	2011-12-09	MDCK2/SIAT1	40	160	160	160	320	640	640	640	640
A/Berlin/87/2011	3C	2011-12-12	MDCK2/SIAT1	40	160	160	160	320	640	640	640	640

1. < = <40

Vaccine virus

Sequences in HA/NA phylogenetic trees

Sequences in M phylogenetic tree

Table 10. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2012-01-18

Viruses		Collection Date	Passage History	Haemagglutination inhibition titre[1]								
				Post infection ferret sera								
				A/Bris 10/07 F29/09	A/Perth 16/09 F30/09	A/Vic 208/09 F7/10	A/Vic 210/09 F11/10	A/Ala 5/10 F27/10	A/Perth 10/10 F03/11	A/HK 3969/11 F27/11	A/Stock 18/11 F28/11	A/Iowa 19/10 F15/11
Genetic group							group 1	group 5	group 5	group 3C	group 3A	group 6
REFERENCE VIRUSES												
A/Brisbane/10/2007		2007-02-06	E2/E1	640	<	<	<	<	80	160	40	<
A/Perth/16/2009		2009-07-04	E3/E2	<	320	40	160	160	160	640	160	160
A/Victoria/208/2009		2009-06-02	E3/E1	640	640	2560	2560	1280	2560	2560	1280	2560
A/Victoria/210/2009		2009-06-02	E2/E3	1280	1280	1280	5120	320	2560	1280	640	1280
A/Alabama/5/2010		2010-07-13	MK1/C2/SIAT2	<	80	40	40	160	320	320	160	160
A/Perth/10/2010		2010-05-25	E2/E2	640	640	1280	2560	1280	2560	2560	1280	2560
A/Hong Kong/3969/2011		2011-05-19	MDCK2/SIAT4	80	160	160	160	320	640	1280	640	320
A/Stockholm/18/2011		2011-03-28	MDCK2/SIAT3	80	160	160	160	320	320	640	1280	320
A/Iowa/19/2010		2010-12-30	E3/E1	160	1280	5120	2560	2560	5120	2560	2560	5120
TEST VIRUSES												
A/Chiang Rai/277/2011	3C	2011-09-20	C1/C1/SIAT1	40	160	320	160	320	640	1280	320	640
A/Hormozgan/7980/2011	3B	2011-11-01	MDCK3/SIAT1	<	40	160	80	160	160	320	320	320
A/Hormozgan/7981/2011	3B	2011-11-01	MDCK4/SIAT1	40	160	320	320	320	320	640	320	320
A/Khorasan/8032/2011	3B	2011-11-01	MDCK1/SIAT1	40	160	320	320	320	640	640	640	640
A/Khorasan/8320/2011	3B	2011-11-01	MDCK1/SIAT1	40	160	160	160	320	320	640	640	640
A/Tehran/8331/2011	5	2011-11-01	MDCK3/SIAT1	40	160	160	160	320	640	640	320	640
A/Esfahan/8343/2011	5	2011-11-01	MDCK2/SIAT1	40	320	160	320	640	640	1280	640	1280
A/Kentucky/05/2011	6	2011-11-04	X1/C2/SIAT1	<	40	40	40	160	160	320	160	160
A/Utah/12/2011	3B	2011-11-06	C1/SIAT1	80	80	160	160	160	320	640	640	320
A/Madrid/RR8753/2011	3B	2011-11-30	SIAT1/SIAT1	40	80	160	160	160	320	640	320	320
A/Slovenia/2855/2011	5	2011-12-05	MDCKx/SIAT1	40	160	160	160	640	640	1280	320	640
A/Berlin/92/2011	3C	2011-12-07	C5/SIAT1	40	160	640	320	640	640	1280	640	640
A/Berlin/93/2011	3C	2011-12-07	C5/SIAT1	80	320	640	320	640	640	1280	640	640
A/Norway/2366/2011	3B	2011-12-07	SIAT2	160	160	160	160	320	320	640	320	320
A/Berlin/89/2011	3C	2011-12-09	C3/SIAT1	40	160	320	160	320	320	640	320	640
A/Slovenia/2970/2011	5	2011-12-12	MDCKx/SIAT1	40	320	320	320	640	640	1280	640	640
A/Berlin/88/2011	3C	2011-12-13	C1/SIAT1	40	160	320	160	320	640	1280	320	640
A/Berlin/90/2011		2011-12-21	C3/SIAT1	40	160	640	320	320	640	1280	640	640
A/Madrid/RR8856/2011	3B	2011-12-22	SIAT1/SIAT1	40	160	160	160	320	320	640	320	320
A/Berlin/91/2011	3C	2011-12-23	C2/SIAT1	40	160	640	320	640	640	1280	640	640
A/Castilla La Mancha/RR8843/2011	3C	2011-12-26	SIAT1/SIAT2	40	320	160	320	320	640	1280	640	640
A/Pais Vasco/RR8864/2011	3A	2011-12-26	SIAT1/SIAT1	<	80	160	160	160	320	320	640	320
A/Pais Vasco/RR8867/2011	3B	2011-12-27	SIAT1/SIAT2	40	80	160	160	320	320	640	320	320
A/Castilla La Mancha/RR8870/2011	3B	2011-12-27	SIAT1/SIAT1	40	160	160	160	160	320	640	320	320
A/Castilla La Mancha/RR8871/2011	6	2011-12-27	SIAT1/SIAT1	40	160	320	160	320	320	640	320	640
A/Berlin/1/2012	3B	2012-01-02	C1/SIAT1	40	160	160	160	320	320	640	320	320
A/Slovenia/9/2012	5	2012-01-03	MDCKx/SIAT1	<	80	80	80	320	320	640	320	320

1. < = <40

Vaccine virus

Sequences in HA/NA phylogenetic trees

Sequences in M phylogenetic tree

Table 11. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2012-01-25

Viruses		Collection Date	Passage History	Haemagglutination inhibition titre[1]								
				Post infection ferret sera								
				A/Bris 10/07	A/Perth 16/09	A/Vic 208/09	A/Vic 210/09	A/Ala 5/10	A/Perth 10/10	A/HK 3969/11	A/Stock 18/11	A/Iowa 19/10
				F29/09	F35/11	F7/10	F11/10	F27/10	F03/11	F27/11	F28/11	F15/11
Genetic group							group 1	group 5	group 5	group 3C	group 3A	group 6
REFERENCE VIRUSES												
A/Brisbane/10/2007		2007-02-06	E2/E1	1280	80	80	160	40	160	320	80	80
A/Perth/16/2009		2009-07-04	E3/E2	<	1280	80	640	320	640	1280	320	320
A/Victoria/208/2009		2009-06-02	E3/E1	640	1280	5120	5120	1280	5120	5120	2560	5120
A/Victoria/210/2009		2009-06-02	E2/E2	640	2560	2560	5120	640	2560	1280	1280	2560
A/Alabama/5/2010		2010-07-13	MK1/M2/SIAT5	<	80	40	80	320	320	640	320	320
A/Perth/10/2010		2010-05-25	E3/E1	320	640	1280	2560	1280	2560	2560	1280	2560
A/Hong Kong/3969/2011		2011-05-19	M2/SIAT4	160	320	160	640	320	640	1280	640	640
A/Stockholm/18/2011		2011-03-28	MDCK2/SIAT3	80	160	80	160	160	320	640	640	320
A/Iowa/19/2010		2010-12-30	E3/E1	160	1280	5120	2560	2560	5120	5120	5120	5120
TEST VIRUSES												
A/Adjame/GR765/2011	3A	2011-09-12	SIAT3	40	320	320	160	320	640	640	2560	640
A/Yopougon/GR826/2011		2011-09-15	SIAT2	40	80	160	80	160	320	320	640	320
A/Attecoube/GR1099/2011	3A	2011-10-17	SIAT2	80	160	320	160	320	640	1280	1280	640
A/Marrakech/38/2011		2011-10-20	SIAT3	<	80	160	80	160	320	320	320	320
A/Attecoube/GR1241/2011		2011-10-31	SIAT2	40	80	160	80	160	640	1280	640	640
A/Adjame/GR1272/2011	3A	2011-11-10	SIAT2	40	80	160	160	160	320	1280	640	320
A/Adjame/GR1327/2011	3A	2011-11-18	SIAT2	40	80	160	160	160	640	1280	640	320
A/Porto/EuroEva58/2011	3A	2011-11-20	SIAT1	40	160	320	80	320	640	1280	1280	320
A/Norway/2233/2011		2011-11-22	MDCK1/SIAT1	40	160	160	160	320	320	640	640	320
A/Meknes/49H/2011		2011-11-24	SIAT2	40	80	80	80	160	320	640	320	320
A/Belgium/G1063/2011	3B	2011-11-25	SIAT2	40	40	80	80	160	320	640	320	320
A/Meknes/136H/2011	3B	2011-11-28	SIAT2	40	80	160	160	160	320	640	640	320
A/Berlin/94/2011	3C	2011-11-29	C3/SIAT1	80	320	320	320	640	1280	2560	1280	1280
A/Meknes/56H/2011		2011-11-30	SIAT2	40	80	320	80	160	320	640	320	320
A/Hong Kong/4960/2011	3C	2011-11-30	MDCK3/SIAT1	40	80	80	160	160	320	320	320	320
A/Hong Kong/4937/2011	3C	2011-11-30	MDCK3/SIAT1	40	160	160	80	160	320	1280	320	320
A/Norway/2350/2011	3B	2011-11-30	MDCK1/SIAT1	40	80	160	160	160	320	320	320	640
A/Meknes/68/2011		2011-12-01	SIAT2	<	80	160	80	160	320	640	320	320
A/Tehran/9671/2011		2011-12-01	MDCK2/SIAT1	40	160	320	320	640	640	1280	640	640
A/Ghom/9677/2011	3C	2011-12-01	MDCK2/SIAT1	40	160	320	160	320	640	1280	640	640
A/Tehran/9720/2011		2011-12-01	MDCK2/SIAT1	40	160	160	160	320	640	1280	640	640
A/Tehran/9721/2011		2011-12-01	MDCK2/SIAT1	40	160	160	160	160	320	640	640	320
A/Hong Kong/4974/2011	3C	2011-12-01	MDCK3/SIAT1	40	160	160	160	320	320	1280	640	320
A/Norway/2335/2011		2011-12-01	MDCK2/SIAT1	40	160	160	320	320	640	1280	640	640
A/Norway/2329/2011	3B	2011-12-02	MDCK1/SIAT1	40	80	160	80	160	320	320	320	320
A/Belgium/G1109/2011	3C	2011-12-05	SIAT3	40	160	320	160	640	1280	2560	640	1280
A/Norway/2334/2011		2011-12-05	MDCK2/SIAT1	40	160	160	160	160	320	1280	640	320
A/Norway/2352/2011		2011-12-05	MDKC2/SIAT1	80	160	160	160	320	320	640	640	320
A/Belgium/G1125/2011	3B	2011-12-10	SIAT3	40	80	160	160	160	640	1280	320	320
A/Agadir/87/2011	3B	2011-12-12	SIAT2	40	160	160	160	160	640	1280	320	320
A/Settat/91H/2011		2011-12-12	SIAT3	40	160	160	320	160	320	640	640	320
A/Norway/2382/2011		2011-12-13	MDCK2/SIAT1	160	160	160	320	320	640	1280	640	320
A/Norway/2430/2011		2011-12-13	SIAT1/SIAT1	80	160	320	160	320	320	1280	640	640
A/Norway/2431/2011	3C	2011-12-13	SIAT1/SIAT1	80	320	320	320	640	1280	2560	1280	640
A/Norway/2432/2011		2011-12-13	SIAT1/SIAT1	40	80	160	160	160	320	640	640	320
A/Bayern/88/2011		2011-12-14	C5/SIAT1	40	160	320	320	320	640	1280	320	640
A/Hong Kong/5047/2011	3C	2011-12-14	MDCK3/SIAT1	40	80	160	160	160	320	640	320	320
A/Norway/2400/2011	3C	2011-12-14	SIAT1/SIAT1	80	320	640	640	1280	1280	2560	1280	1280
A/Belgium/G1147/2011	3A	2011-12-16	SIAT2	80	160	320	160	320	640	1280	1280	640
A/Norway/2406/2011		2011-12-17	SIAT1/S1	80	160	320	160	320	640	1280	640	640
A/Tiznit/131/2011		2011-12-19	SIAT2	40	80	320	160	160	320	640	320	320
A/Norway/2426/2011		2011-12-20	SIAT1/S1	40	160	160	160	320	320	640	640	640
A/Norway/2418/2011		2011-12-21	SIAT1/S1	160	160	160	160	320	640	1280	640	320
A/Norway/2442/2011	3B	2011-12-23	SIAT1/S1	40	160	160	160	160	320	1280	640	320
A/Casablanca/155/2011	3B	2011-12-26	SIAT2	<	80	80	80	160	320	320	320	160
A/Tiznit/167/2011	3B	2011-12-26	SIAT2	<	80	80	80	80	160	320	160	160
A/Rabat/197/2011	3B	2011-12-28	SIAT2	40	80	80	80	160	320	640	320	320
A/Alborz/96/2012	3B	2012-01-01	MDCK1/SIAT1	40	160	320	160	320	640	1280	640	640
A/Tehran/104/2012	3B	2012-01-01	MDCK1/SIAT1	40	80	160	80	160	320	640	320	160
A/Tehran/109/2012		2012-01-01	SIAT1	40	80	160	80	160	160	640	320	160
A/Tehran/115/2012		2012-01-01	MDCK1/SIAT1	40	160	160	160	320	640	640	640	320
A/Tehran/180/2012		2012-01-01	MDCK1/SIAT1	40	80	160	80	160	320	640	640	320
A/Tehran/181/2012	5	2012-01-01	MDCK1/SIAT1	40	160	160	160	320	640	640	320	320
A/Via Real/SU5/2012	6	2012-01-03	SIAT1	40	160	320	160	640	1280	1280	640	1280
A/Porto/EuroEva69/2012	6	2012-01-04	SIAT1	40	160	320	160	640	640	1280	640	1280
A/Norway/2367/2011		2011-12-07	MDCK1/SIAT1	40	160	160	160	320	320	640	640	320
A/Baden-Wurttemberg/1/2012	3A	Jan 2012	C2/SIAT1	40	80	160	80	160	320	640	640	320
A/Oujda/144H/2011	3B		SIAT3	40	80	160	320	160	320	640	640	320

1. < = <40

Vaccine virus

Sequences in HA/NA phylogenetic trees

Sequences in M phylogenetic tree

Table 12. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2012-02-01

Viruses		Collection Date	Passage History	Haemagglutination inhibition titre[1]								
				Post infection ferret sera								
				A/Bris 10/07 F29/09	A/Perth 16/09 F35/11	A/Vic 208/09 F7/10	A/Vic 210/09 F10/11	A/Ala 5/10 F27/10	A/Perth 10/10 F03/11	A/HK 3969/11 F27/11	A/Stock 18/11 F28/11	A/Iowa 19/10 F15/11
Genetic group							group 1	group 5	group 5	group 3C	group 3A	group 6
REFERENCE VIRUSES												
A/Brisbane/10/2007		2007-02-06	E2/E1	5120	40	40	40	40	80	160	<	40
A/Perth/16/2009		2009-07-04	E3/E2	<	1280	40	160	160	160	640	160	160
A/Victoria/208/2009		2009-06-02	E3/E1	320	1280	2560	2560	1280	5120	2560	2560	5120
A/Victoria/210/2009		2009-06-02	E2/32	320	2560	1280	2560	320	1280	1280	640	1280
A/Alabama/5/2010		2010-07-13	MK1/M2/SIAT2	<	80	40	40	160	80	640	160	160
A/Perth/10/2010		2010-05-25	E2/E2	160	640	2560	2560	1280	2560	2560	1280	2560
A/Hong Kong/3969/2011		2011-05-19	MDCK2/SIAT4	80	160	160	160	320	320	1280	640	320
A/Stockholm/18/2011		2011-03-28	MDCK2/SIAT3	<	80	80	40	80	160	320	320	80
A/Iowa/19/2010		2010-12-30	E3/E1	80	640	2560	2560	2560	5120	2560	2560	5120
TEST VIRUSES												
A/La Réunion/2055/2011		2011-06-22	MDCK2/SIAT1	80	640	320	320	640	1280	2560	1280	640
A/La Réunion/1956/2011		2011-07-07	MDCK4/SIAT1	80	320	320	320	320	320	640	640	640
A/Paris/1744/2011		2011-10-05	MDCK3/SIAT1	40	160	160	160	320	160	640	640	640
A/Attecoube/GR1103/2011		2011-10-18	SIAT3	<	160	160	80	160	320	640	1280	320
A/Lyon CHU/46.334/2011		2011-11-15	MDCK3/SIAT1	40	160	160	160	320	320	640	640	320
A/Korogho/GR1307/2011		2011-11-16	SIAT2	<	80	160	160	320	320	640	640	320
A/Ghana/FS-11-1981/2011	3A	2011-11-22	SIAT2	<	160	160	160	320	320	640	640	320
A/Parma/171/2011	3A	2011-11-24	MDCK2/SIAT1	<	40	40	<	40	80	160	160	80
A/Firenze/1/2011	6	2011-11-25	MDCK2/SIAT1	<	40	40	80	160	160	160	320	160
A/Catalonia/S4345/2011		2011-11-28	MDCK0/SIAT1	40	160	320	320	640	640	640	640	1280
A/Milano/260/2011		2011-11-30	MDCK1/SIAT1	<	40	40	80	80	160	320	320	160
A/Trieste/58/2011		2011-11-30	MDCK2/SIAT1	<	80	160	80	160	320	320	320	160
A/Milano/256/2011	3A	2011-12-01	MDCK1/MDCK1	<	80	160	80	160	160	320	320	160
A/Paris/2013/2011		2011-12-06	MDCK1/SIAT1	40	160	320	160	320	640	1280	640	640
A/Parma/169/2011		2011-12-06	MDCK2/SIAT1	<	160	160	80	160	320	320	640	320
A/Turkey/05/2011		2011-12-07	SIAT1/SIAT1	<	80	160	80	160	160	320	320	160
A/Marseille/2240/2011		2011-12-08	MDCK2/SIAT1	<	80	160	160	160	320	640	640	320
A/Lorraine/2073/2011		2011-12-08	MDCK1/SIAT1	40	320	320	160	640	640	1280	640	1280
A/Toulouse/2187/2011		2011-12-09	MDCK2/SIAT1	40	160	160	160	320	320	640	640	320
A/Rheinland-Pfalz/75/2011	3B	2011-12-09	C6/SIAT1	<	80	160	160	160	160	320	320	160
A/Berlin/2/2012		2011-12-09	C2/SIAT1	40	320	160	160	640	640	640	640	640
A/Milano/258/2011		2011-12-09	MDCK1/SIAT1	<	80	80	80	160	160	320	320	160
A/Trieste/59/2011	3B	2011-12-09	MDCK2/SIAT1	<	40	80	80	80	160	320	160	160
A/Israel/32/2011		2011-12-10	C1/SIAT1	<	80	80	80	160	320	160	160	160
A/Norway/2433/2011		2011-12-12	SIAT1/SIAT2	<	80	160	160	160	160	320	320	160
A/Lorraine/2056/2011		2011-12-12	MDCK1/SIAT1	40	160	160	160	160	320	640	320	640
A/Valladolid/48/2011		2011-12-13	MDCKx/SIAT1	<	80	80	80	160	80	160	320	160
A/Milano/265/2011	3A	2011-12-13	MDCK1/SIAT1	<	80	80	80	80	160	320	320	160
A/Parma/170/2011		2011-12-13	MDCK2/SIAT1	40	160	160	160	320	320	640	640	320
A/Turkey/07/2011		2011-12-13	SIAT2/SIAT1	<	160	160	80	160	160	320	320	160
A/Turkey/08/2011	3B	2011-12-13	SIAT2/SIAT1	<	160	160	80	320	320	640	320	80
A/Firenze/3/2011	6	2011-12-14	MDCK2/SIAT1	40	320	320	320	640	640	640	320	640
A/Turkey/12/2011	3B	2011-12-14	SIAT2/SIAT1	<	80	160	160	160	320	320	320	160
A/Paris/2097/2011		2011-12-15	MDCK2/SIAT1	40	160	160	160	320	320	1280	320	640
A/Milano/268/2011	3A	2011-12-15	MDCK1/SIAT2	<	80	80	80	80	160	320	320	160
A/Turkey/14/2011		2011-12-15	SIAT1/SIAT1	<	160	320	160	320	320	640	1280	320
A/Paris/2100/2011		2011-12-16	MDCK2/SIAT1	<	80	160	80	160	160	640	320	80
A/Valladolid/49/2011		2011-12-16	MDCK1/SIAT1	<	80	80	80	160	160	320	320	160
A/Israel/38/2011		2011-12-18	C2/SIAT1	<	80	80	80	160	160	320	160	160
A/Paris/2114/2011		2011-12-19	MDCK2/SIAT1	<	160	160	320	320	320	640	320	320
A/Ireland/11M92381/2011		2011-12-19	MDCK3/SIAT1	<	80	40	<	80	80	320	320	80
A/Parma/168/2011		2011-12-19	MDCK3/SIAT1	40	160	160	160	160	320	1280	640	320
A/Paris/2116/2011		2011-12-20	MDCK2/SIAT1	<	160	160	320	320	320	640	320	640
A/Paris/2133/2011		2011-12-22	MDCK1/SIAT1	<	80	80	80	80	160	160	160	80
A/Ireland/11M92761/2011		2011-12-22	MDCK2/SIAT1	<	80	160	80	160	160	320	160	160
A/Parma/172/2011		2011-12-22	MDCK2/SIAT1	40	160	320	160	320	640	640	1280	320
A/Parma/175/2011		2011-12-22	MDCK2/SIAT1	40	320	320	320	320	640	1280	1280	640
A/Lyon/2264/2011		2011-12-23	MDCK2/SIAT1	40	320	320	160	320	640	640	640	640
A/Israel/41/2011		2011-12-24	C1/SIAT1	<	160	160	160	320	320	640	320	320
A/Catalonia/S4320/2011	6	2011-12-27	C0/SIAT1	40	160	320	320	640	640	640	640	1280
A/Pays de Loire/2149/2011		2011-12-27	MDCK2/SIAT1	<	80	160	80	320	320	640	320	320
A/Trieste/62/2011		2011-12-27	MDCK2/SIAT1	<	160	160	80	160	320	320	640	320
A/Parma/177/2011		2011-12-27	MDCK1/SIAT1	40	160	320	160	320	320	640	1280	160
A/Paris/2154/2011		2011-12-28	MDCK1/SIAT1	<	80	160	80	320	320	640	320	160
A/Paris/7/2012		2011-12-28	MDCK1/SIAT1	<	80	40	80	160	320	320	320	160
A/Salamanca/50/2011		2011-12-29	MDCK1/SIAT1	<	160	160	80	160	320	640	1280	320
A/Trieste/63/2011	3A	2011-12-29	MDCK2/SIAT1	<	160	80	80	160	160	320	640	320
A/Parma/173/2011		2011-12-29	MDCK2/SIAT1	40	160	160	160	320	640	640	1280	320
A/Parma/174/2011		2011-12-30	MDCK2/SIAT1	<	80	80	80	80	160	320	320	160
A/Parma/176/2011	3A	2011-12-30	MDCK2/SIAT1	40	320	320	320	320	320	640	1280	640
A/Baden-Wurttemberg/2/2012	3C	2012-01-01	C2/SIAT1	40	320	320	320	640	640	640	640	640
A/Lyon/40/2012		2012-01-02	MDCK2/SIAT1	40	160	320	320	320	640	640	640	640
A/Via Real/SU6/2012		2012-01-03	SIAT2	<	160	160	160	640	640	640	640	640
A/Paris/27/2012		2012-01-03	MDCK2/SIAT1	<	80	160	80	160	160	320	320	160
A/Parma/01/2012	3B	2012-01-04	MDCK1/SIAT1	<	<	<	<	40	80	160	80	40
A/Lyon CHU/01.593/2011		2012-01-06	MDCK2/SIAT1	40	160	160	160	320	320	640	640	320
A/Valladolid/1/2012		2012-01-09	MDCK1/SIAT1	<	160	160	160	320	640	640	640	640
A/Segovia/2/2012		2012-01-09	MDCK1/SIAT1	<	80	80	80	160	320	320	160	320
A/Berlin/3/2012	3C	2012-01-10	C2/SIAT1	40	160	160	80	320	640	640	320	320
A/Salamanca/4/2012	6	2012-01-12	MDCK1/SIAT1	<	80	160	80	160	160	320	160	320
A/Israel/27/2011			C2/SIAT1	<	160	80	80	320	320	1280	320	320
A/Israel/43/2011			Cx/SIAT1	<	80	160	80	160	80	320	320	320
A/Israel/47/2011			Cx/SIAT1	<	40	80	80	80	80	160	160	80
A/Israel/50/2011			C1/SIAT1	<	40	80	80	80	160	160	160	80

1. < = <40

Vaccine virus

Sequences in HA/NA phylogenetic trees

Sequences in M phylogenetic tree

Table 13. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2012-02-08

Viruses	Genetic group	Collection Date	Passage History	Haemagglutination inhibition titre[1] Post infection ferret sera								
				A/Perth 16/09 F35/11	A/Vic 208/09 F7/10	A/Ala 5/10 F27/10 group 5	A/HK 3969/11 F27/11 group 3C	A/Stock 18/2011 F28/11 group 3A	A/Iowa 19/10 F15/11 group 6	A/Fin 190/11 F01/12 group 3C	A/Eng 259/11 F02/12 group 3B	A/Norway 1789/11 F03/12 group 3C
REFERENCE VIRUSES												
A/Perth/16/2009		2009-07-04	E3/E2	640	80	160	640	160	160	160	160	320
A/Victoria/208/2009		2009-06-02	E3/E1	640	1280	1280	2560	2560	2560	2560	2560	2560
A/Alabama/5/2010		2010-07-13	MK1/C2/SIAT1	40	40	320	320	160	160	160	80	320
A/Hong Kong/3969/2011		2011-05-19	MDCK2/SIAT4	160	160	320	1280	640	320	1280	640	1280
A/Stockholm/18/2011		2011-03-28	MDCK2/SIAT3	40	80	160	320	640	160	320	160	320
A/Iowa/19/2010		2010-12-30	E3/E1	1280	2560	1280	2560	2560	2560	2560	2560	2560
A/Finland/190/2011		2011-11-25	Cx/SIAT1	160	160	160	640	320	160	640	320	640
A/England/259/2011		2011-11-16	Cx/SIAT1	160	160	160	640	320	160	640	640	640
A/Norway/1789/2011			Cx/SIAT1	320	320	320	1280	640	640	2560	640	1280
TEST VIRUSES												
A/Denmark/87/2011		2011-09-04	SIAT1/SIAT1	80	80	160	320	160	160	640	320	640
A/Jordan/20110030568/2011		2011-09-14	SIAT1	160	160	160	640	640	320	1280	320	640
A/Jordan/20110030585/2011		2011-09-23	SIAT2	<	40	40	160	160	80	320	160	160
A/Kobe/241/2011	3B	2011-10-21	MDCK1+2/SIAT1	<	40	80	160	80	80	160	80	160
A/Hiroshima-C/53/2011	5	2011-10-29	MDCK1+2/SIAT1	160	80	320	640	320	320	640	320	640
A/Jordan/20110030655/2011		2011-10-31	SIAT1	160	160	160	640	640	320	640	640	640
A/Yopougon/GR1336/2011	3A	2011-11-21	SIAT3	40	80	80	160	320	80	160	160	320
A/Jordan/20110030687/2011		2011-11-22	SIAT1	80	160	160	320	640	320	640	320	640
A/Bursa/108/2011		2011-11-22	C1/SIAT1	40	80	80	160	160	160	320	160	320
A/Turkey/01/2011	3B	2011-11-28	SIAT2/SIAT2	80	80	160	320	320	160	320	160	320
A/Denmark/90/2011		2011-11-28	MDCK1/SIAT1	80	80	160	640	320	160	640	320	640
A/Jordan/20110030713/2011		2011-11-30	SIAT2	40	40	80	160	160	80	160	160	320
A/Jordan/20110030706/2011		2011-12-03	SIAT1	80	80	160	320	640	320	640	320	640
A/Jordan/20110030717/2011		2011-12-03	SIAT2	80	80	160	320	160	160	320	320	320
A/Netherlands/710/2011	6	2011-12-06	MDCK2/SIAT1	40	80	160	160	80	160	160	160	320
A/Turkey/06/2011		2011-12-08	SIAT2/SIAT2	40	40	80	160	160	80	160	160	320
A/Turkey/10/2011		2011-12-08	SIAT2/SIAT3	80	160	160	320	320	160	640	320	640
A/Jordan/20110030732/2011		2011-12-08	SIAT1	80	160	160	320	640	320	640	320	640
A/İzmir/176/2011		2011-12-09	C1/SIAT1	<	<	40	80	80	80	160	160	160
A/Turkey/04/2011	3B	2011-12-09	SIAT1/SIAT3	40	80	80	160	160	160	160	160	320
A/Jordan/20110030749/2011	3B	2011-12-11	SIAT1	160	320	320	640	640	320	1280	640	180
A/Turkey/26/2011		2011-12-13	SIAT1/SIAT1	40	40	40	160	160	80	160	80	160
A/İzmir/182/2011		2011-12-13	C1/SIAT1	80	80	160	320	320	160	320	320	640
A/Milano/268/2011	3A	2011-12-15	MDCK1/SIAT2	40	40	40	160	160	80	160	160	160
A/Jordan/20110030777/2011		2011-12-15	SIAT1	80	160	80	320	320	160	320	320	320
A/Turkey/18/2011		2011-12-16	SIAT1/SIAT1	80	160	160	640	320	160	1280	320	640
A/Norway/99/2012		2011-12-16	LLC-MK2-MDCK1/SIAT1	320	160	320	640	640	640	1280	640	1280
A/Turkey/19/2011		2011-12-18	SIAT1/SIAT1	320	320	320	1280	1280	320	1280	640	1280
A/İstanbul/202/2011		2011-12-19	C1/SIAT1	160	160	320	1280	320	320	1280	320	1280
A/Antalya/204/2011		2011-12-19	C1/SIAT1	80	80	160	320	320	160	320	320	640
A/Ireland/11M92698/2011	3B	2011-12-20	SIAT2	40	80	80	160	320	160	320	160	320
A/Turkey/21/2011		2011-12-20	SIAT1/SIAT3	40	40	80	160	160	80	160	160	320
A/Turkey/22/2011		2011-12-20	SIAT1/SIAT2	160	160	160	640	640	320	640	320	1280
A/Turkey/27/2011		2011-12-20	SIAT1/SIAT1	40	40	80	160	160	80	160	80	160
A/Turkey/30/2011		2011-12-20	SIAT1/SIAT1	<	40	40	160	160	40	160	80	160
A/Turkey/31/2011		2011-12-20	SIAT1/SIAT1	<	40	40	160	160	40	160	80	160
A/Turkey/32/2011	3B	2011-12-20	SIAT1/SIAT1	160	160	160	640	640	320	640	320	640
A/Ireland/11M92761/2011		2011-12-21	SIAT2	40	80	80	160	320	80	160	160	320
A/Trieste/60/2011	3A	2011-12-21	MDCK2/SIAT2	40	40	40	160	160	80	160	160	160
A/Turkey/23/2011	3B	2011-12-21	SIAT1/SIAT1	160	160	320	1280	640	320	1280	320	1280
A/Turkey/24/2011		2011-12-21	SIAT1/SIAT1	40	40	40	160	160	80	160	80	320
A/Jordan/20110030780/2011	3B	2011-12-21	SIAT1	80	80	80	320	320	160	320	320	320
A/Norway/2448/2011		2011-12-21	SIAT3	320	160	640	1280	640	1280	1280	640	1280
A/Ireland/11M92761/2011		2011-12-21	SIAT2	80	80	80	160	320	160	320	320	320
A/Ireland/11M92922/2011		2011-12-22	SIAT1/SIAT2	40	80	80	320	640	160	320	160	320
A/Turkey/28/2011	3B	2011-12-22	MDCK1/SIAT1	80	160	80	320	640	160	640	320	640
A/Norway/39/2012		2011-12-22	LLC-MK2-MDCK1/SIAT1	40	40	80	160	160	80	160	160	160
A/Norway/96/2012		2011-12-22	SIAT2	40	40	80	160	160	80	160	160	320
A/Ireland/11V9451/2011	3B	2011-12-25	MDCK1/SIAT1	80	80	160	320	320	160	640	320	640
A/Norway/38/2012		2011-12-25	SIAT2	80	80	160	320	320	160	320	320	640
A/Switzerland/5776029/2011	3A	2011-12-27	SIAT1	40	80	80	160	320	160	320	160	320
A/Jordan/20110030776/2011		2011-12-27	C1/SIAT1	80	320	160	640	320	320	640	320	640
A/İstanbul/249/2011		2011-12-28	MDCK1/SIAT1	160	320	320	1280	640	320	1280	320	1280
A/Latvia/12-47890p/2011		2011-12-28	MDCK3/SIAT1	80	80	160	320	160	160	320	320	640
A/Netherlands/713/2011	3C	2011-12-29	C1/SIAT1	40	80	160	320	160	160	320	160	320
A/ Bursa/250/2011		2011-12-29	C1/SIAT1	80	160	160	640	320	160	640	320	640
A/İzmir/251/2011		2011-12-29	C1/SIAT1	80	80	160	320	160	160	320	320	640
A/Norway/3/2012		2012-01-02	MDCK1/SIAT1	40	80	160	160	320	80	160	160	320
A/Norway/75/2012		2012-01-02	MDCK-SIAT1/SIAT1	80	80	160	320	320	160	640	320	640
A/Norway/97/2012		2012-01-02	LLC-MK2-MDCK1/SIAT1	320	160	320	1280	640	640	1280	640	1280
A/Switzerland/5802473/2012		2012-01-03	SIAT2	40	40	80	160	160	80	160	160	160
A/Austria/654044/2012		2012-01-03	C2/SIAT1	40	40	40	160	80	80	160	160	160
A/Ireland/12M90/2012		2012-01-03	SIAT3	80	160	160	640	320	320	640	320	640
A/Lyon/37/2012		2012-01-04	MDCK2/SIAT2	40	80	80	160	320	80	160	160	320
A/Netherlands/001/2012	6	2012-01-05	MDCK2/SIAT1	320	320	640	1280	640	640	1280	640	1280
A/Norway/73/2012		2012-01-05	SIAT1/SIAT1	320	160	640	640	640	1280	1280	640	1280
A/Switzerland/5834715/2012	3C	2012-01-09	SIAT2	80	80	160	640	320	320	1280	320	640
A/Switzerland/5834718/2012	3C	2012-01-09	SIAT2	80	80	80	320	320	160	640	160	320
A/Switzerland/5834731/2012		2012-01-09	SIAT2	80	160	160	320	320	160	640	320	640
A/Berlin/6/2012		2012-01-09	C3/SIAT1	160	160	640	1280	640	640	1280	640	1280
A/Hamburg/1/2012		2012-01-09	C2/SIAT1	160	160	320	640	320	320	160	320	640
A/Austria/654591/2012		2012-01-09	C1/SIAT1	160	320	640	1280	320	640	1280	640	1280
A/Latvia/1-34462p/2012		2012-01-09	MDCK1/SIAT1	80	80	160	320	320	160	320	320	640
A/Latvia/1-34610/2012		2012-01-09	MDCK1/SIAT1	80	80	80	320	160	160	320	320	320
A/Ireland/12v397/2012		2012-01-10	SIAT3	40	80	80	160	320	80	160	160	320
A/England/12/2012		2012-01-10	SIAT1/SIAT1	160	160	320	640	320	320	1280	320	640
A/Norway/114/2012		2012-01-10	MDCK1/SIAT1	40	40	80	160	160	80	160	160	320
A/Latvia/1-35583/2012		2012-01-10	MDCKx/SIAT1	80	80	160	640	160	160	640	320	640
A/Austria/655242/2012		2012-01-11	C1/SIAT1	80	160	320	640	320	320	1280	320	640
A/Netherlands/002/2012	3B	2012-01-12	MDCK2/SIAT1	<	40	80	160	80	40	160	80	160
A/Rheinland-Pfalz/1/2012		2012-01-12	C2/SIAT1	160	160	160	640	320	320	640	320	640
A/Switzerland/5834730/2012		2012-01-13	SIAT3	40	80	80	320	160	80	640	160	320
A/Switzerland/5834796/2012		2012-01-13	SIAT3	40	80	80	320	160	160	640	160	320
A/Berlin/4/2012		2012-01-13	C2/SIAT1	160	160	160	640	320	320	640	320	640
A/Baden-Württemberg/3/2012		2012-01-13	C2/SIAT1	80	160	160	320	160	160	640	160	640
A/Latvia/1-37528/2012		2012-01-13	MDCKx/SIAT1	80	80	160	320	160	160	320	320	320
A/England/21/2012		2012-01-16	SIAT1/SIAT1	40	40	40	80	80	40	160	160	160
A/Berlin/5/2012		2012-01-16	C2/SIAT1	80	160	160	640	320	160	640	320	640
A/Berlin/7/2012		2012-01-16	C2/SIAT1	80	160	160	640	320	160	640	320	1280
A/Brandenburg/1/2012		2012-01-16	C2/SIAT1	320	160	640	1280	640	640	1280	640	1280
A/England/20/2012		2012-01-17	SIAT1/SIAT1	80	40	80	320	160	80	320	160	320
A/Berlin/8/2012		2012-01-17	C2/SIAT1	80	160	160	320	160	160	640	320	640
A/Switzerland/5867852/2012		2012-01-20	SIAT3	40	80	80	160	160	80	640	160	320
A/Austria/653679/2012		Jan 2012	SIAT2/SIAT1	40	80	80	160	80	80	320	160	160

1. < = <40

Vaccine virus

Sequences in HA/NA phylogenetic trees

Sequences in M phylogenetic tree

Table 14. Antigenic analyses of influenza A(H3N2) viruses (Guinea Pig RBC with 20nM Oseltamivir) 2012-02-14

Viruses	Collection Date	Passage History	Haemagglutination inhibition titre[1]										
			Post infection ferret sera										
			A/Perth 16/09	A/Vic 208/09	A/Ala 5/10	A/HK 3969/11	A/Stock 18/11	A/Iowa 19/10	A/Fin 190/11	A/Eng 259/11	A/Norway 1789/11	A/Bris 299/11	A/Bris 299/11
			F35/11	F7/10	F27/10	F27/11	F28/11	F15/11	F01/12	F02/12	F03/12	CDC Egg F2178	CDC T/C F2179
Genetic group					group 5	group 3C	group 3A	group 6	group 3C	group 3B	group 3C	group 6	group 6
REFERENCE VIRUSES													
A/Perth/16/2009	2009-07-04	E3/E2	640	80	160	640	160	160	160	160	320	320	160
A/Victoria/208/2009	2009-06-02	E3/E1	1280	2560	1280	5120	2560	5120	5120	2560	2560	2560	2560
A/Alabama/5/2010	2010-07-13	MK1/C2/SIAT2	40	40	160	320	80	160	80	80	160	160	80
A/Hong Kong/3969/2011	2011-05-19	MDCK2/SIAT4	160	160	320	1280	320	320	1280	640	640	640	640
A/Stockholm/18/2011	2011-03-28	MDCK2/SIAT3	40	40	80	320	320	160	160	160	320	320	160
A/Iowa/19/2010	2010-12-30	E3/E1	1280	5120	1280	5120	2560	5120	5120	1280	5120	2560	5120
A/Finland/190/2011	2011-11-25	Cx/SIAT1	160	160	160	1280	320	320	1280	320	640	640	320
A/England/259/2011	2011-11-16	Cx/SIAT1	160	160	320	1280	640	320	1280	640	640	640	640
A/Norway/1789/2011		Cx/SIAT1	160	160	320	1280	320	320	640	320	640	640	320
IVR-164(A/Brisbane/299/2011)		E5/E1	320	640	640	1280	640	1280	640	320	640	640	320
TEST VIRUSES													
A/Dakar/21/2011	2011-09-29	SIAT2	80	160	160	320	640	320	320	320	640	ND	ND
A/Dakar/23/2011	2011-10-03	SIAT2	80	160	160	320	640	320	320	320	320	ND	ND
A/Stockholm/37/2011	2011-11-27	C3/SIAT1	80	80	160	320	160	160	640	160	320	ND	ND
A/Stockholm/42/2011	2011-12-02	C3/SIAT1	160	160	640	640	320	640	1280	320	640	ND	ND
A/Jordan/20110030729/2011	2011-12-06	SIAT3	80	160	160	640	320	160	640	320	640	ND	ND
A/Stockholm/2011-21445/2011	2011-12-06	C1/SIAT1	80	80	160	320	320	160	640	320	320	ND	ND
A/Suceava/87402/2012	2011-12-12	MDCK3/SIAT1	160	160	320	640	320	320	640	640	640	ND	ND
A/Stockholm/40/2011	2011-12-13	C2/SIAT1	<	40	40	160	80	80	80	80	160	ND	ND
A/Stockholm/39/2011	2011-12-15	C1/SIAT1	80	80	80	320	320	160	640	160	640	ND	ND
A/Turkey/37/2011	2011-12-16	SIAT1/SIAT1	40	40	80	320	160	80	320	320	640	ND	ND
A/Bacau/88448/2012	2011-12-19	MDCK3/SIAT1	160	160	320	640	320	320	640	640	640	ND	ND
A/Turkey/36/2011	2011-12-20	SIAT1/SIAT1	40	80	80	320	160	160	320	160	640	ND	ND
A/Turkey/39/2011	2011-12-20	SIAT1/SIAT1	<	40	40	160	80	80	160	80	320	ND	ND
A/Antalya/214/2011	2011-12-20	C1/SIAT2	80	160	80	320	320	160	640	320	640	ND	ND
A/Turkey/33/2011	2011-12-22	SIAT1/SIAT1	40	80	80	320	160	80	320	160	320	ND	ND
A/Turkey/34/2011	2011-12-22	SIAT1/SIAT1	40	80	80	320	160	80	320	160	320	ND	ND
A/Turkey/35/2011	2011-12-22	SIAT1/SIAT1	40	40	40	320	160	80	160	80	320	ND	ND
A/Turkey/38/2011	2011-12-22	SIAT1/SIAT1	40	80	160	320	160	160	640	320	640	ND	ND
A/Turkey/40/2011	2011-12-26	SIAT1/SIAT1	40	80	80	320	160	160	320	160	640	ND	ND
A/Stockholm/43/2011	2011-12-26	C3/SIAT1	40	40	80	160	160	80	320	80	160	ND	ND
A/Stockholm/12-00978/2012	2011-12-26	C1/SIAT1	160	160	640	640	320	640	640	320	640	ND	ND
A/Turkey/41/2011	2011-12-27	SIAT1/SIAT1	40	80	160	320	160	160	640	160	640	ND	ND
A/Turkey/42/2011	2011-12-27	SIAT1/SIAT1	40	80	160	320	160	160	640	320	640	ND	ND
A/Stockholm/1200979/2012	2011-12-27	C1/SIAT1	160	160	640	640	320	640	640	640	1280	ND	ND
A/Galati/88977/2012	2011-12-27	MDCK2/SIAT1	160	160	160	640	320	320	640	640	640	ND	ND
A/Stockholm/44/2011	2011-12-28	C0/SIAT1	160	160	320	640	320	640	320	320	320	ND	ND
A/Turkey/43/2011	2011-12-29	SIAT1/SIAT1	160	160	160	640	640	320	640	640	640	ND	ND
A/Turkey/44/2011	2011-12-29	SIAT1/SIAT1	40	80	80	160	160	80	160	160	320	ND	ND
A/Turkey/45/2011	2011-12-29	SIAT1/SIAT1	80	80	80	320	160	160	320	160	640	ND	ND
A/Turkey/46/2011	2012-01-02	SIAT1/SIAT1	80	80	80	320	160	160	320	160	320	ND	ND
A/Turkey/48/2011	2012-01-02	SIAT1/SIAT1	40	80	80	320	320	160	320	160	320	ND	ND
A/Turkey/49/2011	2012-01-02	SIAT1/SIAT1	40	80	160	320	320	160	320	160	640	ND	ND
A/Turkey/50/2011	2012-01-02	SIAT1/SIAT1	80	80	160	320	320	160	640	160	640	ND	ND
A/Turkey/51/2011	2012-01-03	SIAT1/SIAT1	40	80	80	320	160	160	320	160	320	ND	ND
A/Turkey/52/2011	2012-01-03	SIAT1/SIAT1	40	80	80	80	320	160	320	320	640	ND	ND
A/Bacau/89197/2012	2012-01-03	MDCK2/SIAT1	160	160	320	640	320	320	640	640	1280	ND	ND
A/Turkey/53/2011	2012-01-04	SIAT1/SIAT1	80	80	80	640	320	160	640	320	640	ND	ND
A/Turkey/55/2011	2012-01-04	SIAT1/SIAT1	80	80	80	640	640	160	640	640	640	ND	ND
A/Braila/89501/2012	2012-01-04	MDCK3/SIAT1	80	80	160	640	160	160	640	320	640	ND	ND
A/Iasi/89451/2012	2012-01-04	MDCK3/SIAT1	160	160	320	1280	640	320	1280	320	640	ND	ND
A/Turkey/54/2011	2012-01-05	SIAT1/SIAT1	80	80	80	320	320	160	320	160	640	ND	ND
A/Turkey/56/2011	2012-01-09	SIAT1/SIAT1	80	160	160	640	1280	320	640	640	640	ND	ND
A/Finland/196/2012	2012-01-09	MDCKSIAT3/SIAT1	80	160	160	320	320	160	320	320	320	ND	ND
A/Turkey/57/2011	2012-01-11	SIAT1/SIAT1	40	80	80	320	320	160	320	160	320	ND	ND
A/Stockholm/12-00694/2012	2012-01-11	C2/SIAT1	160	160	320	640	320	320	1280	320	640	ND	ND
A/Stockholm/12-00574/2012	2012-01-12	C2/SIAT1	160	160	320	640	320	640	640	640	640	ND	ND
A/Stockholm/12-00974/2012	2012-01-12	C1/SIAT1	40	40	80	320	160	80	160	160	320	ND	ND
A/Finland/197/2012	2012-01-12	MDCK-SIAT2/SIAT1	320	320	640	1280	640	1280	2560	640	2560	ND	ND
A/Stockholm/12-00695/2012	2012-01-13	C2/SIAT1	320	320	640	1280	640	1280	1280	640	1280	ND	ND
A/Stockholm/12-00752/2012	2012-01-16	C0/SIAT1	40	80	80	160	320	160	320	160	320	ND	ND
A/Latvia/1-39879p/2012	2012-01-16	MDCK/SIAT1	160	160	320	640	320	320	640	320	320	ND	ND

1. < = <40; ND = Not Done

Vaccine virus

Table 15. Antigenic analysis of influenza A(H3N2) viruses - Plaque Reduction Neutralisation[1] - MDCK-SIAT 2011-12-08

Viruses		Collection Date	Passage History	Neutralisation titre				
				Post infection ferret sera				
				A/Bris 10/07 F18/07	A/Per 16/09 F30/09	A/Per 10/10 F03/11	A/HK 3969/11 F27/11	A/Iowa 19/10 F15/11
Genetic group						group 5	group 3C	group 6
REFERENCE VIRUSES								
A/Brisbane/10/2007		2007-02-06	E2/E4	>5120	320	ND	320	320
A/Perth/16/2009		2009-07-04	E3/E1	40	1280	ND	320	80
A/Hong Kong/3969/2011		2011-05-19	MDCK3	160	80	ND	320	320
A/Iowa/19/2010		2010-12-30	E3/E1	160	640	ND	2560	5120
TEST VIRUSES								
A/Bratislava/31/2011	3C	2011-11-03	MDCK1/SIAT1	40	160	640	1280	320
A/Finland/190/2011	3C	2011-11-25	SIAT3/SIAT3	80	80	320	640	640

1. Based on 50% plaque reduction compared to serum negative controls

Vaccine virus

ND = Not Done

Sequences in phylogenetic trees

Table 16. Antigenic analysis of influenza A(H3N2) viruses - Plaque Reduction Neutralisation[1] - MDCK-SIAT 2012-01-05

Viruses		Collection Date	Passage History	Neutralisation titre[2] Post infection ferret sera				
				A/Bris 10/07 F7/07	A/Per 16/09 F35/11	A/Per 10/10 F8/11	A/HK 3969/11 F27/11	A/Iowa 19/10 F15/11
Genetic group						group 5	group 3C	group 6
REFERENCE VIRUSES								
A/Brisbane/10/2007		2007-02-06	E2/E4	5120	80	80	80	80
A/Perth/16/2009		2009-07-04	E3/E1	<	640	80	160	80
A/Perth/10/2009		2010-05-25	E2/E2	40	320	640	640	640
A/Hong Kong/3969/2011		2011-05-19	MDCK3	<	80	160	160	80
A/Iowa/19/2010		2010-12-30	E3/E1	80	640	2560	2560	5120
TEST VIRUSES								
A/England/253/2011	3C	2011-09-11	SIAT1/SIAT1	<	160	640	1280	640
A/England/257/2011	3B	2011-10-10	SIAT1/SIAT1	<	80	640	1280	320
A/England/256/2011	3B	2011-10-12	SIAT1/SIAT1	<	80	320	1280	320
A/England/255/2011	3B	2011-10-14	SIAT1/SIAT1	<	80	320	640	320
A/Bratislava/31/2011	3C	2011-11-03	SIAT2	<	320	1280	2560	1280
A/England/258/2011	3C	2011-11-07	SIAT1/SIAT1	<	160	640	1280	640
A/England/259/2011	3B	2011-11-16	SIAT1/SIAT1	<	80	320	1280	320
A/Tunisia/15685/2011	3B	2011-11-09	SIAT2	<	80	160	640	320

1. Based on 80% plaque reduction compared to serum negative controls 2. <=<40

Vaccine virus

Sequences in phylogenetic trees

Table 17. Antigenic analysis of influenza A(H3N2) viruses - Plaque Reduction Neutralisation[1] - MDCK-SIAT - 2012-01-12

Viruses	Genetic group	Collection Date	Passage History	Neutralisation titre[2] Post infection ferret sera				
				A/Bris 10/07 F7/07	A/Per 16/09 F35/11	A/Per 10/10 F8/11 group 5	A/HK 3969/11 F27/11 group 3C	A/Iowa 19/10 F15/11 group 6
REFERENCE VIRUSES								
A/Brisbane/10/2007		2007-02-06	E2/E4	5120	80	80	80	80
A/Perth/16/2009		2009-07-04	E3/E1	<	640	80	160	80
A/Perth/10/2009		2010-05-25	E2/E2	40	320	640	640	640
A/Hong Kong/3969/2011		2011-05-19	MDCK3	<	80	160	160	80
A/Iowa/19/2010		2010-12-30	E3/E1	80	640	2560	2560	5120
TEST VIRUSES								
A/Brisbane/299/2011	6	2011-08-13	E5/E1	<	80	320	320	160
A/Stockholm/22/2011	3B	2011-08-15	C2/SIAT1	<	<	40	40	<
A/Stockholm/23/2011	3B	2011-09-05	C1/SIAT1	<	<	40	80	40
A/Valladolid/47/2011	6	2011-09-13	MDCK1/SIAT1	<	320	640	2560	640
A/Stockholm/26/2011	3A	2011-10-05	C1/SIAT1	<	80	160	640	160
A/Norway/2047/2011	6	2011-10-10	MDCK1/SIAT1	<	80	160	160	80
A/Norway/2125/2011	6	2011-10-26	SIAT1/SIAT1	<	320	1280	1280	640
A/Bayern/87/2011	3B	2011-11-16	MDCK2/SIAT1	<	160	640	1280	320
A/Stockholm/32/2011	3C	2011-11-27	C2/SIAT1	<	80	160	320	160
A/Stockholm/34/2011	3B	2011-11-27	C1/SIAT1	<	40	80	160	80
A/Netherlands/702/2011	6	2011-12-02	MDCK4/SIAT1	<	40	160	80	80
A/Berlin/85/2011	3C	2011-12-07	MDCK2/SIAT1	<	320	640	1280	640
A/Berlin/86/2011	3C	2011-12-09	MDCK2/SIAT1	<	160	640	1280	640
A/Berlin/87/2011	3C	2011-12-12	MDCK2/SIAT1	<	320	1280	2560	640

1. Based on 80% plaque reduction compared to serum negative controls 2. <=<40

Vaccine virus

Sequences in phylogenetic trees

Table 18. Antigenic analysis of influenza A H3N2 viruses - Plaque Reduction Neutralisation[1] - MDCK-SIAT - 2012-01-25

Viruses	Genetic group	Collection Date	Passage History	Neutralisation titre[2] Post infection ferret sera				
				A/Bris 10/07 F7/07	A/Per 16/09 F35/11	A/Per 10/10 F8/11	A/HK 3969/11 F27/11	A/Iowa 19/2010 F15/11
						group 5	group 3C	group 6
REFERENCE VIRUSES								
A/Brisbane/10/2007		2007-02-06	E2/E4	5120	80	80	80	80
A/Perth/16/2009		2009-07-04	E3/E1	<	640	80	160	80
A/Perth/10/2009		2010-05-25	E2/E2	40	320	640	640	640
A/Hong Kong/3969/2011		2011-05-19	MDCK3	<	80	160	160	80
A/Iowa/19/2010		2010-12-30	E3/E1	80	640	2560	2560	5120
TEST VIRUSES								
A/Khorasan/8032//2011	3B	2011-11-01	MDCK1/SIAT1	<	80	320	640	320
A/Hormozgan/7981/2011	3B	2011-11-01	MDCK4/SIAT1	<	40	80	160	160
A/Madrid/RR8753/2011	3B	2011-11-30	SIAT1/SIAT1	<	80	320	640	160
A/Tehran/9720/2011		2011-12-01	MDCK2/SIAT/1	<	160	640	1280	320
A/Tehran/9721/2011		2011-12-01	MDCK2/SIAT/1	<	160	640	1280	640
A/Slovenia/2855/2011	5	2011-12-05	MDCKx/SIAT1	<	160	640	640	320
A/Berlin/93/2011	3C	2011-12-07	C5/SIAT1	<	80	160	160	160
A/Berlin/88/2011	3C	2011-12-13	C1/SIAT1	<	320	1280	1280	640
A/Belgium/G1147/2011	3A	2011-12-16	SIAT2	<	80	320	640	160
A/Castilla La Mancha/RR8843/2011	3C	2011-12-26	SIAT1/SIAT2	<	160	640	1280	320
A/Castilla La Mancha/RR8870/2011	3B	2011-12-27	SIAT1/SIAT1	<	80	160	640	160

1. Based on 80% plaque reduction compared to serum negative controls 2. <=<40

Vaccine virus

Sequences in phylogenetic trees

Table 19. Antigenic analysis of influenza A H3N2 viruses - Plaque Reduction Neutralisation[1] - MDCK-SIAT - 2012-02-13

Viruses		Collection Date	Passage History	Neutralisation titre[2] Post infection ferret sera				
				A/Bris 10/07 F29/09	A/Per 16/09 F35/11	A/Per 10/10 F8/11	A/HK 3969/11 F27/11	A/Iowa 19/10 F15/11
Genetic group						group 5	group 3C	group 6
REFERENCE VIRUSES								
A/Brisbane/10/2007		2007-02-06	E2/E4	5120	80	80	80	80
A/Perth/16/2009		2009-07-04	E3/E1	<	640	40	80	40
A/Perth/10/2009		2010-05-25	E2/E2	40	320	640	640	640
A/Hong Kong/3969/2011		2011-05-19	MDCK3	<	80	160	160	80
A/Iowa/19/2010		2010-12-30	E3/E1	80	640	2560	2560	5120
TEST VIRUSES								
A/Adjame/GR765/2011	3A	2011-09-12	SIAT3	<	160	320	1280	320
A/Parma/171/2011	3A	2011-11-24	MDCKx/SIAT1	<	40	40	80	40
A/Turkey/01/2011	3B	2011-11-28	SIAT2/SIAT1	<	80	320	640	160
A/Hong Kong/4974/2011	3C	2011-12-01	MDCK3/SIAT1	<	80	160	320	80
A/Norway/2335/2011		2011-12-01	MDCK2/SIAT1	<	40	160	160	80
A/Norway/2329/2011		2011-12-02	MDCK1/SIAT1	<	80	160	320	160
A/Settat/91H/2011		2011-12-12	SIAT3	<	80	160	320	160
A/Norway/2431/2011	3C	2011-12-13	SIAT1/SIAT1	<	160	640	1280	640
A/Firenze/3/2011	6	2011-12-14	MDCK2/SIAT1	<	160	320	640	320
A/Parma/01/2012	3B	2012-01-04	MDCKx/SIAT1	<	<	40	80	40
A/Berlin/3/2012	3C	2012-01-10	SIAT2/SIAT1	<	80	320	640	160

Vaccine virus

1. Based on 80% plaque reduction compared to serum negative controls 2. <=<40

Figure 10. Phylogenetic comparison of influenza A (H3N2) HA genes

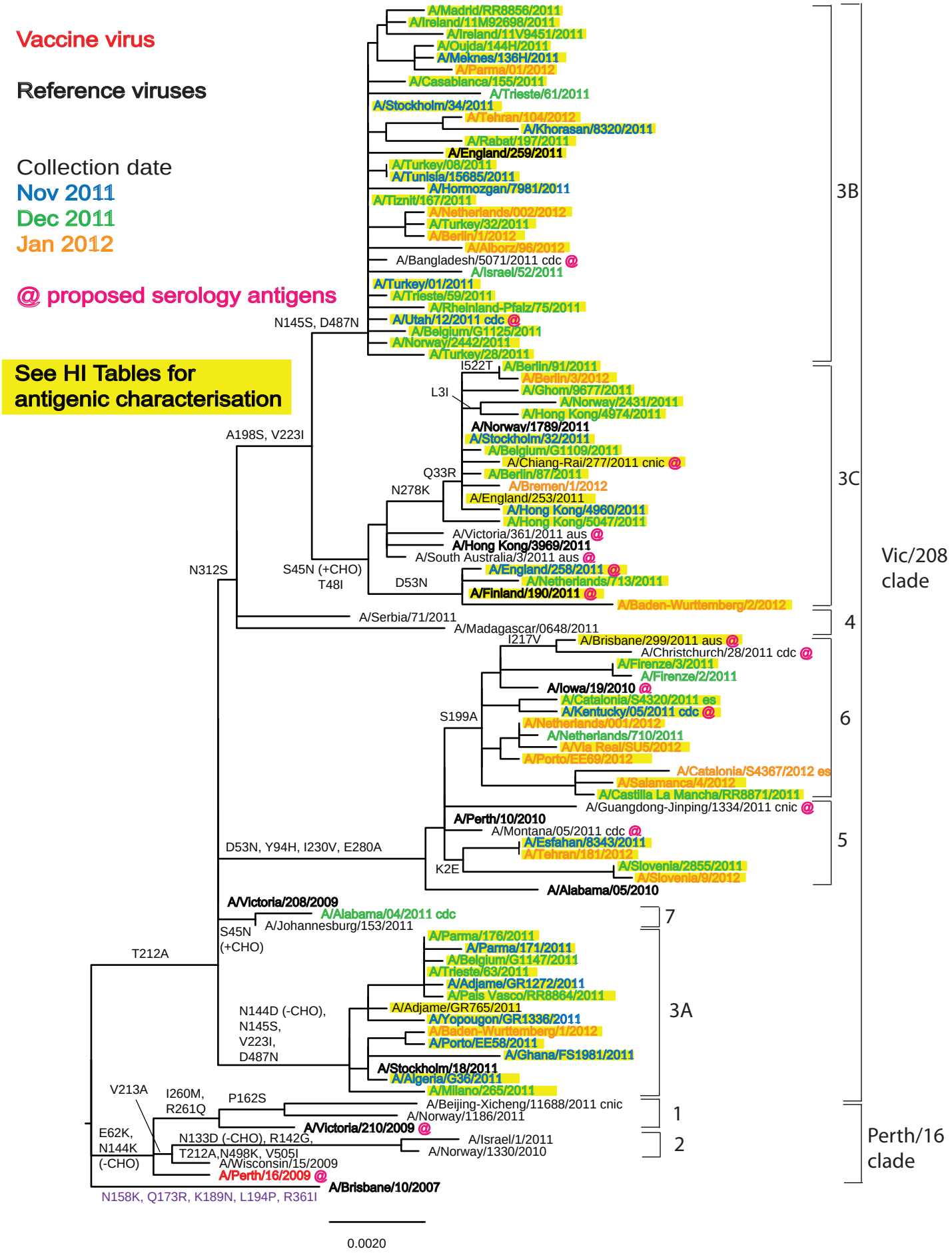


Figure 11. HA protein alignment for A(H3N2) viruses.

```
Reference Viruses   Vaccine Virus      Genetic group/subgroup        Potential N-linked glycosylation sites
                                 HA1      10        20        30        40        50        60        70        80        90       100
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007               QKLPGNDNSTATLCLGHHAVPNGTIVKTITNDQIEVTNATELVQSSSTGEICDSPHQILDGENCTLIDALLGDPQCDGFQNKKWDLFVERSKAYSNCYPY
A/Perth/16/2009                  ..........................................................K.....................................
A/Israel/1/2011                  ..........................................................K.....................................  2
A/Victoria/210/2009              ...........................................N..............K.....................................  1
A/Norway/1186/2011               ...........................................K..........K.....................................  1
A/Victoria/208/2009              ..........................................................K.....................................
A/Johannesburg/153/2011          ...........................................N..............K.....................................  7
A/Alabama/05/2010                ..........................................N.....................H.....................  5
A/Perth/10/2010                  ..........................................N.....................H.....................  5
A/Guangdong-Jinping/1334/2011    ..........................................N.....................H.....................  5
A/Slovenia/9/2012                .E........................................N.....................H.....................  5
A/Iowa/19/2010                   ..........................................N.....................H.....................  6
A/Castilla La Mancha/RR8871/2011 ..........................................N.....................H.....................  6
A/Netherlands/001/2012           ..........................................N.....................H.....................  6
A/Brisbane/299/2011              ..........................................N.....................H.....................  6
A/Stockholm/18/2011              ..........................................................K.....................................  3A
A/Milano/265/2011                ..........................................................K.....................................  3A
A/Baden-Wurttemberg/1/2012       ..........................................................K.....................................  3A
A/Yopougon/GR1336/2011           ..........................................................K.....................................  3A
A/Belgium/G1147/2011             ..........................................................K.....................................  3A
A/England/259/2011               ...........................................A..............K.....................................  3B
A/Turkey/32/2011                 ..........................................................K.....................................  3B
A/Israel/52/2011                 ..........................................................K.....................................  3B
A/Khorasan/8320/2011             ..........................................................K.....................................  3B
A/Madrid/RR8856/2011             ..........................................................K.....................................  3B
A/Finland/190/2011               ...........................................N..I....N......K.....................................  3C
A/Hong Kong/3969/2011            ...........................................N..I...........K.....................................  3C
A/Hong Kong/5047/2011            ...........................................N..I....N......K.....................................  3C
A/Norway/1789/2011               ...........................R..............N..I...........K.....................................  3C
A/Norway/2431/2011               ..I.........................R..............N..I...........K.....................................  3C

                                          110       120       130       140       150       160       170       180       190       200
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007               DVPDYASLRSLVASSGTLEFNNESFNWTGVTQNGTSSACIRRSNNSFFSRLNWLTHLKFKYPALNVTMPNNEKFDKLYIWGVHHPGTDNDQIFPYAQASG
A/Perth/16/2009                  ...........................................K.............N...............Q.........L.....K....L......
A/Israel/1/2011                  ...............................D........G.K.............N...............Q...............K....L......
A/Victoria/210/2009              ...........................................K.............N...............Q............V..K....L......
A/Norway/1186/2011               ...........................................K.............N...S...........H...............K....L......
A/Victoria/208/2009              .........................................................N...............Q............V..K....L......
A/Johannesburg/153/2011          .........................................................N...............Q...............K....L......
A/Alabama/05/2010                .........................................................N...............Q...............K....L......
A/Perth/10/2010                  ...........................................................X.N...............Q.........X..X..K....L......
A/Guangdong-Jinping/1334/2011    ....................Y......................................N...............Q...............K....L......
A/Slovenia/9/2012                .........................................................N...............Q...............K....L......
A/Iowa/19/2010                   .........................................................N...............Q............X..K....L.T..A.
A/Castilla La Mancha/RR8871/2011 .........................................................N...............Q...............K....L....A.
A/Netherlands/001/2012           .........................................................N...............Q...............K....L....A.
A/Brisbane/299/2011              .........................................................N...............Q...............K....L....A.
A/Stockholm/18/2011              ...........................................DS............N...............Q...............K....L......
A/Milano/265/2011                ...........................................DS............N...............Q...............K....L......
A/Baden-Wurttemberg/1/2012       ...........................................DS............N...............Q...............K....L......
A/Yopougon/GR1336/2011           ...........................................DS............N...............Q...............K....L......
A/Belgium/G1147/2011             ...........................................K...DS........N...............Q...............K....L......
A/England/259/2011               ...........................................S.............N...............Q...............K....L...S..
A/Turkey/32/2011                 ...........................................S.............N...............Q...............K....L...S..
A/Israel/52/2011                 ...........................................S.............N...............Q...............K....L...S..
A/Khorasan/8320/2011             ...........................................S.............N..K............Q.....C.........K....L...S..
A/Madrid/RR8856/2011             ...........................................S.............N...............Q...............K....L...S..
A/Finland/190/2011               .........................................................N...............Q...............K....L...S..
A/Hong Kong/3969/2011            .........................................................N...............Q...............K....L...S..
A/Hong Kong/5047/2011            .........................................................N...............Q...............K....L...S..
A/Norway/1789/2011               .........................................................N...............Q...............K....L...S..
A/Norway/2431/2011               .........................................................N...............Q...............K....L...S..

                                          210       220       230       240       250       260       270       280       290       300
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007               RITVSTKRSQQTVIPNIGSRPRVRNIPSRISIYWTIVKPGDILLINSTGNLIAPRGYFKIRSGKSSIMRSDAPIGKCNSECITPNGSIPNDKPFQNVNRI
A/Perth/16/2009                  ............S.............................................................................
A/Israel/1/2011                  ...........AAV..............................................................................
A/Victoria/210/2009              ..........................................................MQ..................................
A/Norway/1186/2011               ....................L.......................................MQ..................................
A/Victoria/208/2009              ...........A..............................X...............................................
A/Johannesburg/153/2011          ...........A...............................................................................
A/Alabama/05/2010                .......K...A............X....V.....................................A.....................
A/Perth/10/2010                  ...........A..............V................................................A.....................
A/Guangdong-Jinping/1334/2011    ...........A..............V.....................................T.......................
A/Slovenia/9/2012                ...........A..............V................................................A.....................
A/Iowa/19/2010                   ...........A..............V................................................A.....................
A/Castilla La Mancha/RR8871/2011 ...........A..............V................................................A.....................
A/Netherlands/001/2012           ...........A..............V................................................A.....................
A/Brisbane/299/2011              ...........A....V.........V................................................A.....................
A/Stockholm/18/2011              ...........A........I......................................................................
A/Milano/265/2011                ...........A........I......................................................................
A/Baden-Wurttemberg/1/2012       ...........A........I......................................................................
A/Yopougon/GR1336/2011           ...........A........I......................................................................
A/Belgium/G1147/2011             ...........A........I......................................................................
A/England/259/2011               ...........A......F...I....................................................................
A/Turkey/32/2011                 ...........A........I......................................................................
A/Israel/52/2011                 ...........A........I......................................................................
A/Khorasan/8320/2011             ...........A........I......................................................................
A/Madrid/RR8856/2011             ...........A........I......................................................................
A/Finland/190/2011               ...........A........I......................................................................
A/Hong Kong/3969/2011            ...........A........I......................................................................
A/Hong Kong/5047/2011            ...........A........I.....................................K.....................................
A/Norway/1789/2011               ...........A........I.....................................K.....................................
A/Norway/2431/2011               ...........A........I.....................................K.....................................
```

```
                                         310       320       HA2       340       350       360       370       380       390       400
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007               TYGACPRYVKQNTLKLATGMRNVPEKQTRGIFGAIAGFIENGWEGMVDGWYGFRHQNSEGIGQAADLKSTQAAIDQINGKLNRLIGKTNEKFHQIEKEFS
A/Perth/16/2009                  ........................................................R.......................................
A/Israel/1/2011                  ........................................................R.......................................
A/Victoria/210/2009              ........................................................R.......................................
A/Norway/1186/2011               ........................................................R.......................................
A/Victoria/208/2009              ........................................................R.......................................
A/Johannesburg/153/2011          ........................................................R.......................................
A/Alabama/05/2010                ........................................................R.......................................
A/Perth/10/2010                  ........................................................R.......................................
A/Guangdong-Jinping/1334/2011    ......................I.................................R.......................................
A/Slovenia/9/2012                ........................................................R.......................................
A/Iowa/19/2010                   ........................................................R.......................................
A/Castilla La Mancha/RR8871/2011.........................................................R.......................................
A/Netherlands/001/2012           ........................................................R.......................................
A/Brisbane/299/2011              ........................K...............................R.......................................
A/Stockholm/18/2011              ........................................................R.......................................
A/Milano/265/2011                ........................................................R.......................................
A/Baden-Wurttemberg/1/2012       ........................................................R.......................................
A/Yopougon/GR1336/2011           ........................................................R.......................................
A/Belgium/G1147/2011             ........................................................R.......................................
A/England/259/2011               ...........S............................................R.......................................
A/Turkey/32/2011                 ...X.......S............................................R.......................................
A/Israel/52/2011                 ...........S............R...............................R.......................................
A/Khorasan/8320/2011             ...........S............................................R.......................................
A/Madrid/RR8856/2011             ...........S............................................R.......................................
A/Finland/190/2011               ...........S............................................R.......................................
A/Hong Kong/3969/2011            ...........S............................................R.......................................
A/Hong Kong/5047/2011            ...........S............................................R.......................................
A/Norway/1789/2011               ...........S............................................R.......................................
A/Norway/2431/2011               ...........S............................................R.......................................

                                         410       420       430       440       450       460       470       480       490       500
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007               EVEGRIQDLEKYVEDTKIDLWSYNAELLVALENQHTIDLTDSEMNKLFEKTKKQLRENAEDMGNGCFKIYHKCDNACIGSIRNGTYDHDVYRDEALNNRF
A/Perth/16/2009                  ........................................................................................................
A/Israel/1/2011                  ........................................................................................................K..
A/Victoria/210/2009              ........................................................................................N...........
A/Norway/1186/2011               ........................................................................................................
A/Victoria/208/2009              ........................................................................................................
A/Johannesburg/153/2011          ........................................................................................................
A/Alabama/05/2010                ........................................................................................................
A/Perth/10/2010                  ........................................................................................................
A/Guangdong-Jinping/1334/2011    ........................................................................................................
A/Slovenia/9/2012                ........................................................................................................
A/Iowa/19/2010                   ........................................................................................................
A/Castilla La Mancha/RR8871/2011........................................................................................................
A/Netherlands/001/2012           ........................................................................................................
A/Brisbane/299/2011              ........................................................................................................
A/Stockholm/18/2011              ....................................................................................N...................
A/Milano/265/2011                ...............................................R........................N...................
A/Baden-Wurttemberg/1/2012       ....................................................................................N...................
A/Yopougon/GR1336/2011           ....................................................................................N...................
A/Belgium/G1147/2011             ....................................................................................N...................
A/England/259/2011               ....................................................................................N...................
A/Turkey/32/2011                 ....................................................................................N...................
A/Israel/52/2011                 ....................................................................................N...................
A/Khorasan/8320/2011             ....................................................................................N...................
A/Madrid/RR8856/2011             ....................................................................................N...................
A/Finland/190/2011               ........................................................................................................
A/Hong Kong/3969/2011            ........................................................................................................
A/Hong Kong/5047/2011            ........................................................................................................
A/Norway/1789/2011               ........................................................................................................
A/Norway/2431/2011               ........................................................................................................

                                         510       520       530       540       550
                                 ....|....|....|....|....|....|....|....|....|....|.
A/Brisbane/10/2007               QIKGVELKSGYKDWILWISFAISCFLLCVALLGFIMWACQKGNIRCNICI*
A/Perth/16/2009                  ...........................................*
A/Israel/1/2011                  ....I......................................*
A/Victoria/210/2009              ...........................................*
A/Norway/1186/2011               ...........................................*
A/Victoria/208/2009              ...........................................*
A/Johannesburg/153/2011          ...........................................*
A/Alabama/05/2010                ...........................................*
A/Perth/10/2010                  ...........................................*
A/Guangdong-Jinping/1334/2011    .....D.....................................*
A/Slovenia/9/2012                ...........................................*
A/Iowa/19/2010                   ...........................................*
A/Castilla La Mancha/RR8871/2011...........................................*
A/Netherlands/001/2012           ...........................................*
A/Brisbane/299/2011              ...........................................*
A/Stockholm/18/2011              ...........................................*
A/Milano/265/2011                ...........................................*
A/Baden-Wurttemberg/1/2012       ...........................................*
A/Yopougon/GR1336/2011           ...........................................*
A/Belgium/G1147/2011             ...........................................*
A/England/259/2011               ...........................................*
A/Turkey/32/2011                 ...........................................*
A/Israel/52/2011                 ...........................................*
A/Khorasan/8320/2011             ...........................................*
A/Madrid/RR8856/2011             ...........................................*
A/Finland/190/2011               ...........................................*
A/Hong Kong/3969/2011            ...........................................*
A/Hong Kong/5047/2011            ..........................I................*
A/Norway/1789/2011               ...........................................*
A/Norway/2431/2011               ...........................................*
```

Figure 12. H3-HA locations of genetic cluster defining amino acid substitutions.

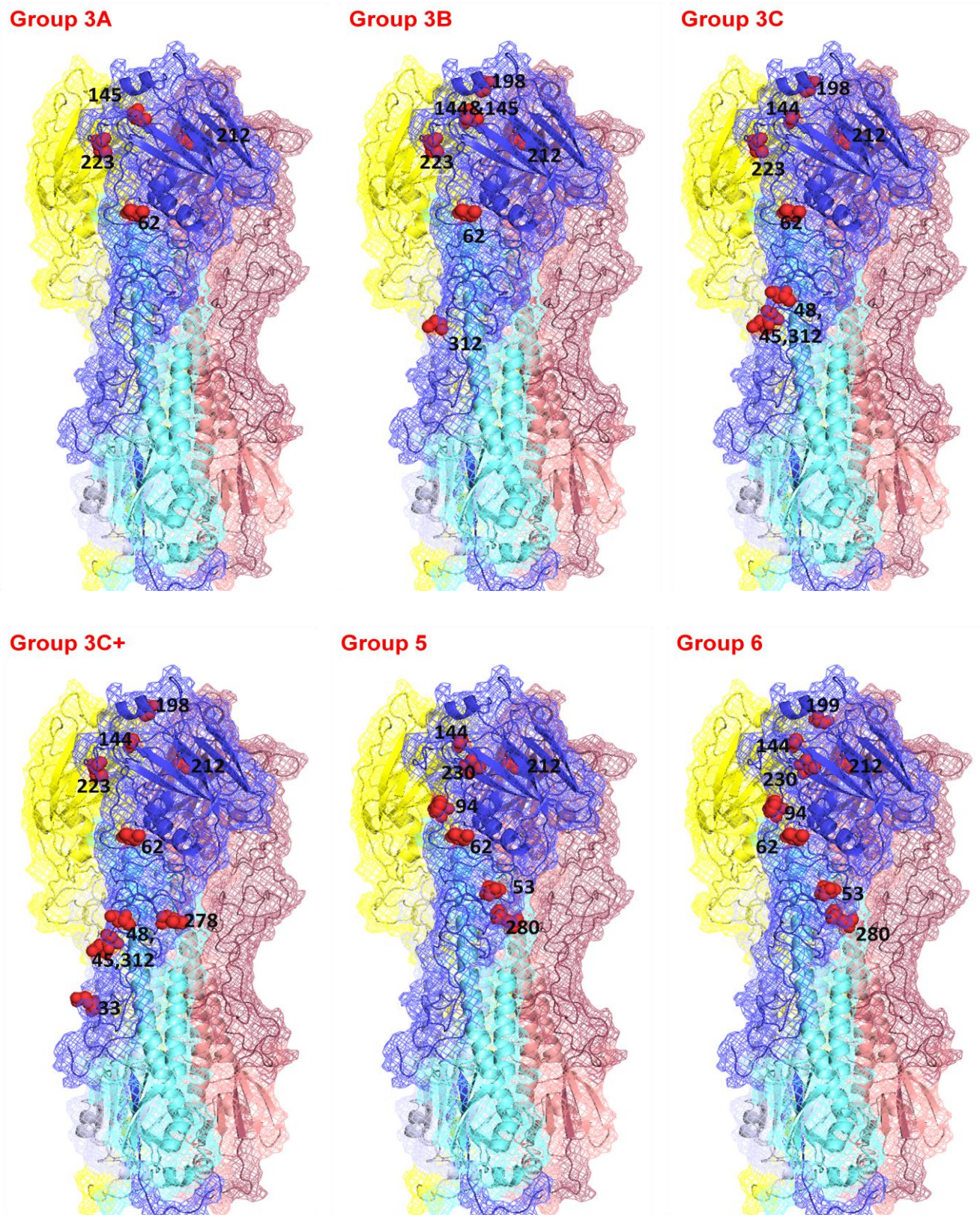


Figure 13. Phylogenetic comparison of influenza A (H3N2) NA genes

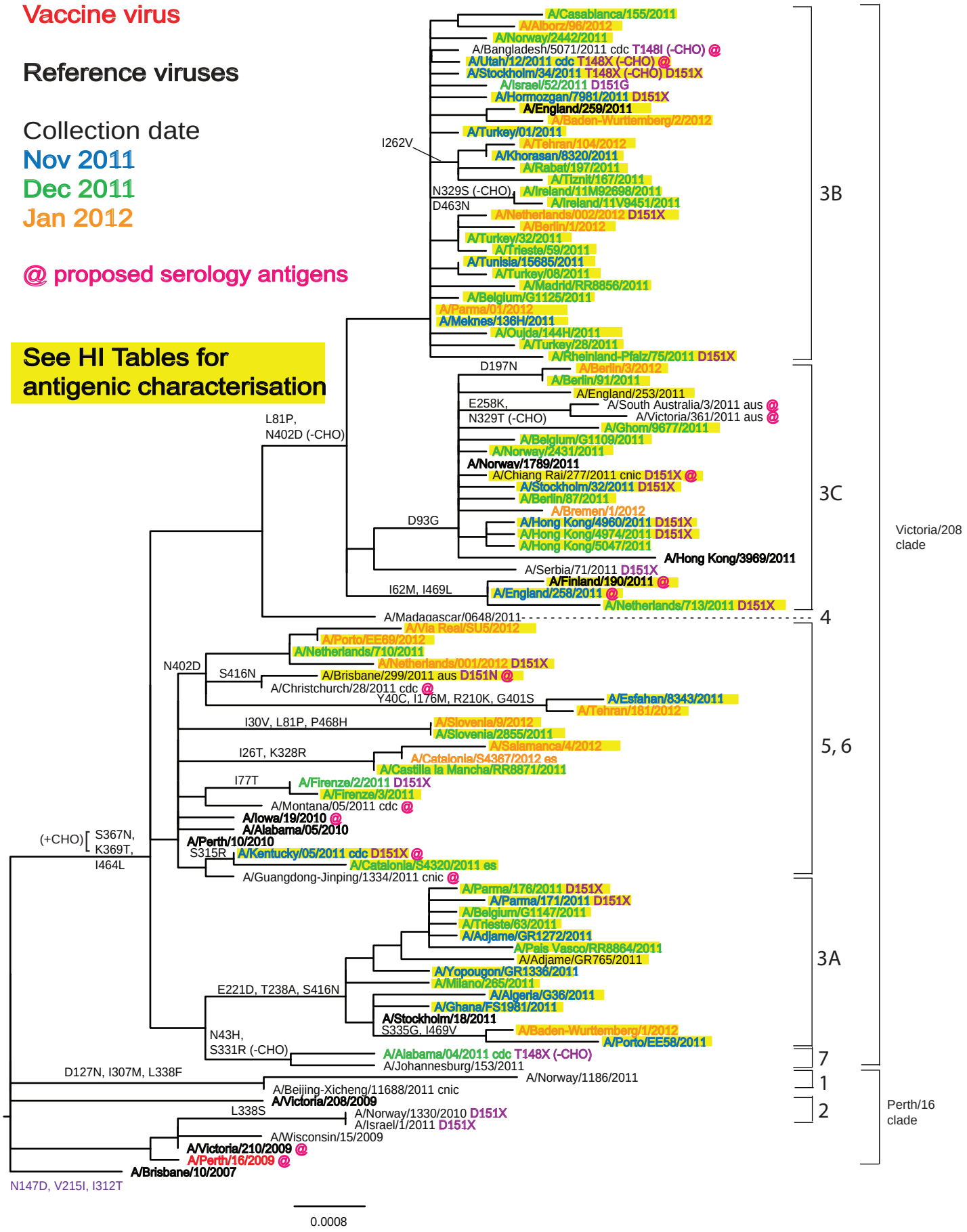


Figure 14. NA protein alignment for A(H3N2) viruses.

```
Reference Viruses   Vaccine Virus      Genetic group/subgroup        Potential N-linked glycosylation sites
                                          10        20        30        40        50        60        70        80        90       100
                                   ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007                 MNPNQKIITIGSVSLTISTICFFMQIAILITTVTLHFKQYEFNSPPNNQVMLCEPTIIERNITEIVYLTNTTIEKEICPKLAEYRNWSKPQCDITGFAPF
A/Perth/16/2009                    ..................................................................................................
A/Israel/1/2011                    ..................................................................................................  2
A/Victoria/210/2009                ..................................................................................................  2*
A/Norway/1186/2011                 ..................................................................................................  1
A/Victoria/208/2009                ......................T.............C...................................................
A/Johannesburg/153/2011            ........................................H.........................................................  7
A/Alabama/05/2010                  ..................................................................................................  5,6
A/Perth/10/2010                    ..................................................................................................  5,6
A/Guangdong-Jinping/1334/2011      ..................................................................................................  5,6
A/Slovenia/9/2012                  ............................V.....................................P...................  5,6
A/Iowa/19/2010                     ..................................................................................................  5,6
A/Castilla La Mancha/RR8871/2011.......................T..................................................................................  5,6
A/Netherlands/001/2012             ..................................................................................................  5,6
A/Brisbane/299/2011                ..................................................................................................  5,6
A/Stockholm/18/2011                ..................................................................................X.................  3A
A/Milano/265/2011                  ..................................................................................................  3A
A/Baden-Wurttemberg/1/2012         ..................................................................................................  3A
A/Yopougon/GR1336/2011             ..................................................................................................  3A
A/Belgium/G1147/2011               ..................................................................................................  3A
A/England/259/2011                 ..................................................................................P.................  3B
A/Turkey/32/2011                   ..................................................................................P.................  3B
A/Israel/52/2011                   ..................................................................................P.................  3B
A/Khorasan/8320/2011               ..................................................................................P.................  3B
A/Madrid/RR8856/2011               ..................................................................................P.................  3B
A/Finland/190/2011                 ..................................................M...............................P.................  3C
A/Hong Kong/3969/2011              ..................................................................................P..........G......  3C
A/Hong Kong/5047/2011              ..................................................................................RP.........G......  3C
A/Norway/1789/2011                 ..................................................................................P..........G......  3C
A/Norway/2431/2011                 ..................................................................................P..........G......  3C

                                          110       120       130       140       150       160       170       180       190       200
                                   ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007                 SKDNSIRLSAGGDIWVTREPYVSCDPDKCYQFALGQGTTLNNVHSNDTVRDRTPYRTLLMNELGVPFHLGTKQVCIAWSSSSCHDGKAWLHVCITGDDKN
A/Perth/16/2009                    ..............................................N.....................................
A/Israel/1/2011                    ..............................................N...X.................................
A/Victoria/210/2009                ..............................................N.....................................
A/Norway/1186/2011                 ...............I..........N...................N.....................................
A/Victoria/208/2009                ..............................................N.....................................
A/Johannesburg/153/2011            ..............................................N.....................................
A/Alabama/05/2010                  ..............................................N...X.................................
A/Perth/10/2010                    ..............................................N.....................................
A/Guangdong-Jinping/1334/2011      ..............................................N.....................................
A/Slovenia/9/2012                  ..............................................N.....................................
A/Iowa/19/2010                     ..............................................N.....................................
A/Castilla La Mancha/RR8871/2011...............................................N.....................................
A/Netherlands/001/2012             ..............................................N...X.................................
A/Brisbane/299/2011                ..............................................N...N.................................
A/Stockholm/18/2011                ..............................................N.....................................
A/Milano/265/2011                  ..............................................N.....................................
A/Baden-Wurttemberg/1/2012         ..............................................N.....................................
A/Yopougon/GR1336/2011             ..............................................N.....................................
A/Belgium/G1147/2011               ..............................................N.....................................
A/England/259/2011                 ..............................................N.....................................
A/Turkey/32/2011                   ..............................................N.....................................
A/Israel/52/2011                   ..............................................N...G.................................
A/Khorasan/8320/2011               ..............................................N.....................................
A/Madrid/RR8856/2011               ..............................................N.....................................
A/Finland/190/2011                 ..............................................N.....................................
A/Hong Kong/3969/2011              ..............................................N.....................................
A/Hong Kong/5047/2011              ..............................................N.....................................
A/Norway/1789/2011                 ..............................................N.....................................
A/Norway/2431/2011                 ..............................................N.....................................

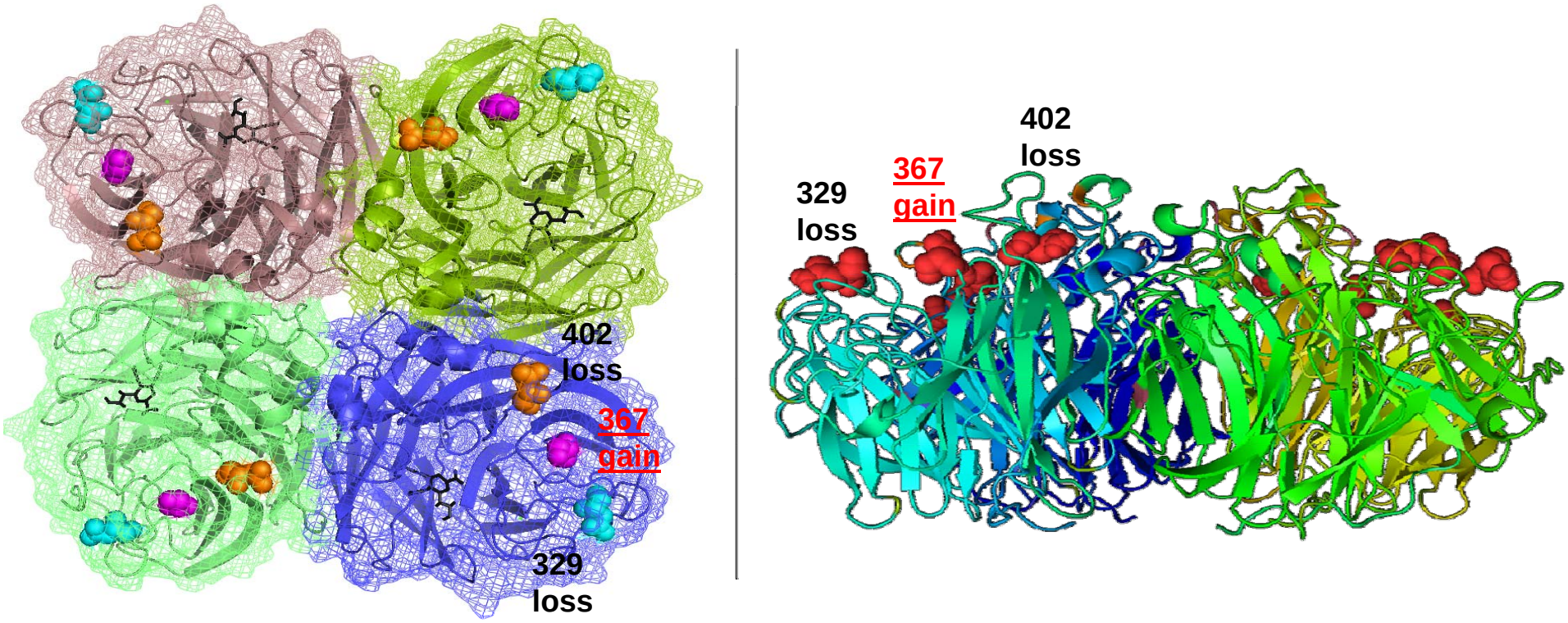
                                          210       220       230       240       250       260       270       280       290       300
                                   ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007                 ATASFIYNGRLVDSIVSWSKEILRTQESECVCINGTCTVVMTDGSASGKADTKILFIEEGKIVHTSTLSGSAQHVEECSCYPRYPGVRCVCRDNWKGSNR
A/Perth/16/2009                    .............V....................................................................................
A/Israel/1/2011                    .............V....................................................................................
A/Victoria/210/2009                .............V....................................................................................
A/Norway/1186/2011                 .............V...................I................................................................
A/Victoria/208/2009                .............V....................................................................................
A/Johannesburg/153/2011            .............V....................................................................................
A/Alabama/05/2010                  .............V....................................................................................
A/Perth/10/2010                    .............V....................................................................................
A/Guangdong-Jinping/1334/2011      .........K...V....................................................................................
A/Slovenia/9/2012                  .............V....................................................................................
A/Iowa/19/2010                     .............V....Q...............................................................................
A/Castilla La Mancha/RR8871/2011.............V....................................................................................
A/Netherlands/001/2012             .............V....................................................................................
A/Brisbane/299/2011                .............V....................................................................................
A/Stockholm/18/2011                .............V.....D..............A.................................................................
A/Milano/265/2011                  .............V.....D..............A.................................................................
A/Baden-Wurttemberg/1/2012         .............V.....D..............A.................................................................
A/Yopougon/GR1336/2011             .............V.....D..............A.................................................................
A/Belgium/G1147/2011               ...........I..V.....D..............A.................................................................
A/England/259/2011                 .............V....................................................................................
A/Turkey/32/2011                   .............V....................................................................................
A/Israel/52/2011                   .............V....................................................................................
A/Khorasan/8320/2011               .............V.....................................V..............................................
A/Madrid/RR8856/2011               .............V....................................................................................
A/Finland/190/2011                 .............V.....................X..............................................................
A/Hong Kong/3969/2011              .............V....N...............................................................................
A/Hong Kong/5047/2011              .............V....................................................................................
A/Norway/1789/2011                 .............V....................................................................................
A/Norway/2431/2011                 .............V....................................................................................
```

```
                                          310       320       330       340       350       360       370       380       390       400
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007                PIVDINIKDHSTVSSYVCSGLVGDTPRKNDSSSSSHCLDPNNEEGGHGVKGWAFDDGNDVWMGRTISEKSRLGYETFKVIEGWSNPKSKLQINRQVIVDR
A/Perth/16/2009                   ...........I..................................................................................
A/Israel/1/2011                   ...........I.................S....................................................................
A/Victoria/210/2009               ...........I..................................................................................
A/Norway/1186/2011                ......M....I.....................F...D.........................................................
A/Victoria/208/2009               ...........I..................................................................................
A/Johannesburg/153/2011           ...........I.................R.................................N.T.............................
A/Alabama/05/2010                 ...........I..................................................N.T.............................
A/Perth/10/2010                   ...........I..................................................N.T.............................
A/Guangdong-Jinping/1334/2011     ...........I..................................................N.T.............................
A/Slovenia/9/2012                 ...........I..................................................N.T.............................
A/Iowa/19/2010                    ...........I..................................................N.T.....................M........
A/Castilla La Mancha/RR8871/2011...........I..............R...................................N.T.............................
A/Netherlands/001/2012            ...........I..................................................N.T.............................
A/Brisbane/299/2011               ...........I..................................................N.T.............................
A/Stockholm/18/2011               ...........I..................................................N.T.............................
A/Milano/265/2011                 ...........I..................................................N.T..............F..............
A/Baden-Wurttemberg/1/2012        ...........I.....................G............................N.T.............................
A/Yopougon/GR1336/2011            ...........I..................................................N.T.............................
A/Belgium/G1147/2011              ...........I..................................................N.T.............................
A/England/259/2011                ...........I..................................................N.T.............................
A/Turkey/32/2011                  ...........I..................................................N.T.............................
A/Israel/52/2011                  ...........I..................................................N.T.............................
A/Khorasan/8320/2011              ...........I..................................................N.T.............................
A/Madrid/RR8856/2011              ...........I..................................................N.T.............................
A/Finland/190/2011                ...........I..................................................N.T.............................
A/Hong Kong/3969/2011             ...........I..................................................N.T.............................
A/Hong Kong/5047/2011             ...........I..................................................N.T.............................
A/Norway/1789/2011                ...........I..................................................N.T.............................
A/Norway/2431/2011                ...........I..................................................N.T.............................

                                          410       420       430       440       450       460       470
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|
A/Brisbane/10/2007                GNRSGYSGIFSVEGKSCINRCFYVELIRGRKEETEVLWTSNSIVVFCGTSGTYGTGSWPDGADINLMPI*
A/Perth/16/2009                   ...........................................................................*
A/Israel/1/2011                   ...........................................................................*
A/Victoria/210/2009               ...........................................................................*
A/Norway/1186/2011                .D.........................S..............................................*
A/Victoria/208/2009               ...........................................................................*
A/Johannesburg/153/2011           ...........................................................L.....*
A/Alabama/05/2010                 ...........................................................L.....*
A/Perth/10/2010                   ...........................................................L.....*
A/Guangdong-Jinping/1334/2011     ...........................................................L.....*
A/Slovenia/9/2012                 ...........................................................L...H.*
A/Iowa/19/2010                    ...........................................................L.....*
A/Castilla La Mancha/RR8871/2011...........................................................L.....*
A/Netherlands/001/2012            .D.........................................................L.....*
A/Brisbane/299/2011               .D............N............................................L.....*
A/Stockholm/18/2011               ............N.............................................L.....*
A/Milano/265/2011                 ............N.............................................L.....*
A/Baden-Wurttemberg/1/2012        ............N.............................................L....V*
A/Yopougon/GR1336/2011            ............N.............................................L.....*
A/Belgium/G1147/2011              ............N.............................................L.....*
A/England/259/2011                .D.........................................................L.....*
A/Turkey/32/2011                  .D.........................................................L.....*
A/Israel/52/2011                  .D.........................................................L.....*
A/Khorasan/8320/2011              .D.........................................................L.....*
A/Madrid/RR8856/2011              .D.........................................................L.....*
A/Finland/190/2011                .D.........................................................L....L*
A/Hong Kong/3969/2011             .D.........................................................L.....*
A/Hong Kong/5047/2011             .D.........................................................L.....*
A/Norway/1789/2011                .D.........................................................L.....*
A/Norway/2431/2011                .D.........................................................L.....*
```

* HA-1

Figure 15. N2-NA locations of amino acid substitutions defining variable N-linked glycosylation.



View from top **View from side**

Figure 16. Phylogenetic comparison of influenza A(H3N2) M genes

Vaccine virus

Reference viruses

Collection date
Nov 2011
Dec 2011
Jan 2012

@ Proposed serology antigens

M2 numbering

See HI Tables for antigenic characterisation

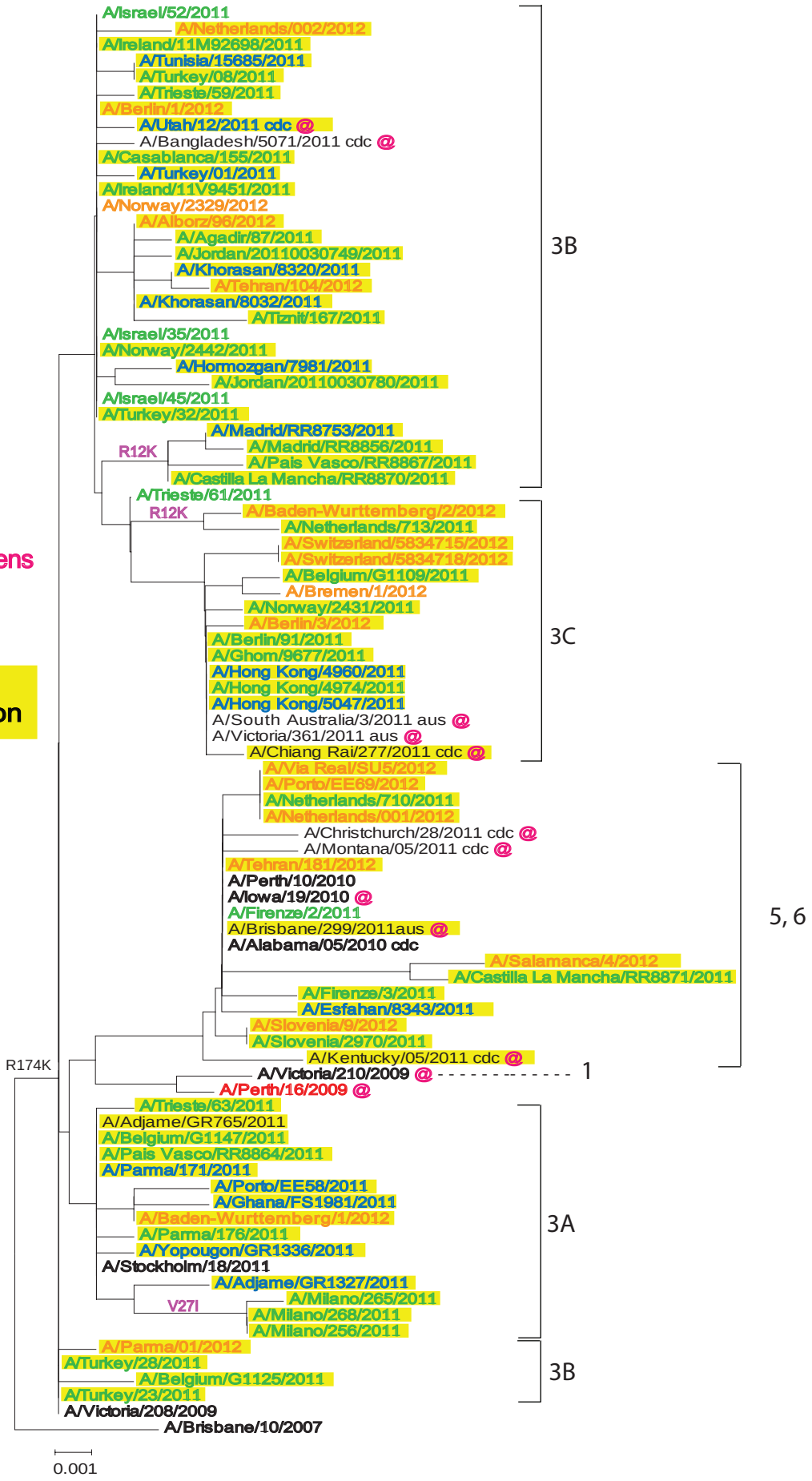


Table 20. Summary of influenza B viruses (Victoria-lineage) received, collected since 2011-09-01

MONTH Country	B Victoria lineage			
	Number propagated	≤2 fold*	4 fold*	≥8 fold*
SEPTEMBER				
Cote d'Ivoire	2	2		
France	1	1		
OCTOBER				
Germany	1	1		
Norway	1	1		
NOVEMBER				
Israel	1	1		
Switzerland	1	1		
DECEMBER				
Hong Kong SAR	2		2	
Israel	2	2		
Norway	2	2		
JANUARY				
Austria	1	1		
Germany	1	1		
Ireland	1	1		
Switzerland	1	1		
Total	17	15	2	0
		88.2%	11.8%	0.0%

* Compared to homologous titres for ferret antisera raised against at least one of three tissue-culture grown B/Brisbane/60/2008-like equivalents (B/Paris/1762/2008, B/Hong Kong/514/2009 and B/Odessa/3886/2010)

Table 21. Antigenic analyses of influenza B viruses (Victoria lineage) - 2012-01-09

Viruses	Collection date	Passage History	Haemagglutination inhibition titre[1]						
			Post infection ferret sera						
			B/Bris[2] 60/08 Sh 524	B/Mal 2506/04 F28/05	B/Eng 393/08 F05/11	B/Bris 60/08 F06/11	B/Paris 1762/08 F07/11	B/HK 514/09 F13/10	B/Odessa 3886/10 F19/11
REFERENCE VIRUSES									
B/Malaysia/2506/2004	2004-12-06	E3/E2	640	160	20	80	<	<	<
B/England/393/2008	2008-08-29	E1/E5	2560	320	320	1280	80	40	40
B/Brisbane/60/2008	2008-08-04	E4/E4	640	160	160	320	40	20	40
B/Paris/1762/2008	2009-02-09	C2/MDCK1	5120	20	10	80	80	80	80
B/Hong Kong/514/2009	2009-10-11	MDCK1/MDCK1	5120	40	20	80	80	160	320
B/Odessa/3886/2010	2010-03-19	C2/MDCK1	5120	20	20	160	80	80	160
TEST VIRUSES									
B/Stockholm/18/2011	2011-07-19	C1/MDCK1	5120	20	20	40	80	80	160
B/Norway/2075/2011	2011-10-11	MDCK2/MDCK1	1280	<	10	40	80	80	160
B/Berlin/146/2011	2011-10-19	MDCK1/MDCK1	5120	40	20	80	80	80	160

1. < = <10; 2. hyperimmune sheep serum

Vaccine virus

Sequences in phylogenetic trees

Table 22. Antigenic analyses of influenza B viruses (Victoria lineage) - 2012-01-27

Viruses	Collection date	Passage History	Haemagglutination inhibition titre[1]							
			Post infection ferret sera							
			B/Bris[2] 60/08 Sh 524	B/Mal 2506/04 F37/11	B/England 393/08 F05/11	B/Bris 60/08 F06/11	B/Paris 1762/08 F07/11	B/HK 514/09 F13/10	B/Odessa 3886/10 F17/10	B/Malta 636714/11 F33/11
REFERENCE VIRUSES										
B/Malaysia/2506/2004	2004-12-06	E3/E5	1280	320	40	160	<	<	<	80
B/England/393/2008	2008-08-29	E1/E1	2560	40	160	640	40	20	40	320
B/Brisbane/60/2008	2008-08-04	E4/E2	1280	40	160	320	40	20	20	160
B/Paris/1762/2008	2009-02-09	C2/MDCK4	5120	10	20	80	80	80	160	40
B/Hong Kong/514/2009	2009-10-11	MDCK3	5120	<	10	80	80	80	80	10
B/Odessa/3886/2010	2010-03-19	C2/MDCK1	5120	<	10	40	80	40	80	10
B/Malta/636714/2011	2011-03-07	E4	2560	80	160	640	80	40	40	320
TEST VIRUSES										
B/Attecoube/GR857/2011	2011-09-21		5120	10	20	80	160	80	80	40
B/Aix-en-Provence/1795/2011	2011-09-26	P2/MDCK1	5120	20	40	80	160	80	80	40
B/Norway/2368/2011	2011-12-05	MDCK1	5120	20	10	80	80	80	80	20
B/Hong Kong/1129/2011	2011-12-12	MDCK2	2560	<	<	10	20	20	40	<
B/Norway/2429/2011	2011-12-14	MDCK1	5120	10	10	40	80	40	40	20
B/Hong Kong/1153/2011	2011-12-16	MDCK2	5120	<	<	10	20	20	40	<
B/Sachen Anhalt/1/2012	Jan-2012	MDCK2	5120	10	20	80	80	40	80	40

1. < = <10; 2. hyperimmune sheep serum

Vaccine virus

Sequences in phylogenetic trees

Table 23. Antigenic analyses of influenza B viruses (Victoria lineage) - 2012-01-31

Viruses	Collection date	Passage History	Haemagglutination inhibition titre[1]						
			Post infection ferret sera						
			B/Bris[2] 60/08 Sh 524	B/Mal 2506/04 F28/05	B/England 393/08 F05/11	B/Bris 60/08 F06/11	B/Paris 1762/08 F07/11	B/HK 514/09 F13/10	B/Odessa 3886/10 F17/10
REFERENCE VIRUSES									
B/Malaysia/2506/2004	2004-12-06	E3/E3	1280	320	80	160	10	<	10
B/England/393/2008	2008-08-29	E1/E6	1280	320	160	1280	80	80	80
B/Brisbane/60/2008	2008-08-04	E4/E4	1280	160	320	320	80	40	80
B/Paris/1762/2008	2009-02-09	C2/MDCK4	1280	20	80	80	80	160	160
B/Hong Kong/514/2009	2009-10-11	MDCK1/MDCK1	1280	20	40	80	160	80	160
B/Odessa/3886/2010	2010-03-19	C2/MDCK3	2560	20	80	160	160	320	80
TEST VIRUSES									
B/Attecoube/GR887/2011	2011-09-22	MDCK4	2560	<	<	40	80	40	80
B/Israel/14/2011	2011-11-29	px/MDCK1	5120	<	10	20	80	40	80
B/Israel/15/2011	2011-12-13	px/MDCK1	2560	<	<	20	80	40	80
B/Israel/17/2011	2011-12-20	px/MDCK1	2560	<	<	40	80	40	40

1. < = <10; 2. hyperimmune sheep serum

Vaccine virus

Sequences in phylogenetic trees

Table 24. Antigenic analyses of influenza B viruses (Victoria lineage) - 2012-02-07/2012-02-14

Viruses	Collection date	Passage History	Haemagglutination inhibition titre[1]							
			Post infection ferret sera							
			B/Bris[2] 60/08 Sh 524	B/Mal 2506/04 F37/11	B/England 393/08 F05/11	B/Bris 60/08 F06/11	B/Paris 1762/08 F07/11	B/HK 514/09 F13/10	B/Odessa 3886/10 F17/10	B/Malta 636714/11 F33/11
REFERENCE VIRUSES										
B/Malaysia/2506/2004	2004-12-06	E3/E5	2560	320	40	160	<	<	<	80
B/England/393/2008	2008-08-29	E1/E6	2560	160	640	1280	80	40	40	320
B/Brisbane/60/2008	2008-08-04	E8	2560	160	640	1280	40	40	40	320
B/Paris/1762/2008	2009-02-09	C2/MDCK1	2560	<	10	40	80	80	80	10
B/Hong Kong/514/2009	2009-10-11	MDCK1/MDCK1	2560	<	10	40	80	80	80	10
B/Odessa/3886/2010	2010-03-19	C2/MDCK1	2560	<	10	40	80	80	80	10
B/Malta/636714/2011	2011-03-07	E4/E1	2560	80	320	640	80	40	80	320
TEST VIRUSES										
B/Denmark/22/2011	2011-02-16	MDCK2/MDCK1	2560	40	160	320	80	40	80	160
B/Denmark/16/2011	2011-02-23	MDCK3/MDCK1	2560	10	20	80	160	80	160	40
B/Denmark/21/2011	2011-02-26	MDCK3/MDCK1	2560	80	320	640	160	80	160	320
B/Denmark/24/2011	2011-02-28	MDCK2/MDCK1	1280	40	160	320	80	40	80	160
B/Denmark/23/2011	2011-03-23	MDCK2/MDCK1	2560	80	320	640	80	40	80	320
B/Dominican Republic/5486/2011	2011-07-05	E3/E1	1280	160	40	160	40	20	40	80
B/Tokyo/91107/2011	2011-10-27	MDCK3/MDCK1	2560	<	<	20	40	40	40	10
B/Switzerland/5632623/2011	2011-11-21	MDCK2	2560	10	10	80	80	80	80	40
B/Ireland/12M2515/2012	2012-01-09	MDCK2	2560	10	10	40	80	80	80	40
B/Switzerland/5867933/2012	2012-01-20	MDCK2	2560	10	10	80	80	80	80	20
B/Austria/653113/2012	2012-01-01	1P/MDCK1	1280	<	<	20	80	80	40	10

1. < = <10; 2. hyperimmune sheep serum

Vaccine virus

Sequences in phylogenetic trees

Figure 17. Phylogenetic comparison of influenza B (Victoria-lineage) HA genes (HA1 region)

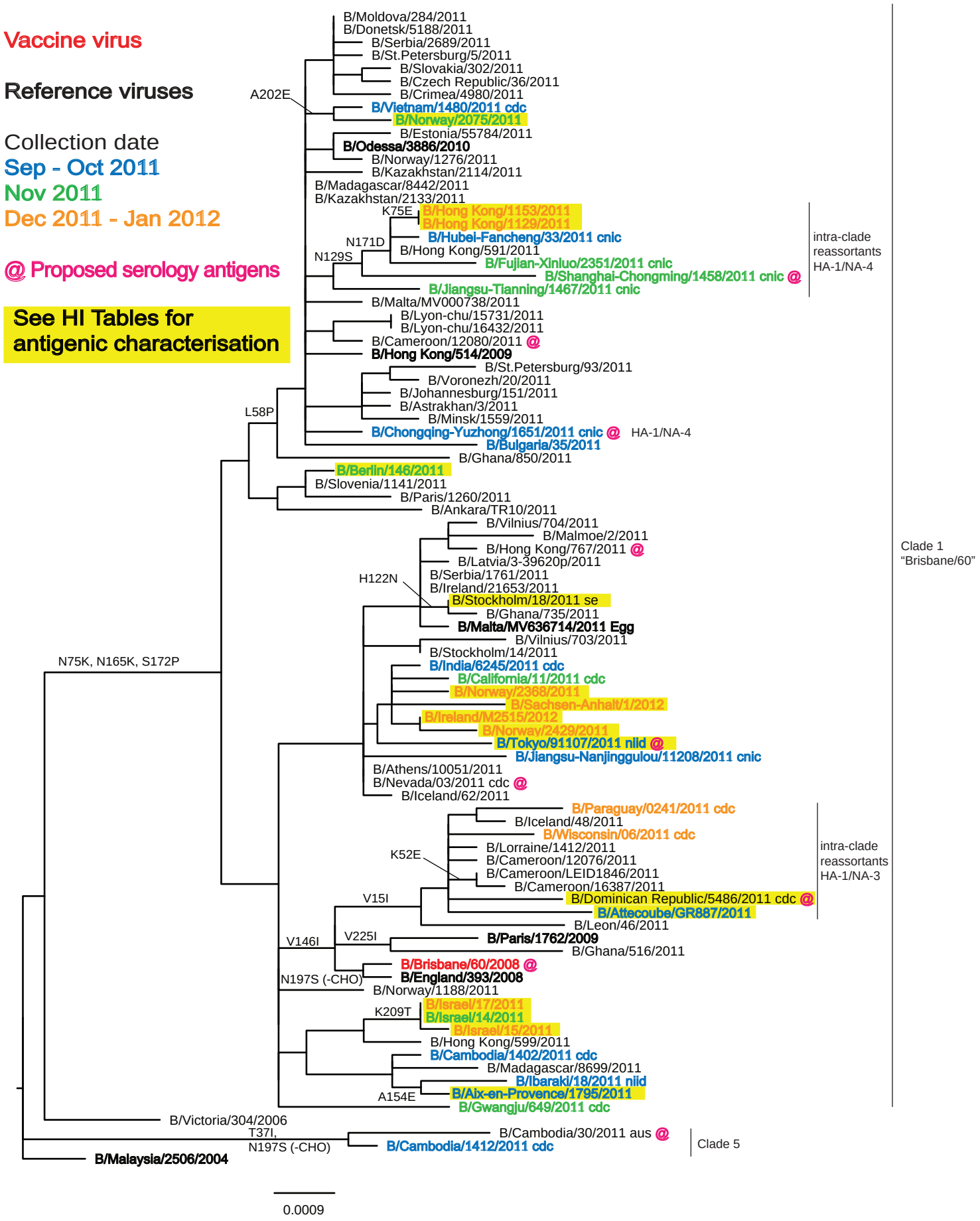


Figure 18. HA protein alignment for B-Victoria lineage viruses.

```
Reference Viruses   Vaccine Virus      Potential N-linked glycosylation sites
                                 HA1      10        20        30        40        50        60        70        80        90       100
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004             DRICTGITSSNSPHVVKTATQGEVNVTGVIPLTTTPTKSHFANLKGTETRGKLCPKCLNCTDLDVALGRPKCTGNIPSARVSILHEVRPVTSGCFPIMHD
B/Cambodia/1412/2011             ........................................I.......................................................
B/Victoria/304/2006              ........................................................................................
B/Gwangju/649/2011               ........................................................................................K.......
B/Aix-en-Provence/1795/2011      ........................................................................................K.......
B/Cambodia/1402/2011             ........................................................................................K.......
B/Israel/15/2011                 ........................................................................................K.......
B/Brisbane/60/2008               ........................................................................................K.......
B/England/393/2008               ........................................................................................K.......
B/Paris/1762/2009                ........................................................................................K.......
B/Leon/46/2011                   .............I..........................................................................K.......
B/Dominican Republic/5486/2011   .............I..........................................................................K.......
B/Wisconsin/06/2011              .............I..........................................................................K.......
B/Paraguay/0241/2011             .............I..........................................................................KV......
B/Athens/10051/2011              ........................................................................................K.......
B/Jiangsu-Nanjinggu/11208/2011   ........................................................................................K....K..
B/Norway/2429/2011               ........................................................................................K.......
B/Sachsen-Anhalt/1/2012          ........................................................................................K.......
B/Stockholm/18/2011              ........................................................................................K.......
B/Hong Kong/767/2011             ........................................................................................K.......
B/Berlin/146/2011                ........................................................................................K.......
B/Chongqing-Yuzhong/1651/2011    ...........................................................P...........................K.......
B/Hong Kong/514/2009             ...........................................................P...........................K.......
B/Cameroon/12080/2011            ...........................................................P...........................K.......
B/Shanghai-Chongming/1458/2011   ........................................I..................P...........M.K...........I.........
B/Hubei-Fancheng/33/2011         ...........................................................P...........................K.......
B/Hong Kong/1153/2011            ...........................................................P...........................E.......
B/Odessa/3886/2010               ...........................................................P...........................K.......
B/Norway/2075/2011               ...........................................................P...........................K.......
B/Czech Republic/36/2011         ...........................................................P...........................K.......

                                         110       120       130       140       150       160       170       180       190       200
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004             RTKIRQLPNLLRGYEHIRLSTHNVINAENAPGGSYKIGTSGSCPNVTNGNGFFATMAWAVPKNDNNKTATNSLTIEVPYICTEGEDQITVWGFHSDNEAQ
B/Cambodia/1412/2011             ...............................P.......................E...............................S.T.
B/Victoria/304/2006              ...............................P.......................................................T.T.
B/Gwangju/649/2011               ...............................P.......................K......P.......................T.
B/Aix-en-Provence/1795/2011      ...............................P.....................E.....K......P.......................T.
B/Cambodia/1402/2011             ...........................D....P.......................K......P.......................T.
B/Israel/15/2011                 ...............................P.......................K......P.......................T.
B/Brisbane/60/2008               ...............................P..........I..............K......P.......................S.T.
B/England/393/2008               ...............................P..........I..............K......P.......................S.T.
B/Paris/1762/2009                ...............................P..........I..............K......P.................I.....T.
B/Leon/46/2011                   ...............................P..........I..............K......P.......................T.
B/Dominican Republic/5486/2011   ...............................P..........I..............K......P.......................I.
B/Wisconsin/06/2011              ........................T......P..........I..............K......P.......................T.
B/Paraguay/0241/2011             ...............................P..........I..............K......P.......................T.
B/Athens/10051/2011              ...............................P.......................K......P.......................T.
B/Jiangsu-Nanjinggu/11208/2011   ...............................P.....................E.....K......P.......................T.
B/Norway/2429/2011               ...............................P.......................K......P.......................T.
B/Sachsen-Anhalt/1/2012          ...............................P.......................K......P.......................T.
B/Stockholm/18/2011              ....................N..........P.......................K......P.......................T.
B/Hong Kong/767/2011             ...............................P.......................K......P.......................T.
B/Berlin/146/2011                ...............................P.......................K......P.......................T.
B/Chongqing-Yuzhong/1651/2011    ...............................P.......................K......P.......................X.T.
B/Hong Kong/514/2009             ...............................P.......................K......P.......................T.
B/Cameroon/12080/2011            ...............................P.......................K......P.......................T.
B/Shanghai-Chongming/1458/2011   ..........................S....P.......................EK.....P.......................T.
B/Hubei-Fancheng/33/2011         ..........................S....P.......................K.....DP.......................T.
B/Hong Kong/1153/2011            ..........................S....P.......................K.....DP.......................T.
B/Odessa/3886/2010               ...............................P.......................K......P.......................T.
B/Norway/2075/2011               ...............................P.......................K......P.......................T.
B/Czech Republic/36/2011         ...............................P.......................K......P.......................T.

                                         210       220       230       240       250       260       270       280       290       300
                                 ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004             MAKLYGDSKPQKFTSSANGVTTHYVSQIGGFPNQTEDGGLPQSGRIVVDYMVQKSGKTGTITYQRGILLPQKVWCASGRSKVIKGSLPLIGEADCLHEKY
B/Cambodia/1412/2011             ........................................................................................
B/Victoria/304/2006              ..........................D.............................................................
B/Gwangju/649/2011               .E......................................................................................
B/Aix-en-Provence/1795/2011      ........................................................................................
B/Cambodia/1402/2011             ........................................................................................
B/Israel/15/2011                 ........T...............................................................................
B/Brisbane/60/2008               ........................................................................................
B/England/393/2008               ........................................................................................
B/Paris/1762/2009                ......................I.................................P.....................................
B/Leon/46/2011                   ........................................................................................
B/Dominican Republic/5486/2011   ........................................................................................
B/Wisconsin/06/2011              ........................................................................................
B/Paraguay/0241/2011             ........................................................................................
B/Athens/10051/2011              ........................................................................................
B/Jiangsu-Nanjinggu/11208/2011   ........................................................................................
B/Norway/2429/2011               ........................................................................................
B/Sachsen-Anhalt/1/2012          ...................................F....................................................
B/Stockholm/18/2011              ........................................................................................
B/Hong Kong/767/2011             ........................................................................................
B/Berlin/146/2011                ........................................................................................
B/Chongqing-Yuzhong/1651/2011    ........................................................................................
B/Hong Kong/514/2009             ...............................................................K........................
B/Cameroon/12080/2011            ........................................................................................
B/Shanghai-Chongming/1458/2011   ........................................................................................
B/Hubei-Fancheng/33/2011         ........................................................................................
B/Hong Kong/1153/2011            ........................................................................................
B/Odessa/3886/2010               ........................................................................................
B/Norway/2075/2011               .E......................................................................................
B/Czech Republic/36/2011         ........................................................................................
```

```
                                  310       320       330       340      HA2       360       370       380       390       400
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004      GGLNKSKPYYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLN
B/Cambodia/1412/2011      ..................................................................................................
B/Victoria/304/2006       ..................................................................................................
B/Gwangju/649/2011        ..................................................................................I.............
B/Aix-en-Provence/1795/2011 ................................................................................................
B/Cambodia/1402/2011      ..................................................................................................
B/Israel/15/2011          ..................................................................................................
B/Brisbane/60/2008        ..................................................................................................
B/England/393/2008        ..........................................~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
B/Paris/1762/2009         ..................................................................................................
B/Leon/46/2011            ..................................................................................................
B/Dominican Republic/5486/2011 ..............................................................................................
B/Wisconsin/06/2011       ..................................................................................................
B/Paraguay/0241/2011      ..................................................................................................
B/Athens/10051/2011       ..................................................................................................
B/Jiangsu-Nanjinggu/11208/2011 ..............................................................................................
B/Norway/2429/2011        ..................................................................................................
B/Sachsen-Anhalt/1/2012   ..................................................................................................
B/Stockholm/18/2011       ..................................................................................................
B/Hong Kong/767/2011      ..................................................................................................
B/Berlin/146/2011         ..................................................................................................
B/Chongqing-Yuzhong/1651/2011 ..............................................................................................
B/Hong Kong/514/2009      ..................................................................................................
B/Cameroon/12080/2011     ..................................................................................................
B/Shanghai-Chongming/1458/2011 ..............................................................................................
B/Hubei-Fancheng/33/2011  ..................................................................................................
B/Hong Kong/1153/2011     ..................................................................................................
B/Odessa/3886/2010        ..................................................................................................
B/Norway/2075/2011        ..................................................................................................
B/Czech Republic/36/2011  ..................................................................................................

                                  410       420       430       440       450       460       470       480       490       500
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004      SLSELEVKNLQRLSGAMDELHNEILELDEKVDDLRADTISSQIELAVLLSNEGIINSEDEHLLALERKLKKMLGPSAVEIGNGCFETKHKCNQTCLDRIA
B/Cambodia/1412/2011      ..................................................................................................
B/Victoria/304/2006       ..................................................................................................
B/Gwangju/649/2011        ..................................................................................................
B/Aix-en-Provence/1795/2011 ................................................................................................
B/Cambodia/1402/2011      ..................................................................................................
B/Israel/15/2011          ..................................................................................................
B/Brisbane/60/2008        ..................................................................................................
B/England/393/2008        ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
B/Paris/1762/2009         ............................D.....................................................................
B/Leon/46/2011            ..................................................................................................
B/Dominican Republic/5486/2011 ..............................................................................................
B/Wisconsin/06/2011       ..................................................................................................
B/Paraguay/0241/2011      ..................................................................................................
B/Athens/10051/2011       ..................................................................................................
B/Jiangsu-Nanjinggu/11208/2011 ..............................................................................................
B/Norway/2429/2011        ..................................................................................................
B/Sachsen-Anhalt/1/2012   ..................................................................................................
B/Stockholm/18/2011       ..................................................................................................
B/Hong Kong/767/2011      ..................................................................................................
B/Berlin/146/2011         ..................................................................................................
B/Chongqing-Yuzhong/1651/2011 ..............................................................................R...................
B/Hong Kong/514/2009      ..................................................................................................
B/Cameroon/12080/2011     ..................................................................................................
B/Shanghai-Chongming/1458/2011 ..............................................................................................
B/Hubei-Fancheng/33/2011  ..................................................................................................
B/Hong Kong/1153/2011     ..................................................................................................
B/Odessa/3886/2010        ..................................................................................................
B/Norway/2075/2011        ..................................................................................................
B/Czech Republic/36/2011  ..................................................................................................

                                  510       520       530       540       550       560       570
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|.
B/Malaysia/2506/2004      AGTFDAGEFSLPTFDSLNITAASLNDDGLDNHTILLYYSTAASSLAVTLMIAIFVVYMVSRDNVSCSICL*
B/Cambodia/1412/2011      ...................................................................*
B/Victoria/304/2006       ...................................................................*
B/Gwangju/649/2011        ...................................................................*
B/Aix-en-Provence/1795/2011 ...................................................I..............*
B/Cambodia/1402/2011      ...................................................I..............*
B/Israel/15/2011          ...................................................................*
B/Brisbane/60/2008        ...................................................................*
B/England/393/2008        ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
B/Paris/1762/2009         ...................................................................*
B/Leon/46/2011            ...................................................................*
B/Dominican Republic/5486/2011 ...................................................................*
B/Wisconsin/06/2011       ...................................................................*
B/Paraguay/0241/2011      ...................................................................*
B/Athens/10051/2011       ...................................................................*
B/Jiangsu-Nanjinggu/11208/2011 ...................................................................*
B/Norway/2429/2011        ...................................................................*
B/Sachsen-Anhalt/1/2012   ...................................................I..............*
B/Stockholm/18/2011       ...................................................................*
B/Hong Kong/767/2011      ...................................................................*
B/Berlin/146/2011         ...................................................................*
B/Chongqing-Yuzhong/1651/2011 ...................................................................*
B/Hong Kong/514/2009      ...................................................................*
B/Cameroon/12080/2011     ...S...............................................................*
B/Shanghai-Chongming/1458/2011 ...........E.......................................................*
B/Hubei-Fancheng/33/2011  ...................................................................*
B/Hong Kong/1153/2011     ...................................................................*
B/Odessa/3886/2010        ...................................................................*
B/Norway/2075/2011        ...................................................................*
B/Czech Republic/36/2011  ...................................................................*
```

Figure 19. Phylogenetic comparison of influenza B (Victoria-lineage) NA genes

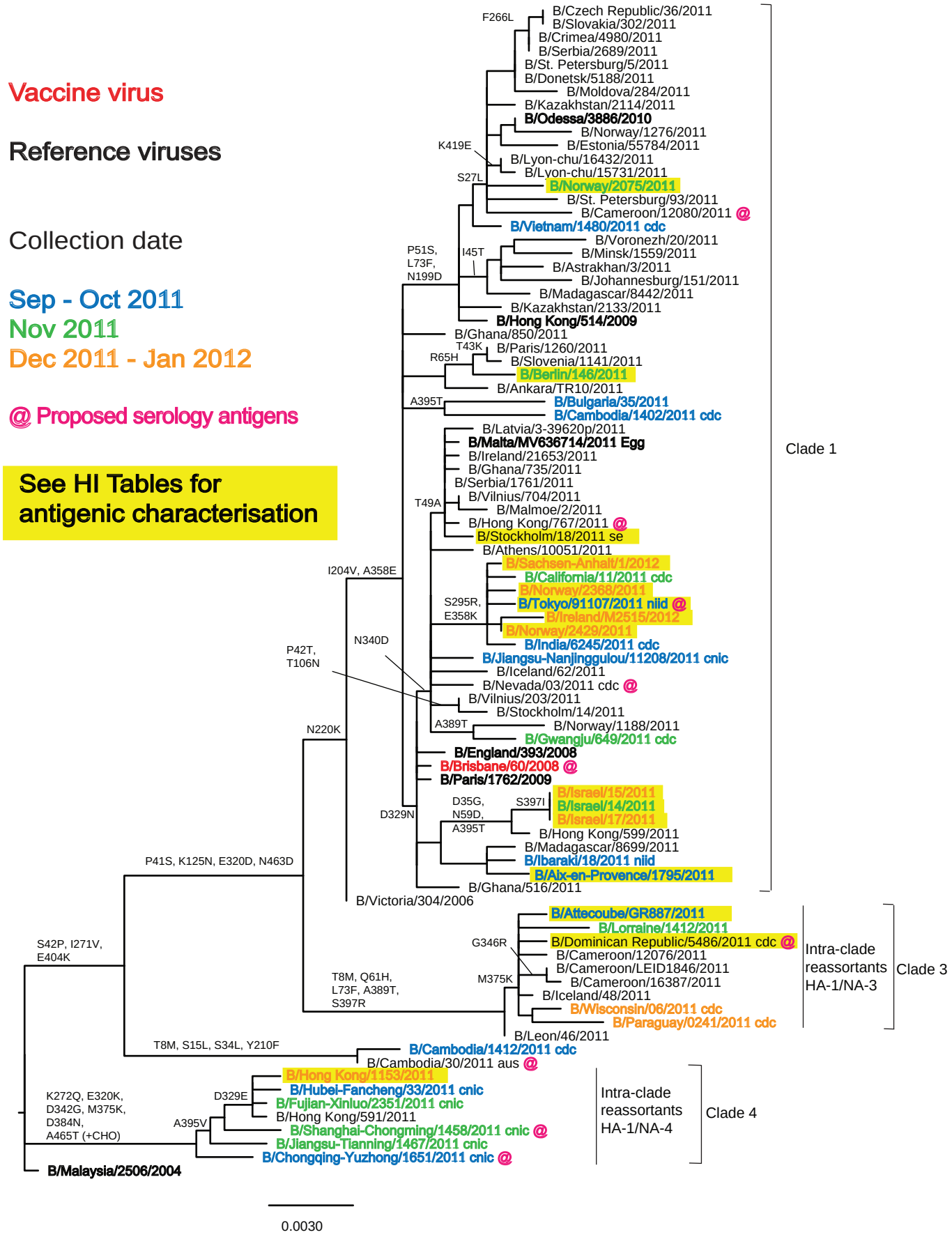


Figure 20. NA protein alignment for B-Victoria lineage viruses.

Reference Viruses Vaccine Virus Potential N-linked glycosylation sites

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                                   10        20        30        40        50        60        70        80        90       100
                                   ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004               MLPSTIQTLTLFLTSGGVLLSLYVSASLSYLLYSDILLKFPSTEITAPTMPLDCANASNVQAVNRSATKGVTLLLPEPEWTYPRLSCPGSTFQKALLISP
B/Cambodia/1412/2011               .......M......L..................L.......P.............................................................
B/Victoria/304/2006                ......................................SP.............................................................
B/Gwangju/649/2011                 ......................................SP.............................................................
B/Aix-en-Provence/1795/2011        ......................................SP.............................................................
B/Cambodia/1402/2011               ......................................SP.............................................................
B/Israel/15/2011                   ................................G.....SP...............D.............................................
B/Brisbane/60/2008                 ......................................SP.............................................................
B/England/393/2008                 ......................................SP.............................................................
B/Paris/1762/2009                  ......................................SP.......T.....................................................
B/Leon/46/2011                     .......M..............................SP................H..........F.............................
B/Dominican Republic/5486/2011     .......M..............................SP................H..........F.............................
B/Wisconsin/06/2011                .......M..............................SP................H..........F................T............
B/Paraguay/0241/2011               .......M..............................SP................H..........F.............................
B/Athens/10051/2011                ......................................SP.............................................................S
B/Jiangsu-Nanjinggu/11208/2011     ......................................SP.............................F.............................
B/Norway/2429/2011                 ......................................SP.............................................................
B/Sachsen-Anhalt/1/2012            ......................................SP.............................................................
B/Stockholm/18/2011                ......................................SP......A......................................................
B/Hong Kong/767/2011               ......................................SP......A......................................................
B/Berlin/146/2011                  ......................................SP.................H...........................................
B/Chongqing-Yuzhong/1651/2011      ................................L.....................................................................
B/Hong Kong/514/2009               ......................................SP........S.....................S.............................
B/Cameroon/12080/2011              ........................L.............SP........S...............L.......F.............................
B/Shanghai-Chongming/1458/2011     ...................................................................................................
B/Hubei-Fancheng/33/2011           ...................................................................................................
B/Hong Kong/1153/2011              ...................................................................................................
B/Odessa/3886/2010                 ........................L.............SP........S.....................F.............................
B/Norway/2075/2011                 ......................L..L.............SP........S.....................F.............................
B/Czech Republic/36/2011           ........................L.............SP........S.....................F.............................

                                   110       120       130       140       150       160       170       180       190       200
                                   ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004               HRFGETKGNSAPLIIREPFIACGPKECKHFALTHYAAQPGGYYNGTRGDRNKLRHLISVKLGKIPTVENSIFHMAAWSGSACHDGKEWTYIGVDGPDNNA
B/Cambodia/1412/2011               ...................................................................................................
B/Victoria/304/2006                ......................N....................................................................................
B/Gwangju/649/2011                 ......................N....................................................................................
B/Aix-en-Provence/1795/2011        ......................N....................................................................................
B/Cambodia/1402/2011               ......................N.....................................R.............................................
B/Israel/15/2011                   ......................N....................................................................................
B/Brisbane/60/2008                 ......................N....................................................................................
B/England/393/2008                 ......................N....................................................................................
B/Paris/1762/2009                  ......................N....................................................................................
B/Leon/46/2011                     ......................N....................................................................................
B/Dominican Republic/5486/2011     ......................N....................................................................................
B/Wisconsin/06/2011                ......................N....................................................................................
B/Paraguay/0241/2011               ......................N....................................................................................
B/Athens/10051/2011                ...................V....N....................................................................................
B/Jiangsu-Nanjinggu/11208/2011     ......................N....................................................................................
B/Norway/2429/2011                 ......................N....................................................................................
B/Sachsen-Anhalt/1/2012            ......................N....................................................................................
B/Stockholm/18/2011                ......................N....................................................................................
B/Hong Kong/767/2011               ......................N....................................................................................
B/Berlin/146/2011                  ......................N....................................................................................
B/Chongqing-Yuzhong/1651/2011      ...................................................................................................
B/Hong Kong/514/2009               ......................N.....................................................................................D.
B/Cameroon/12080/2011              ......................N.....................................................................................D.
B/Shanghai-Chongming/1458/2011     ....................................................................................................D..
B/Hubei-Fancheng/33/2011           ...................................................................................................
B/Hong Kong/1153/2011              ...................................................................................................
B/Odessa/3886/2010                 ......................N.....................................................................................D.
B/Norway/2075/2011                 ......................N.....................................................................................D.
B/Czech Republic/36/2011           ......................N.....................................................................................D.

                                   210       220       230       240       250       260       270       280       290       300
                                   ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004               LLKIKYGEAYTDTYHSYANNILRTQESACNCIGGNCYLMITDGSASGVSECRFLKIREGRIIKEIFPTGRIKHTEECTCGFASNKTIECACRDNSYTAKR
B/Cambodia/1412/2011               .........F.........................................................V.....................................
B/Victoria/304/2006                ..................K..............................................V.....................................
B/Gwangju/649/2011                 ...V..............K..............................................V.....................................
B/Aix-en-Provence/1795/2011        ...V..............K..............................................V.....................................
B/Cambodia/1402/2011               ...V..............K..............................................V.....................................
B/Israel/15/2011                   ...V..............K..............................................V.....................................
B/Brisbane/60/2008                 ...V..............K..............................................V.....................................
B/England/393/2008                 ...V..............K..............................................V.....................................
B/Paris/1762/2009                  ...V..............K..............................................V.....................................
B/Leon/46/2011                     ...................................................................V.....................................
B/Dominican Republic/5486/2011     ...................................................................V.....................................
B/Wisconsin/06/2011                ...................................................................V.....................................
B/Paraguay/0241/2011               ..................D.......................................I..V.....................................
B/Athens/10051/2011                ...V..............K..............................................V.....................................
B/Jiangsu-Nanjinggu/11208/2011     ...V..............K..............................................V.....................................
B/Norway/2429/2011                 ...V..............K..............................................V.....................R.....
B/Sachsen-Anhalt/1/2012            ...V..............K..............................................V.....................R.....
B/Stockholm/18/2011                ...V..............K..............................................V.....................................
B/Hong Kong/767/2011               ...V..............K..............................................V.....................................
B/Berlin/146/2011                  ...V..............K..............................................V.....................................
B/Chongqing-Yuzhong/1651/2011      ...................................................M.......TQ.....................................
B/Hong Kong/514/2009               ...V..............K..............................................V.....................................
B/Cameroon/12080/2011              ...V..............K..............................................V.....................G.....
B/Shanghai-Chongming/1458/2011     ...................................................................Q.....................................
B/Hubei-Fancheng/33/2011           ...................................................................Q.....................................
B/Hong Kong/1153/2011              ...................................................................Q.....................................
B/Odessa/3886/2010                 ...V..............K..............................................V.....................................
B/Norway/2075/2011                 ...V..............K.....................................V........V.....................................
B/Czech Republic/36/2011           ...V..............K...........................................L....V.....................................
```

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                                  310       320       330       340       350       360       370       380       390       400
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Malaysia/2506/2004      PFVKLNVETDTAEIRLMCTETYLDTPRPDDGSITGPCESNGDKGSGGIKGGFVHQRMASKIGRWYSRTMSKTKRMGMGLYVKYDGDPWADSDALAFSGVM
B/Cambodia/1412/2011      ..........................................................................E...........................
B/Victoria/304/2006       ..................D.......................................................E...........................
B/Gwangju/649/2011        ..................D........N..........D................E..............E...............T...........
B/Aix-en-Provence/1795/2011 ................D........N...........E...............E..............E.....................T.....
B/Cambodia/1402/2011      ..................D.......................................E..............E..........G..........T.....
B/Israel/15/2011          ..................D........N...........................E..............E.....................T.I...
B/Brisbane/60/2008        ..................D........N...........................E..............E...........................
B/England/393/2008        ..................D........N...........................E..............E...........................
B/Paris/1762/2009         ..................D........N...........................E..............E...........................
B/Leon/46/2011            ..................D..........................................................E...............T.......R...
B/Dominican Republic/5486/2011 ..............D.......................N...........................E.K.............T.......R...
B/Wisconsin/06/2011       ..................D..........................................................E.K.............T.......R...
B/Paraguay/0241/2011      ..................D...............L..................................E.K.............T.......R...
B/Athens/10051/2011       ..................D........N..........D................E..............E...........................
B/Jiangsu-Nanjinggu/11208/2011 ..............D........N..........D................E..............E.......................L.
B/Norway/2429/2011        ..................D........N..........D................K..............E...........................
B/Sachsen-Anhalt/1/2012   ..................D........N..........D................K..............E...........................
B/Stockholm/18/2011       ..................D........N..........D................E..............E...........................
B/Hong Kong/767/2011      ..................D........N....I.....D................E..............E...........................
B/Berlin/146/2011         ..................D.................................E..............E.....................D.....
B/Chongqing-Yuzhong/1651/2011 ................K....................G..............................E.K........N................
B/Hong Kong/514/2009      ..................D.................................E..............E...........................
B/Cameroon/12080/2011     ..................D.................................E..............E...........................
B/Shanghai-Chongming/1458/2011 ...............K....................G...........................I...E.K........N..........V.....
B/Hubei-Fancheng/33/2011  ..................K........E............S...........................E.K........N..........V.....
B/Hong Kong/1153/2011     ..................K........E............G...........................E.K........N..........V.....
B/Odessa/3886/2010        ..................D.................................E..............E...........................
B/Norway/2075/2011        ..................D.................................K..............E...........................
B/Czech Republic/36/2011  ..................D.................................E..............E...........................

                                  410       420       430       440       450       460
                          ....|....|....|....|....|....|....|....|....|....|....|....|..
B/Malaysia/2506/2004      VSMEEPGWYSFGFEIKDKKCDVPCIGIEMVHDGGKETWHSAATAIYCLMGSGQLLWDTVTGVNMAL*
B/Cambodia/1412/2011      ...K.......................................................*
B/Victoria/304/2006       ...K.......................................................D...*
B/Gwangju/649/2011        ...K.......................................................D...*
B/Aix-en-Provence/1795/2011 ...K.....................................................D...*
B/Cambodia/1402/2011      ...K.......................................................*
B/Israel/15/2011          ...K.......................................................D...*
B/Brisbane/60/2008        ...K.......................................................D...*
B/England/393/2008        ...K.......................................................D...*
B/Paris/1762/2009         ...K.......................................................D...*
B/Leon/46/2011            ...K.......................................................D...*
B/Dominican Republic/5486/2011 ...K...................................................D...*
B/Wisconsin/06/2011       ...K.......................................................D...*
B/Paraguay/0241/2011      ...K.......................................................D...*
B/Athens/10051/2011       ...K.......................................................D...*
B/Jiangsu-Nanjinggu/11208/2011 ...K...................................................D...*
B/Norway/2429/2011        ...K.......................................................D...*
B/Sachsen-Anhalt/1/2012   ...K.......................................................D...*
B/Stockholm/18/2011       ...K.......................................................D...*
B/Hong Kong/767/2011      ...K.......................................................D...*
B/Berlin/146/2011         ...K.......................................................D...*
B/Chongqing-Yuzhong/1651/2011 ........................................................T.*
B/Hong Kong/514/2009      ...K.......................................................D...*
B/Cameroon/12080/2011     ...K.......................................................D...*
B/Shanghai-Chongming/1458/2011 .....................................V..................T.*
B/Hubei-Fancheng/33/2011  ........................................................T.*
B/Hong Kong/1153/2011     ........................................................T.*
B/Odessa/3886/2010        ...K.......................................................D...*
B/Norway/2075/2011        ...K.......................................................D...*
B/Czech Republic/36/2011  ...K.......................................................D...*
```

Table 25. Summary of influenza B viruses (Yamagata-lineage) received, collected since 2011-09-01

MONTH Country	B Yamagata lineage			
	Number propagated	≤2 fold*	4 fold*	≥8 fold*
SEPTEMBER				
Cote d'Ivoire	6	2	3	1
Senegal	3		2	1
OCTOBER				
Cote d'Ivoire	1		1	
Ghana	1	1		
Hong Kong SAR	1	1		
United Kingdom	1			1
NOVEMBER				
France	2	2		
Ghana	2	1	1	
Netherlands	1	1		
Spain	1		1	
Sweden	2	1	1	
DECEMBER				
Germany	1	1		
Hong Kong SAR	1	1		
Israel	1	1		
Spain	1		1	
Turkey	1	1		
JANUARY				
Ireland	1	1		
Sweden	1		1	
United Kingdom	1	1		
Total	29	15 51.7%	11 37.9%	3 10.4%

*** Reduction in HI titre with ferret antiserum raised against B/Bangladesh/3333/2007 (egg grown virus)**

Table 26. Antigenic analyses of influenza B viruses (Yamagata lineage) - 2012-01-09

Viruses	Collection date	Passage History	B/Fl[3] 4/06 SH479	Haemagglutination inhibition titre – Post infection ferret sera: B/Eg[1] 144/05 F03/07	B/Fl[1] 4/06 F20/07	B/Bris[1] 3/07 F24/07	B/Eng[2] 145/08 F12/11	B/Bang[2] 3333/07 F21/08	B/Wis[2] 1/10 F26/10
REFERENCE VIRUSES									
B/Egypt/144/2005	2005-05-01	E3/E5	5120	320	2560	1280	80	320	160
B/Florida/4/2006	2006-12-15	E3/E4	5120	640	2560	1280	160	320	320
B/Brisbane/3/2007	2007-09-03	E2/E4	2560	160	1280	640	40	80	80
B/England/145/2008		Ex/E1	320	40	160	40	40	20	10
B/Bangladesh/3333/2007	2007-08-07	E4/E1	2560	80	640	80	20	160	160
B/Wisconsin/1/2010	2010-02-20	E3/E3	2560	160	1280	160	40	160	320
TEST VIRUSES									
B/England/254/2011	2011-10-04	SIAT1/MDCK1	1280	<	160	<	20	20	10
B/Netherlands/707/2011	2011-11-29	MDCK1/MDCK1	2560	160	320	40	40	160	80
B/Sweden/2/2011	2011-11-15	C1/MDCK1	2560	80	160	20	20	40	40
B/Stockholm/19/2011	2011-11-23	C1/MDCK1	2560	160	320	40	40	80	80
B/Berlin/147/2011	2011-12-01	MDCK2/MDCK1	5120	80	640	80	40	160	80

1. < = <40; 2. < =<10 ; 3. hyperimmune sheep serum

Sequences in phylogenetic trees

Table 27. Antigenic analyses of influenza B viruses (Yamagata lineage) - 2012-01-27

Viruses	Collection date	Passage History	B/Fl[3] 4/06 SH479	Haemagglutination inhibition titre								
				Post infection ferret sera								
				B/Eg[1] 144/05 F3/07	B/Fl[1] 4/06 F20/07	B/Bris[1] 3/07 F24/07	B/Eng[2] 145/08 F09/08	B/Bang[2] 3333/07 F24/10	B/Wis[2] 1/10 F26/10	B/Stock[2] 12/11 F34/11	B/Estonia[2] 55669/11 F26/11	B/Serbia[2] 1894/11 F25/11
REFERENCE VIRUSES												
B/Egypt/144/2005	2005-05-01	E7	5120	160	2560	5120	80	160	160	640	80	20
B/Florida/4/2006	2006-12-15	E3/E4	5120	320	2560	5120	160	320	320	1280	160	40
B/Brisbane/3/2007	2007-09-03	E2/E3	5120	320	2560	5120	160	320	320	1280	160	20
B/England/145/2008		Ex/E5	640	40	160	160	160	20	10	160	<	10
B/Bangladesh/3333/2007	2007-08-07	E3/E4	5120	80	640	640	40	320	160	320	10	40
B/Wisconsin/1/2010	2010-02-20	E3/E2	2560	80	640	640	80	160	320	640	10	40
B/Stockholm/12/2011	2011-03-14	E4/E1	2560	80	320	320	80	80	40	320	<	20
B/Estonia/55669/2011	2011-03-14	MDCK2/MDCK2	5120	80	320	160	40	40	10	320	1280	80
B/Serbia/1894/2011	2011-03-08	MDCK1/MDCK4	5120	160	640	320	160	160	80	640	160	320
TEST VIRUSES												
B/Texas/06/2011	2011-02-16	E4/E2	1280	40	160	160	80	40	20	160	<	<
B/Adjame/GR874/2011	2011-09-22	MDCK2	2560	80	320	160	40	80	40	640	40	80
B/Adjame/GR877/2011	2011-09-22	MDCK2	2560	80	160	160	160	80	40	640	40	80
B/Adjame/GR890/2011	2011-09-22	MDCK2	2560	40	160	80	80	20	40	640	20	80
B/Yopougon/GR882/2011	2011-09-23	MDCK2	2560	80	320	320	40	160	160	640	80	160
B/Yopougon/GR926/2011	2011-09-27	MDCK2	2560	80	320	160	160	80	40	640	40	160
B/Hong Kong/1127/2011	2011-10-12	MDCK2/MDCK1	5120	160	640	640	80	320	160	640	320	320
B/Attecoube/GR1101/2011	2011-10-17	MDCK2	5120	80	320	160	160	80	80	640	80	160
B/Catalonia/S4125/2011	2011-11-16	MDCK1	2560	80	320	160	40	80	80	640	80	160
B/Hong Kong/1121/2011	2011-12-12	MDCK2/MDCK1	5120	160	640	1280	160	320	160	640	1280	320
B/Catalonia/S4251/2011	2011-12-12	MDCK1	2560	80	320	320	80	80	80	640	80	160

1. < = <40; 2. < =<10 ; 3. hyperimmune sheep serum

Sequences in phylogenetic trees

Table 28. Antigenic analyses of influenza B viruses (Yamagata lineage) - 2012-01-31

Viruses	Collection date	Passage History	B/Fl[3] 4/06 SH479	Haemagglutination inhibition titre								
				Post infection ferret sera								
				B/Eg[1] 144/05 F3/07	B/Fl[1] 4/06 F20/07	B/Bris[1] 3/07 F24/07	B/Eng[2] 145/08 F12/11	B/Bang[2] 3333/07 F21/08	B/Wis[2] 1/10 F26/10	B/Stock[2] 12/11 F34/11	B/Estonia[2] 55669/11 F26/11	B/Serbia[2] 1894/11 F25/11
REFERENCE VIRUSES												
B/Egypt/144/2005	2005-05-01	E3/E6	2560	80	640	640	40	80	160	640	80	20
B/Florida/4/2006	2006-12-15	E3/E4	5120	640	1280	640	160	160	320	1280	160	40
B/Brisbane/3/2007	2007-09-03	E2/E3	5120	640	1280	2560	40	80	160	1280	160	20
B/England/145/2008		Ex/E5	320	40	80	<	40	10	20	160	<	10
B/Bangladesh/3333/2007	2007-08-07	E3/E4	2560	320	320	160	40	80	320	320	10	40
B/Wisconsin/1/2010	2010-02-20	E3/E2	1280	160	320	80	40	80	40	640	10	40
B/Stockholm/12/2011	2011-03-14	E4/E1	2560	80	320	320	80	80	40	160	<	20
B/Estonia/55669/2011	2011-03-14	MDCK2/MDCK2	5120	80	320	160	40	40	10	320	640	80
B/Serbia/1894/2011	2011-03-08	MDCK1/MDCK4	5120	160	640	320	160	160	80	640	160	320
TEST VIRUSES												
B/Yopougon/GR852/2011	2011-09-20	MDCK3	1280	<	160	80	20	40	20	320	160	160
B/Ghana/FS-11-1827/2011	2011-10-25	MDCK3	1280	40	160	80	40	40	20	320	80	320
B/Paris/1870/2011	2011-11-12	MDCK2/MDCK1	2560	40	160	160	40	40	40	320	160	320
B/Paris/1900/2011	2011-11-17	MDCK2/MDCK1	2560	80	160	160	40	80	40	320	160	320
B/Ghana/FS-11-1994/2011	2011-11-24	MDCK3	640	<	80	<	10	20	<	160	40	80
B/Ghana/FS-11-1995/2011	2011-11-24	MDCK3	2560	40	160	160	40	40	40	320	80	160
B/Israel/20/2011	2011-12-20	C1/MDCK1	5120	40	320	320	40	80	40	320	160	320
B/Ireland/12M1522/2012	Jan 2012	MDCK1	5120	80	320	160	80	80	40	320	160	160

1. < = <40; 2. < =<10 ; 3. hyperimmune sheep serum

Sequences in phylogenetic trees

Table 29. Antigenic analyses of influenza B viruses (Yamagata lineage) - 2012-02-07/2012-02-14

Viruses	Collection date	Passage History	B/Fl[3] 4/06 SH479	Haemagglutination inhibition titre – Post infection ferret sera: B/Eg[1] 144/05 F3/07	B/Fl[1] 4/06 F20/07	B/Bris[1] 3/07 F24/07	B/Eng[2] 145/08 F12/11	B/Bang[2] 3333/07 F21/08	B/Wis[2] 1/10 F26/10	B/Stock[2] 12/11 F34/11	B/Estonia[2] 55669/11 F26/11	B/Serbia[2] 1894/11 F25/11
REFERENCE VIRUSES												
B/Egypt/144/2005	2005-05-01	E9	5120	320	1280	640	80	160	160	320	160	20
B/Florida/4/2006	2006-12-15	E7	5120	320	1280	640	160	160	320	320	320	20
B/Brisbane/3/2007	2007-09-03	E2/E1	5120	640	1280	640	160	320	160	320	320	20
B/England/145/2008		Ex/E3	640	40	160	20	40	10	10	160	<	10
B/Bangladesh/3333/2007	2007-08-07	E4/E4	5120	160	640	160	40	320	160	320	10	40
B/Wisconsin/1/2010	2010-02-20	E3/E1	2560	80	320	80	40	80	160	320	10	40
B/Stockholm/12/2011	2011-03-14	E4/E1	5120	160	320	80	40	160	80	320	10	40
B/Estonia/55669/2011	2011-03-14	MDCK2/MDCK2	5120	80	320	430	<	10	<	160	1280	40
B/Serbia/1894/2011	2011-03-08	MDCK1/MDCK4	5120	160	320	40	40	160	80	320	320	320
TEST VIRUSES												
B/Sakai/36/2011	2011-11-01	MDCK1	5120	80	320	40	40	80	80	320	160	160
B/Turkey/17/2011	2011-12-21	MDCK1	5120	160	320	80	80	320	80	320	320	320
B/England/9/2012	2012-01-05	MDCK1	5120	160	640	80	80	320	80	320	320	640
B/Dakar/05/2011	2011-09-15	MDCK2	5120	80	320	20	80	80	20	320	40	80
B/Dakar/06/2011	2011-09-16	MDCK2	2560	40	320	20	40	80	40	320	40	160
B/Dakar/08/2011	2011-09-16	MDCK2	1280	40	320	20	40	40	20	320	40	80
B/Stockholm/12-00971/2012	2012-01-08	C0/MDCK1	5120	40	160	20	40	80	40	320	80	160

1. < = <40; 2. < =<10 ; 3. hyperimmune sheep serum

Sequences in phylogenetic trees

Figure 21. Phylogenetic comparison of influenza B (Yamagata-lineage) HA genes (HA1 region)

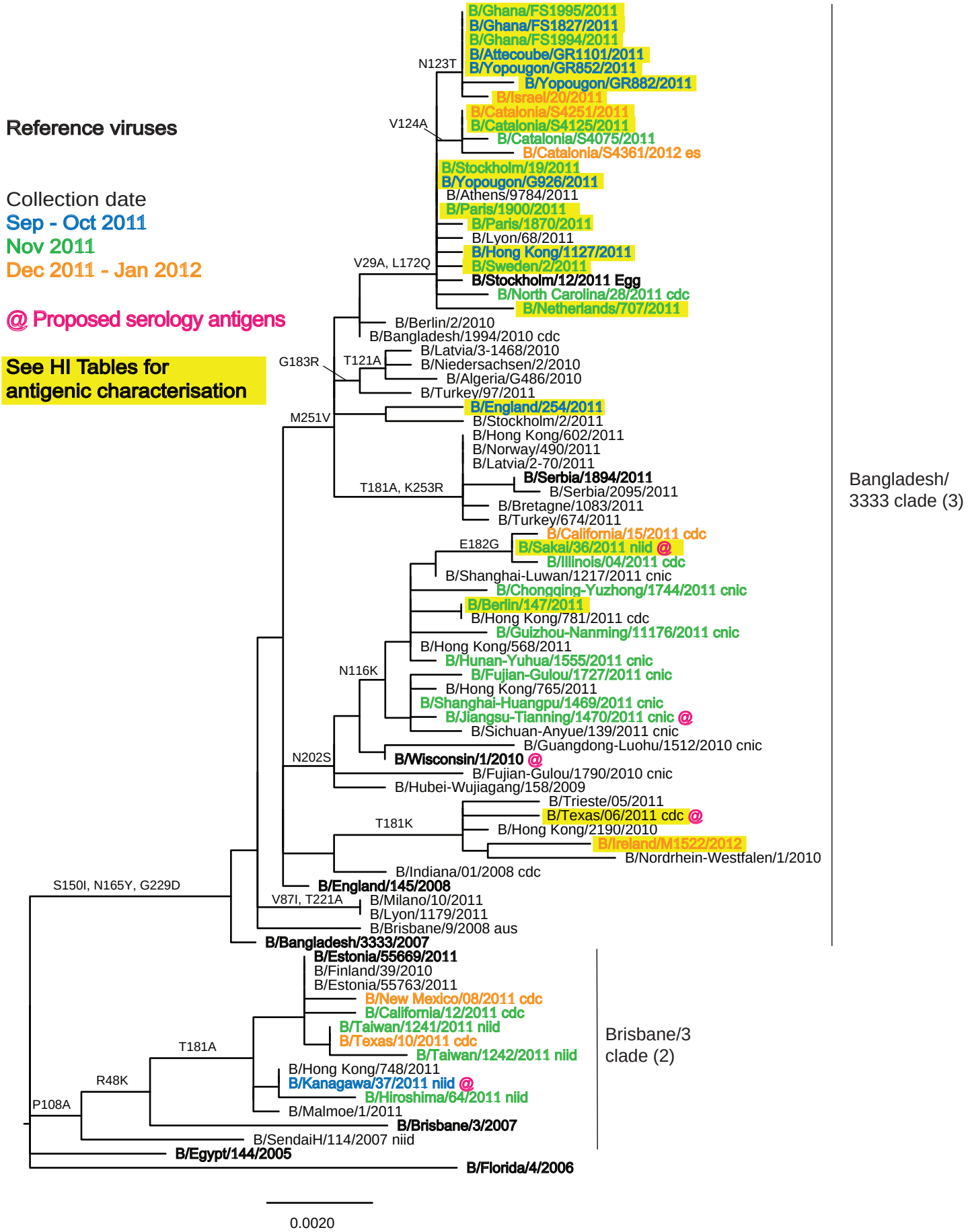

Figure 22. HA protein alignment for B-Yamagata lineage viruses.

```
Reference Viruses                 Potential N-linked glycosylation sites
                                  HA1       10        20        30        40        50        60        70        80        90       100
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006                  DRICTGITSSNSPHVVKTATQGEVNVTGVIPLTTTPTKSYFANLKGTRTRGKLCPDCLNCTDLDVALGRPMCVGTTPSAKASILHEVKPVTSGCFPIMHD
B/Egypt/144/2005                  ..........................................................................IR............
B/Brisbane/3/2007                 ...........................................K..............................R............
B/Estonia/55669/2011              ...........................................K..............................R............
B/New Mexico/08/2011              ...........................................K..............................R............
B/Hiroshima/64/2011               ...........................................K..............................R............
B/Bangladesh/3333/2007            ..........................................................................R............
B/England/145/2008                ..........................................................................R............
B/Texas/06/2011                   ..........................................................................R............
B/Ireland/M1522/2012              ..........................................................................R............
B/Wisconsin/1/2010                ..........................................................................R............
B/Jiangsu-Tianning/1470/2011      ..........................................................................R............
B/Hunan-Yuhua/1555/2011           ..........................................................................R............
B/Berlin/147/2011                 ..........................................................................R............
B/California/15/2011              ..........................................................................R............
B/Serbia/1894/2011                ..........................................................................R............
B/England/254/2011                ..........................................................................R............
B/Turkey/97/2011                  ..........................................................................R............
B/Berlin/2/2010                   ..........................................................................R............
B/Netherlands/707/2011            ...........................A..............................................R............
B/North Carolina/28/2011          ...........................A..............................................R............
B/Stockholm/12/2011 Egg           ...........................A..............................................R............
B/Hong Kong/1127/2011             ...........................A..............................................R............
B/Paris/1870/2011                 ...........................A..............................................R............
B/Yopougon/GR926/2011             ...........................A..............................................R............
B/Stockholm/19/2011               ...........................A..............................................R............
B/Catalonia/S4251/2011            ...........................A..............................................R............
B/Israel/20/2011                  ...........................A..............................................R............
B/Yopougon/GR882/2011             ...........................A..............................................R............
B/Ghana/FS1995/2011               ...........................A..............................................R............

                                          110       120       130       140       150       160       170       180       190       200
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006                  RTKIRQLPNLLRGYENIRLSTQNVIDAEKAPGGPYRLGTSGSCPNATSKSGFFATMAWAVPKDNNKNATNPLTVEVPYICTEGEDQITVWGFHSDDKTQM
B/Egypt/144/2005                  ..........................................................Q.......................................
B/Brisbane/3/2007                 .......A..................................................................................N....
B/Estonia/55669/2011              .......A..................................................................A.............N....
B/New Mexico/08/2011              .......A..................................................................A.............N....
B/Hiroshima/64/2011               .......A.....................................X.............................A.............N....
B/Bangladesh/3333/2007            ..........................................I.............Y..............................X....
B/England/145/2008                ..........................................I.............Y..............................N.A..
B/Texas/06/2011                   ..........................................I.............Y.............K.E............N..X.
B/Ireland/M1522/2012              ..........................................I.............Y.............K.............N....
B/Wisconsin/1/2010                ..........................................I.............Y..............................N....
B/Jiangsu-Tianning/1470/2011      ...............K..........................I.............Y..............................N....
B/Hunan-Yuhua/1555/2011           ...............K..........................I.............Y..............................N....
B/Berlin/147/2011                 ...............K..........................I.............Y..............................N....
B/California/15/2011              ...............K..........................I.............Y.............G............N....
B/Serbia/1894/2011                ..........................................I.............Y.............A............N....
B/England/254/2011                ..........................................I.............Y..............................N....
B/Turkey/97/2011                  ..........................................I.............Y...............R............N....
B/Berlin/2/2010                   ..........................................I.............Y..............................N....
B/Netherlands/707/2011            ..........................................I.............Y.....Q........................N....
B/North Carolina/28/2011          ..........................................I...S.........Y.....Q........................N....
B/Stockholm/12/2011 Egg           ..........................................I.............Y.....Q........................
B/Hong Kong/1127/2011             ..........................................I.............Y.....Q........................N....
B/Paris/1870/2011                 ..........................................I.............Y.....Q........................N....
B/Yopougon/GR926/2011             ..........................................I.............Y.....Q........................N....
B/Stockholm/19/2011               ..........................................I.............Y.....Q........................N....
B/Catalonia/S4251/2011            ......................A...................I.............Y.....Q........................N....
B/Israel/20/2011                  ......................T...................I.............Y.....Q........................N....
B/Yopougon/GR882/2011             ......................T...................I...........R..Y.....Q........................N....
B/Ghana/FS1995/2011               ......................T...................I.............Y.....Q........................N....

                                          210       220       230       240       250       260       270       280       290       300
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006                  KNLYGDSNPQKFTSSANGVTTHYVSQIGSFPDQTEDGGLPQSGRIVVDYMMQKPGKTGTIVYQRGVLLPQKVWCASGRSKVIKGSLPLIGEADCLHEKYG
B/Egypt/144/2005                  ...........................G..............................................................
B/Brisbane/3/2007                 ...........................G..............................................................
B/Estonia/55669/2011              ...........................G..............................................................
B/New Mexico/08/2011              ...........................G..............................................................
B/Hiroshima/64/2011               ...........................G.............................A................................
B/Bangladesh/3333/2007            ...........................D..............................................................
B/England/145/2008                ...........................D..............................................................
B/Texas/06/2011                   ...........................D..............................................................
B/Ireland/M1522/2012              ...........................D..............................................................
B/Wisconsin/1/2010                .S..........................D..............................................................
B/Jiangsu-Tianning/1470/2011      .S..........................D..............................................................
B/Hunan-Yuhua/1555/2011           .S..........................D..............................................................
B/Berlin/147/2011                 .S..........................D..............................................................
B/California/15/2011              .S..........................D..............................................................
B/Serbia/1894/2011                ...........................D.....................V.R......................................
B/England/254/2011                ...................I.........D.....................V........................................
B/Turkey/97/2011                  ...........................D.....................V........................................
B/Berlin/2/2010                   ...........................D.....................V........................................
B/Netherlands/707/2011            ...........................D.....................V........................................
B/North Carolina/28/2011          ...........................D.....................V........................................
B/Stockholm/12/2011 Egg           ...........................D.....................V........................................
B/Hong Kong/1127/2011             ...........................D.....................V........................................
B/Paris/1870/2011                 ...........................D.....................V........................................
B/Yopougon/GR926/2011             ...........................D.....................V........................................
B/Stockholm/19/2011               ...........................D.....................V........................................
B/Catalonia/S4251/2011            ...........................D.....................V........................................
B/Israel/20/2011                  ...........................D.....................V........................................
B/Yopougon/GR882/2011             ...........................D.....................V........................................
B/Ghana/FS1995/2011               ...........................D.....................V........................................
```

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                                  310       320       330       340     HA2       360       370       380       390       400
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006          GLNKSKPYYTGEHAKAIGNCPIWVKTPLKLANGTKYRPPAKLLKERGFFGAIAGFLEGGWEGMIAGWHGYTSHGAHGVAVAADLKSTQEAINKITKNLNS
B/Egypt/144/2005          ..................................................................................................
B/Brisbane/3/2007         ..................................................................................................
B/Estonia/55669/2011      ..................................................................................................
B/New Mexico/08/2011      ..................................................................................................
B/Hiroshima/64/2011       ..................................................~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
B/Bangladesh/3333/2007    ..................................................................................................
B/England/145/2008        ..................................................................................................
B/Texas/06/2011           ..................................................................................................
B/Ireland/M1522/2012      ..................................................................................................
B/Wisconsin/1/2010        ..................................................................................................
B/Jiangsu-Tianning/1470/2011 ..............................................................................................
B/Hunan-Yuhua/1555/2011   ..................................................................................................
B/Berlin/147/2011         ..................................................................................................
B/California/15/2011      ..................................V...............................................................
B/Serbia/1894/2011        ..................................................................................................
B/England/254/2011        ..................................................................................................
B/Turkey/97/2011          ..................................................................................................
B/Berlin/2/2010           ..................................................................................................
B/Netherlands/707/2011    ..................................................................................................
B/North Carolina/28/2011  ..................................................................................................
B/Stockholm/12/2011 Egg   ..................................................................................................
B/Hong Kong/1127/2011     ..................................................................................................
B/Paris/1870/2011         ..................................................................................................
B/Yopougon/GR926/2011     ..................................................................................................
B/Stockholm/19/2011       ..................................................................................................
B/Catalonia/S4251/2011    ..................................................................................................
B/Israel/20/2011          ..................................................................................................
B/Yopougon/GR882/2011     ..................................................................................................
B/Ghana/FS1995/2011       ..................................................................................................

                                  410       420       430       440       450       460       470       480       490       500
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006          LSELEVKNLQRLSGAMDELHNEILELDEKVDDLRADTISSQIELAVLLSNEGIINSEDEHLLALERKLKKMLGPSAVEIGNGCFETKHKCNQTCLDRIAA
B/Egypt/144/2005          ......................................................................D...........................
B/Brisbane/3/2007         ......................................................................D...........................
B/Estonia/55669/2011      ......................................................................D...........................
B/New Mexico/08/2011      ......................................................................D...........................
B/Hiroshima/64/2011       ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
B/Bangladesh/3333/2007    ......................................................................D...........................
B/England/145/2008        ......................................................................D...........................
B/Texas/06/2011           ......................................................................D...........................
B/Ireland/M1522/2012      ......................................................................D...........................
B/Wisconsin/1/2010        ......................................................................D...........................
B/Jiangsu-Tianning/1470/2011 ..................................................................D...........................
B/Hunan-Yuhua/1555/2011   ......................................................................D...........................
B/Berlin/147/2011         ......................................................................D...........................
B/California/15/2011      ......................................................................D...........................
B/Serbia/1894/2011        ......................................................................D...........................
B/England/254/2011        ......................................................................D...........................
B/Turkey/97/2011          ......................................................................D...........................
B/Berlin/2/2010           ......................................................................D...........................
B/Netherlands/707/2011    ......................................................................D...........................
B/North Carolina/28/2011  ......................................................................D...........................
B/Stockholm/12/2011 Egg   ......................................................................D...........................
B/Hong Kong/1127/2011     ......................................................................D...........................
B/Paris/1870/2011         ......................................................................D...........................
B/Yopougon/GR926/2011     ..................................................................K...D...........................
B/Stockholm/19/2011       ......................................................................D...........................
B/Catalonia/S4251/2011    ......................................................................D...........................
B/Israel/20/2011          ......................................................................D...........................
B/Yopougon/GR882/2011     ......................................................................D...........................
B/Ghana/FS1995/2011       ......................................................................D...........................

                                  510       520       530       540       550       560       570
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006          GTFNAGEFSLPTFDSLNITAASLNDDGLDNHTILLYYSTAASSLAVTLMLAIFIVYMVSRDNVSCSICL*
B/Egypt/144/2005          ...................................................................*
B/Brisbane/3/2007         ...................................................................*
B/Estonia/55669/2011      ...................................................................*
B/New Mexico/08/2011      ...................................................................*
B/Hiroshima/64/2011       ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
B/Bangladesh/3333/2007    ...................................................................*
B/England/145/2008        ...................................................................*
B/Texas/06/2011           ...................................................................*
B/Ireland/M1522/2012      ...................................................................*
B/Wisconsin/1/2010        ...................................................................*
B/Jiangsu-Tianning/1470/2011 ..............................................................*
B/Hunan-Yuhua/1555/2011   ...................................................................*
B/Berlin/147/2011         ...............................C...................................*
B/California/15/2011      ...................................................................*
B/Serbia/1894/2011        ...................................................................*
B/England/254/2011        ...................................................................*
B/Turkey/97/2011          ...................................................................*
B/Berlin/2/2010           ...................................................................*
B/Netherlands/707/2011    ...................................................................*
B/North Carolina/28/2011  ...................................................................*
B/Stockholm/12/2011 Egg   ...................................................................*
B/Hong Kong/1127/2011     ...................................................................*
B/Paris/1870/2011         ...................................................................*
B/Yopougon/GR926/2011     ...................................................................*
B/Stockholm/19/2011       ...................................................................*
B/Catalonia/S4251/2011    ...................................................................*
B/Israel/20/2011          ...............D....................................................*
B/Yopougon/GR882/2011     ...................................................................*
B/Ghana/FS1995/2011       ...................................................................*
```

Figure 23. Phylogenetic comparison of influenza B (Yamagata-lineage) NA genes

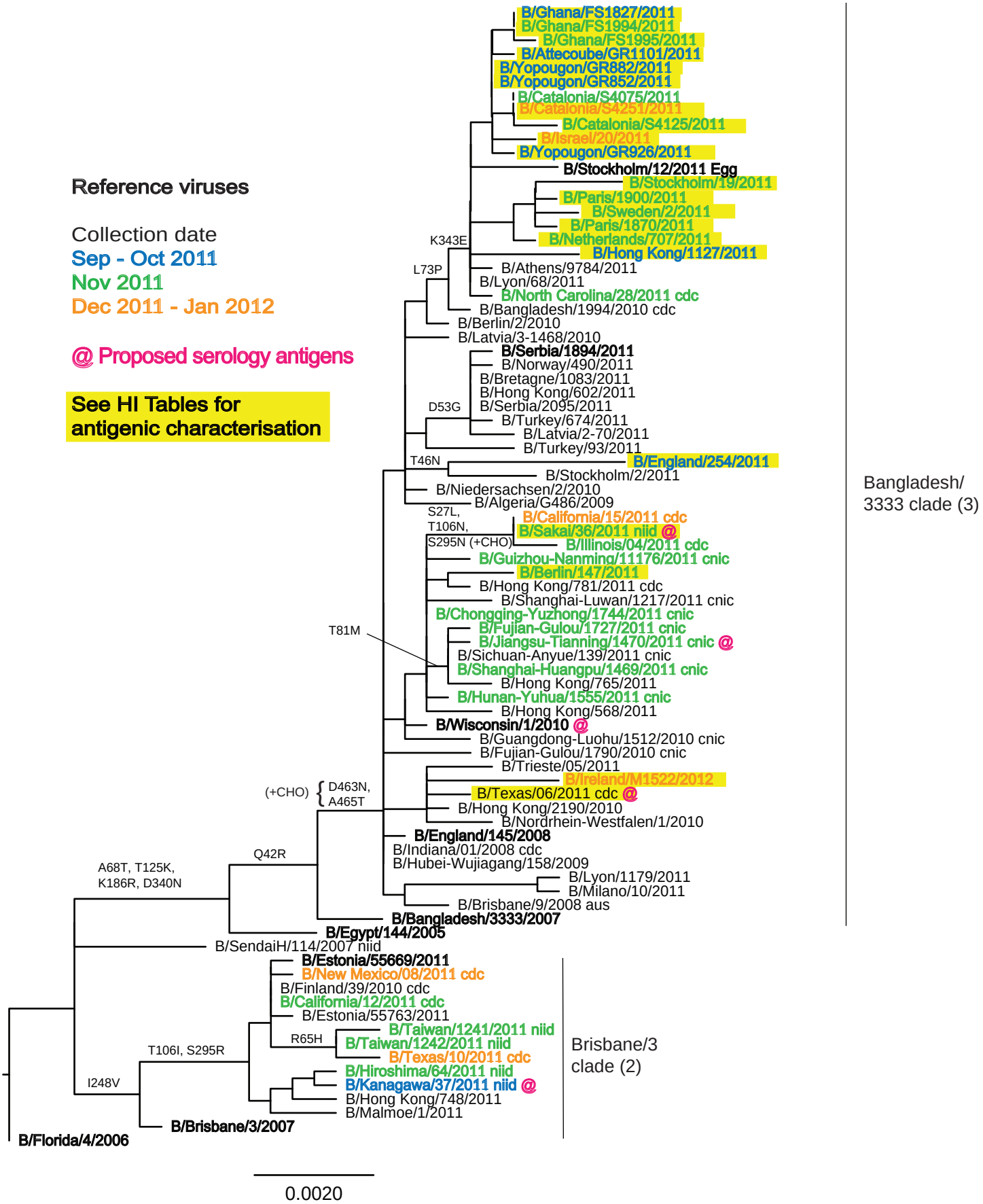

Figure 24. NA protein alignment for B-Yamagata lineage viruses.

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Reference Viruses                 Potential N-linked glycosylation sites
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
                                          10        20        30        40        50        60        70        80        90       100
B/Florida/4/2006                  MLPSTIQTLTLFLTSGGVLLSLYVSASLSYLLYSDILLKFSQTEITAPIMPLDCANASNVQAVNRSAAKGVTLLLPEPEWTYPRLSCPGSTFQKALLISP
B/Egypt/144/2005                  ........................................R...............................T...............................
B/Brisbane/3/2007                 .......K.................................................................................................
B/Estonia/55669/2011              ........................................................................................................
B/New Mexico/08/2011              ........................................................................................................
B/Hiroshima/64/2011               ........................................................................................................
B/Bangladesh/3333/2007            ........................................R..T...........................T...............................
B/England/145/2008                ........................................R...............................T...............................
B/Texas/06/2011                   ........................................R...............................T...............................
B/Ireland/M1522/2012              ........................................R...............................T...............................
B/Wisconsin/1/2010                ........................................R...............................T...............................
B/Jiangsu-Tianning/1470/2011      ........................................R...............................T............M..................
B/Hunan-Yuhua/1555/2011           ........................................R...............................T...............................
B/Berlin/147/2011                 ........................................R...............................T...............................
B/California/15/2011              ........................L...............R...............................T...............................
B/Serbia/1894/2011                ........................................R..........G....................T...............................
B/England/254/2011                ........................................R...N...........................T...............................
B/Berlin/2/2010                   ........................................R...............................T...............................
B/Netherlands/707/2011            ........................................R...............................T....P..........................
B/North Carolina/28/2011          ........................................R...............................T....P..........................
B/Stockholm/12/2011 Egg           ........................................R...............................T....P..........................
B/Hong Kong/1127/2011             ........................................R...............................T...IP.........................
B/Paris/1870/2011                 ........................................R...............................T....P..........................
B/Yopougon/GR926/2011             ........................................R...............................T....P..........................
B/Stockholm/19/2011               ........................L...............R...............................T....P..........................
B/Catalonia/S4251/2011            ........................................R...............................T....P..........................
B/Israel/20/2011                  ........................................R...............................T....P..........................
B/Yopougon/GR882/2011             ........................................R...............................T....P..........................
B/Ghana/FS1995/2011               ........................................R...............................T....P..........................

                                          110       120       130       140       150       160       170       180       190       200
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006                  HRFGETKGNSAPLIIREPFIACGPTECKHFALTHYAAQPGGYYNGTREDRNKLRHLISVKLGKIPTVENSIFHMAAWSGSACHDGKEWTYIGVDGPDSNA
B/Egypt/144/2005                  ......................K.........................................................................R.............
B/Brisbane/3/2007                 ........................................................................................................
B/Estonia/55669/2011              .....I..................................................................................................
B/New Mexico/08/2011              .....I..................................................................................................
B/Hiroshima/64/2011               .....I..................................................................................................
B/Bangladesh/3333/2007            ......................K.........................................................................R.............
B/England/145/2008                ......................K.........................R.......................................R.............
B/Texas/06/2011                   ......................K.........................................................................R.............
B/Ireland/M1522/2012              ......................K.........................R.......................................R.............
B/Wisconsin/1/2010                ......................K.........................................................................R.............
B/Jiangsu-Tianning/1470/2011      ......................K.........................................................................R.............
B/Hunan-Yuhua/1555/2011           ......................K.........................................................................R.....I.......
B/Berlin/147/2011                 ......................K.........................................................................R.............
B/California/15/2011              .....N................K.........................................................................R.............
B/Serbia/1894/2011                ......................K.........................R.......................................R.............
B/England/254/2011                .....I................K.........................................................................R.............
B/Berlin/2/2010                   ......................K.........................................................................R.............
B/Netherlands/707/2011            ......................K.........................................................................R.............
B/North Carolina/28/2011          ......................K.........................................................................R.............
B/Stockholm/12/2011 Egg           ......................K.........................................................................R.............
B/Hong Kong/1127/2011             ......................K.........................................................................R.............
B/Paris/1870/2011                 ......................K.........................................................................R.............
B/Yopougon/GR926/2011             ......................K.........................................................................R.............
B/Stockholm/19/2011               ......................K..R......................................................................R.............
B/Catalonia/S4251/2011            ......................K.........................................................................R.............
B/Israel/20/2011                  ......................K.........................................................................R.............
B/Yopougon/GR882/2011             ......................K.........................................................................R.............
B/Ghana/FS1995/2011               ......................K.........................................................................R.............

                                          210       220       230       240       250       260       270       280       290       300
                                  ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006                  LLKIKYGEAYTDTYHSYAKNILRTQESACNCIGGDCYLMITDGPASGISECRFLKIREGRIIKEIFPTGRVKHTEECTCGFASNKTIECACRDNSYTAKR
B/Egypt/144/2005                  ........................................................................................................
B/Brisbane/3/2007                 ...........................................V............................................................
B/Estonia/55669/2011              ...........................................V.............................................R..........
B/New Mexico/08/2011              ...........................................V.............................................R..........
B/Hiroshima/64/2011               ...........................................V.............................................R..........
B/Bangladesh/3333/2007            ........................................................................................................
B/England/145/2008                ........................................................................................................
B/Texas/06/2011                   ........................................................................................................
B/Ireland/M1522/2012              ........................................................................................................
B/Wisconsin/1/2010                ........................................................................................................
B/Jiangsu-Tianning/1470/2011      ........................................................................................................
B/Hunan-Yuhua/1555/2011           ........................................................................................................
B/Berlin/147/2011                 ........................................................................................................
B/California/15/2011              ........................................................................................................
B/Serbia/1894/2011                ........................................................................................................
B/England/254/2011                ........................................................................................................
B/Berlin/2/2010                   ........................................................................................................
B/Netherlands/707/2011            ........................................................................................................
B/North Carolina/28/2011          ........................................................................................................
B/Stockholm/12/2011 Egg           ........................................................................................................
B/Hong Kong/1127/2011             ........................................................................................................
B/Paris/1870/2011                 ........................................................................................................
B/Yopougon/GR926/2011             ........................................................................................................
B/Stockholm/19/2011               ........................................................................................................
B/Catalonia/S4251/2011            ........................................................................................................
B/Israel/20/2011                  ....................T...................................................................................
B/Yopougon/GR882/2011             ........................................................................................................
B/Ghana/FS1995/2011               ........................................................................................................
```

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                                  310       320       330       340       350       360       370       380       390       400
                          ....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|....|
B/Florida/4/2006          PFVKLNVETDTAEIRLMCTETYLDTPRPNDGSITGPCESDGDKGSGGIKGGFVHQRMASKIGRWYSRTMSKTKRMGMGLYVKYDGDPWTDSEALALSGVM
B/Egypt/144/2005          ......................................N................................R.........................
B/Brisbane/3/2007         ........................................................................................................
B/Estonia/55669/2011      ........................................................................................................
B/New Mexico/08/2011      ........................................................................................................
B/Hiroshima/64/2011       ........................................................................................................
B/Bangladesh/3333/2007    ......................................N.................................................................
B/England/145/2008        ......................................N.................................................................
B/Texas/06/2011           ......................................N.................................................................
B/Ireland/M1522/2012      ......................................N.................................................................
B/Wisconsin/1/2010        ......................................N.................................................................
B/Jiangsu-Tianning/1470/2011 ..................................N.................................................................
B/Hunan-Yuhua/1555/2011   ......................................N.................................................................
B/Berlin/147/2011         ......................................N.................................................................
B/California/15/2011      ......................................N.................................................................
B/Serbia/1894/2011        ......................................N.................................................................
B/England/254/2011        ......................................N.................................................................
B/Berlin/2/2010           ......................................N.................................................................
B/Netherlands/707/2011    ......................................N..E..............................................................
B/North Carolina/28/2011  ......................................N..E..............................................................
B/Stockholm/12/2011 Egg   ......................................N..E..............................................................
B/Hong Kong/1127/2011     ..................K...................N..E..............................................................
B/Paris/1870/2011         ..............K.......................N..E..............................................................
B/Yopougon/GR926/2011     ......................................N..E..............................................................
B/Stockholm/19/2011       ......................................N..E..............................................................
B/Catalonia/S4251/2011    ......................................N..E..............................................................
B/Israel/20/2011          ......................................N..E..............................................................
B/Yopougon/GR882/2011     ......................................N..E..............................................................
B/Ghana/FS1995/2011       ......................................N..E..............................................................

                                  410       420       430       440       450       460
                          ....|....|....|....|....|....|....|....|....|....|....|....|..
B/Florida/4/2006          VSMEEPGWYSFGFEIKDKKCDVPCIGIEMVHDGGKTTWHSAATAIYCLMGSGQLLWDTVTGVDMAL*
B/Egypt/144/2005          ............................................................*
B/Brisbane/3/2007         ............................................................*
B/Estonia/55669/2011      ............................................................*
B/New Mexico/08/2011      ............................................................*
B/Hiroshima/64/2011       ............................................................*
B/Bangladesh/3333/2007    ............................................................*
B/England/145/2008        ...........................................................N.T.*
B/Texas/06/2011           ...........................................................N.T.*
B/Ireland/M1522/2012      ...........................................................N.T.*
B/Wisconsin/1/2010        ...........................................................N.T.*
B/Jiangsu-Tianning/1470/2011 ........................................................N.T.*
B/Hunan-Yuhua/1555/2011   ...........................................................N.T.*
B/Berlin/147/2011         I..........................................................N.T.*
B/California/15/2011      ...........................................................N.T.*
B/Serbia/1894/2011        ...........................................................N.T.*
B/England/254/2011        ............................................................*
B/Berlin/2/2010           ...........................................................N.T.*
B/Netherlands/707/2011    ...........................................................N.T.*
B/North Carolina/28/2011  ...........................................................N.T.*
B/Stockholm/12/2011 Egg   ...........................................................N.T.*
B/Hong Kong/1127/2011     ...........................................................N.T.*
B/Paris/1870/2011         ...........................................................N.T.*
B/Yopougon/GR926/2011     ...........................................................N.T.*
B/Stockholm/19/2011       ...........................................................N.T.*
B/Catalonia/S4251/2011    ...........................................................N.T.*
B/Israel/20/2011          ...........................................................N.T.*
B/Yopougon/GR882/2011     ...........................................................N.T.*
B/Ghana/FS1995/2011       ...........................................................N.T.*
```

Table 30. Antiviral testing of influenza viruses collected 2011-09-01 until present*

Influenza Type	Number tested	Number resistant to oseltamivir	Number resistant to zanamivir
H1N1pdm	0	0	0
H3N2	161	0	0
B	1	0	0
Total	162	0	0

***Total number of viruses tested since 2011-09-01**

Influenza Type	Number tested	Number resistant to oseltamivir	Number resistant to zanamivir
H1N1pdm	89	0	0
H3N2	250	0	0
B[1]	127	3	3
Total	466	5	3

1. The 3 resistant B viruses were recovered from the same French patient at different times