Recommended viruses for influenza vaccines for use in the 2010-2011 northern hemisphere influenza season

February 2010

The World Health Organization (WHO) convenes technical meetings[1] in February and September each year to recommend viruses for inclusion in influenza vaccines[2] for the northern and southern hemispheres, respectively. The recommendation in this report relates to the influenza vaccines for the forthcoming influenza season in the northern hemisphere (2010 - 2011). A recommendation will be made in September 2010 relating to vaccines that will be used for the influenza season in the southern hemisphere (2011). For countries in equatorial regions epidemiological considerations will influence which recommendation (February or September) individual national and regional authorities consider more appropriate.

Influenza activity, September 2009 – January 2010

Between September 2009 and January 2010, influenza was active worldwide and reported in Africa, the Americas, Asia, Europe and Oceania. The predominant circulating virus was pandemic influenza A(H1N1) 2009. In many regions widespread activity was reported outside the usual influenza season and as a result, influenza activity was much higher than in the same period of the previous year.[3] From April 2009 to January 2010 more than 211 countries and overseas territories reported laboratory confirmed cases of pandemic influenza A(H1N1) 2009.[4]

In the northern hemisphere, widespread activity of pandemic influenza A(H1N1) 2009 was reported, which occurred earlier than is usual for seasonal influenza. Activity generally declined by January with the exception of widespread or regional activity reported in a few countries. In the southern hemisphere, pandemic influenza activity had declined to sporadic levels by September in most countries. In tropical areas widespread activity of pandemic influenza A(H1N1) 2009 was reported but activity has generally declined in all but a few countries.

Activity from seasonal influenza A viruses worldwide was markedly lower than in previous years. Low numbers of influenza A(H1N1) viruses were reported while for influenza A(H3N2)

[1] http://www.who.int/csr/disease/influenza/vaccinerecommendations/en/index.html
[2] Description of the process of influenza vaccine virus selection and development available at: http://www.who.int/gb/pip/pdf_files/Fluvaccvirusselection.pdf
[3] http://www.who.int/wer/2009/wer8409/en/index.html
[4] http://www.who.int/csr/don/2010_02_5/en/index.html

viruses sporadic activity was reported in some countries in Africa, the Americas, Asia, Europe and Oceania.

Intermittent influenza B activity was reported in Asia, Australia and New Zealand, some African and European countries, and many countries in the Americas. More significant sporadic activity was reported in Canada, the United States of America and the Russian Federation. In Bangladesh and China regional activity of influenza B was reported. By January, influenza B viruses became predominant in China. The extent and type/subtype of reported influenza activity worldwide are summarized in Table 1.

Influenza A(H5N1) and A(H9N2)

From 1 October 2009 to 17 February 2010, 16 human cases of influenza A(H5N1), 4 of which were fatal, were confirmed and reported by Cambodia, Egypt and Viet Nam, where highly pathogenic avian influenza A(H5N1) is present in poultry. In addition, Indonesia has reported 22 cases since January 2009 with 20 fatalities. Since December 2003, a total of 478 human cases and 286 deaths have been confirmed in 15 countries[5]. To date, there has been no evidence of sustained human-to-human transmission.

Two unrelated human cases of influenza A(H9N2) infection were reported by China Hong Kong Special Administrative Region in October and December 2009.

Antigenic and genetic characteristics of recent isolates

A combination of antigenic and genetic analyses is used to identify emergent antigenic variants of potential future epidemic importance and for consideration of their inclusion in vaccines. Antigenic relationships among contemporary viruses and vaccine viruses are of prime importance in determining vaccine composition. These relationships are evaluated mainly on the basis of haemagglutination inhibition (HI) tests with postinfection ferret antisera against egg and cell grown reference and vaccine viruses, using red blood cells principally from turkeys and guinea pigs, but also from other species as appropriate. Virus neutralization tests provide complementary data. Antigenic cartography is used as an additional analytical tool to visualize and integrate antigenic data. Phylogenetic analyses of haemagglutinin (HA) and neuraminidase (NA) genes help to define the genetic relatedness of antigenic variants to their predecessors and to elucidate the molecular basis for antigenic drift. The spread of antigenic variants associated with influenza outbreaks in different countries is also an important criterion for selection of epidemiologically relevant vaccine candidates.

Influenza A(H1N1) viruses

The vast majority of A(H1N1) viruses detected worldwide during this period were pandemic A(H1N1) 2009; only a few seasonal A(H1N1) viruses were detected. HI tests using postinfection ferret antisera indicated that pandemic A(H1N1) 2009 viruses remained antigenically homogeneous and closely related to the vaccine virus A/California/7/2009. Sequence analysis of the pandemic A(H1N1) 2009 viruses indicated that they were genetically homogeneous. A small number of viruses showed reductions in their reactivity

[5] http://www.who.int/csr/disease/avian_influenza/country/cases_table_2010_02_17/en/index.html

with some ferret antisera (raised against a panel of representative viruses including the vaccine virus) in HI assays.

Of the few seasonal A(H1N1) viruses received, most were antigenically and genetically closely related to A/Brisbane/59/2007 and belonged to clade 2B.

Influenza A(H3N2) viruses

In HI tests with postinfection ferret antisera most viruses circulating since September 2009 were antigenically closely related to the current southern hemisphere vaccine virus A/Perth/16/2009. Phylogenetically the haemagglutinin genes of recent viruses fell into 2 distinct clades, one represented by A/Perth/16/2009 and another by A/Victoria/208/2009. Viruses from these 2 clades were antigenically similar.

Influenza B viruses

Influenza B viruses of both the B/Victoria/2/87 and the B/Yamagata/16/88 lineages circulated and B/Victoria/2/87 lineage viruses continued to predominate.

In HI tests with postinfection ferret antisera the majority of the B/Victoria/2/87 lineage viruses were antigenically closely related to the vaccine virus B/Brisbane/60/2008. The B/Yamagata/16/88 lineage viruses isolated in China were closely related to B/Hubei-Wujiagang/158/2009 while in Bangladesh and elsewhere the majority of B/Yamagata/16/88 lineage viruses were closely related to the previous vaccine virus B/Florida/4/2006.

Resistance to influenza antiviral drugs

Neuraminidase inhibitors

The vast majority of pandemic A(H1N1) 2009 viruses were sensitive to oseltamivir. A small number of oseltamivir resistant pandemic A(H1N1) 2009 viruses were detected with most linked to use of this drug for prophylaxis or treatment; in all of these resistance was due to the histidine to tyrosine amino acid substitution at residue 275 (H275Y) in the neuraminidase. There were no reports of oseltamivir resistant A(H3N2) or B viruses, but the majority of seasonal A(H1N1) viruses were oseltamivir resistant. No zanamivir resistant viruses were reported. Updates are available at
http://www.who.int/csr/disease/influenza/h1n1_table/en/index.html

M2 inhibitors

The vast majority of pandemic A(H1N1) 2009 viruses and most A(H3N2) viruses were resistant to the M2 inhibitors, amantadine and rimantadine, while the majority of seasonal A(H1N1) viruses were sensitive. Resistance to these antiviral drugs remained predominantly associated with a serine to asparagine substitution at residue 31 (S31N) of the M2 ion channel protein. A small number of seasonal A(H1N1) viruses were resistant to both oseltamivir and M2 inhibitors.

Studies with inactivated influenza virus vaccines

The presence of antibodies to the HA of recent virus isolates was determined by HI tests in 13 panels of sera from children, adolescents, younger adults and the elderly who had received seasonal trivalent inactivated vaccines. The trivalent vaccines contained the antigens of A/Brisbane/59/2007 (H1N1) and A/Uruguay/716/2007 (H3N2); for the B component, vaccines contained B/Brisbane/60/2008 or B/Florida/4/2006. Only panels from recipients who had received vaccines containing B/Brisbane/60/2008 were considered for the analysis of recent influenza B virus isolates. For all panels of sera, the antibody responses to the seasonal A(H1N1) vaccine component were not considered due to the predominance of pandemic A(H1N1) 2009 viruses in the world. In addition, 9 panels of sera from children, adolescents, younger adults and the elderly participating in clinical trials of pandemic A(H1N1) 2009 vaccines were analysed.

Vaccines containing influenza A/California/7/2009 (H1N1)-like antigen stimulated anti-HA antibodies of similar geometric mean HI titres to the vaccine virus and a representative pandemic A(H1N1) 2009 isolate. For a small number of pandemic A(H1N1) 2009 viruses showing reduced HI reactivity with postinfection ferret sera to A/California/7/2009, the geometric mean HI titres were lower than to the vaccine virus (average reductions: children, 65%; adolescents, 64%; younger adults, 51%; the elderly, 56%).

Vaccines containing influenza A/Brisbane/10/2007 (H3N2)-like antigen stimulated anti-HA antibodies of geometric mean HI titres that were lower to recent isolates than to the vaccine virus (average reductions: children, 67%; adolescents, 53%; younger adults 57%; the elderly 66%). Similar results were obtained in microneutralization tests using a subset of sera (average reductions: younger adults 47%; the elderly 79%).

Vaccines containing influenza B/Brisbane/60/2008-like antigen stimulated anti-HA antibodies of similar geometric mean HI titres to the vaccine virus and recent B/Victoria/2/87 lineage isolates. Geometric mean HI titres were somewhat lower to recent B/Yamagata/16/88 lineage viruses than to the B/Victoria/2/87 lineage vaccine virus (average reductions: children, 20%; adolescents, 0%; younger adults 33%; the elderly 37%).

Recommended viruses for influenza vaccines for use in the 2010-2011 northern hemisphere influenza season

Pandemic influenza A(H1N1) viruses emerged in March 2009 and remain globally predominant, while seasonal influenza A(H1N1), A(H3N2) and B viruses circulated at very low levels in many countries during the period September 2009 to January 2010.

Pandemic A(H1N1) 2009 viruses were antigenically and genetically similar to A/California/7/2009. Vaccines containing A/California/7/2009 antigen stimulated anti-HA antibodies of similar titres against the vaccine virus and recent pandemic A(H1N1) 2009 viruses.

Very few seasonal influenza A(H1N1) viruses were reported. Of these, the majority were antigenically and genetically similar to the (previous northern hemisphere) vaccine virus A/Brisbane/59/2007.

Sporadic influenza A(H3N2) activity was reported in several countries. The majority of recent viruses were closely related to the southern hemisphere vaccine virus A/Perth/16/2009. Current vaccines containing A/Uruguay/716/2007 antigens stimulated anti-HA antibodies with titres that were consistently lower to recent influenza A(H3N2) viruses.

Influenza B activity was reported in several countries with regional activity being reported in Bangladesh and China. While viruses of both B/Victoria/2/87 and B/Yamagata/16/88 lineages co-circulated, B/Victoria/2/87 lineage viruses predominated. The majority of recent B/Victoria/2/87 lineage viruses were antigenically and genetically closely related to B/Brisbane/60/2008. Most recent B/Yamagata/16/88 lineage viruses were antigenically closely related to B/Florida/4/2006 or B/Hubei-Wujiagang/158/2009. Current vaccines containing B/Brisbane/60/2008 antigens stimulated anti-HA antibodies that had similar titres against the vaccine viruses and recent viruses of the B/Victoria/2/87 lineage; however, titres were lower to recent viruses of the B/Yamagata/16/88 lineage.

Based on the analyses it is expected that A(H1N1) pandemic 2009, A(H3N2) and B viruses will co-circulate in the northern hemisphere 2010-2011 with the likelihood that the pandemic A(H1N1) 2009 viruses will predominate. Based on recent epidemiological evidence it is anticipated that seasonal A(H1N1) viruses are unlikely to circulate at significant levels during the 2010-2011 northern hemisphere season; hence it has not been recommended for inclusion in the 2010-2011 vaccine. A virus of B/Victoria/2/87 lineage, the predominant lineage of type B viruses circulating since September 2009, has been recommended.

It is recommended that the following viruses be used for influenza vaccines in the 2010-2011 influenza season (northern hemisphere):

– an A/California/7/2009 (H1N1)-like virus;
– an A/Perth/16/2009 (H3N2)-like virus;#
– a B/Brisbane/60/2008-like virus.

 # A/Wisconsin/15/2009 is an A/Perth/16/2009 (H3N2)-like virus and is a 2010 southern hemisphere vaccine virus

Candidate influenza vaccine viruses that are under development and reagents for vaccine standardization can be found on
http://www.who.int/csr/disease/swineflu/guidance/vaccines/candidates/en/index.html

As in previous years, national or regional control authorities approve the composition and formulation of vaccines used in each country. National public health authorities are responsible for making recommendations regarding the use of the vaccine. WHO has published recommendations on the prevention of influenza[6].

[6] http://www.who.int/docstore/wer/pdf/2002/wer7728.pdf

Vaccine viruses (including reassortants) and reagents for use in the laboratory standardization of inactivated vaccine may be obtained from: Immunobiology Section, Office of Laboratory and Scientific Services, Therapeutic Goods Administration, P.O. Box 100, Woden ACT, 2606 Australia (fax: +61 2 6232 8564, email: influenza.standards@tga.gov.au ; web site: http://www.tga.gov.au); Division of Virology, National Institute for Biological Standards and Control, Health Protection Agency, Blanche Lane, South Mimms, Potters Bar, Hertfordshire, EN6 3QG UK (fax: +44 1707 641050, e-mail: enquiries@nibsc.hpa.org.uk , web site: http://www.nibsc.ac.uk/flu_site/index.html); or Division of Product Quality, Center for Biologics Evaluation and Research, Food and Drug Administration, 1401 Rockville Pike, Rockville, MD 20892, United States (fax: +1 301 480 9748).

Requests for reference viruses for antigenic analysis should be addressed to the WHO Collaborating Centre for Reference and Research on Influenza, VIDRL, 10 Wreckyn Street, North Melbourne, Victoria 3051, Australia (fax: +61 3 9342 3939, web site: http://www.influenzacentre.org); the WHO Collaborating Centre for Reference and Research on Influenza, National Institute of Infectious Diseases, Gakuen 4-7-1, Musashi-Murayama, Tokyo 208-0011, Japan (fax: +81 42 561 6149 or +81 42 565 2498, web site: http://www.nih.go.jp/niid/index.html); the WHO Collaborating Center for Surveillance, Epidemiology and Control of Influenza, Centers for Disease Control and Prevention, 1600 Clifton Road, Mail Stop G16, Atlanta, GA 30333, United States (fax: +1 404 639 0080, web site: http://www.cdc.gov/flu/); or the WHO Collaborating Centre for Reference and Research on Influenza, MRC National Institute for Medical Research, The Ridgeway, Mill Hill, London NW7 1AA, UK (fax: +44 208 906 4477, web site: http://www.nimr.mrc.ac.uk/wic/). Updated epidemiological information is available on the WHO web site at http://www.who.int/influenza .

Table 1

Extent and type of influenza activity worldwide, September 2009 - January 2010

Country, area or territory	September 09	October 09	November 09	December 09	January 10
Africa					
Algeria	*H1, *H3, *H1(pdm)	*H3,**H1(pdm)	*H3, *H1(pdm)	*H3,**H1(pdm)	**H3, **H1(pdm)
Cameroon	*H3	*H3	*H1(pdm), *H3	*H3	*H3,*H1(pdm)
Cape Verde	*H3,*H1(pdm)	*H3,*H1(pdm)	*H3,*B, *H1(pdm)	**H1(pdm)	
Central African Republic			*H1,**H1(pdm)		
Côte d'Ivoire	**H3, *B	*H3, *B, *H1(pdm)			**H1(pdm)
Democratic Republic of the Congo	*H3, *H1(pdm)				
Egypt	****H1(pdm), *H5	****H1(pdm)	****H1(pdm), *H5	*B, ****H1(pdm), *H5	****H1(pdm), *H5
Ethiopia	*H3	*H1(pdm)	*H1(pdm)	*H3, *H1(pdm)	*B,*H1(pdm)
France, Réunion	**H1(pdm)				
Gabon					**H1(pdm)
Ghana	*H1,*H3,*B, *H1(pdm)	*H3, *B,*H1(pdm)	*H3, *B,**H1(pdm)	*H3, *B,*H1(pdm)	*H3, *B,*H1(pdm)
Kenya	*H1, *H3, *B, *H1(pdm)	*H1, *H3, *B, *H1(pdm)	*H1, *H3, *B, *H1(pdm)	*H1, *H3, *B,*H1(pdm)	*H3, *B,*H1(pdm)
Madagascar	*H3,*B, *H1(pdm)	*B,**H1(pdm)	*H1,**H1(pdm)	***H1(pdm)	*H1(pdm)
Mauritania				*H1, *H3, *H1(pdm)	
Morocco	*H1, *H3, *H1(pdm)	*H1, H3,*B, ***H1(pdm)	*B, ****H1(pdm)	****H1(pdm)	*B, ****H1(pdm)
Nigeria		*H1(pdm)	*H3,*B		
Rwanda	*H3,*B				*B,*H1(pdm)
Senegal	*H3, *H1(pdm)	*H3,*B, *H1(pdm)	*H3,*B, *H1(pdm)	*H1(pdm)	*H1, *H1(pdm)
Sierra Leone	*H3				
South Africa	*H3,*B, **H1(pdm)	*H3,*B,*H1(pdm)	*H1,*B,*H1(pdm)	*H1	*H1(pdm)
Sudan	*H1(pdm)	*H1(pdm)	***H1(pdm)	***H1(pdm)	***H1(pdm)
Tunisia	*H1(pdm)	*H3,**H1(pdm)	****H1(pdm)	*H3,*B, ****H1(pdm)	*H3, ***H1(pdm)
Uganda	***H1, *H3,*B, ***H1(pdm)	*H1,*H3,*B, **H1(pdm)	*H1,*B, **H1(pdm)	*H3,*B, *H1(pdm)	
United Republic of Tanzania	****H1(pdm)	*H3,*B, ***H1(pdm)			*B,*H1(pdm)
Zambia	*H1,**H1(pdm)	*H3,*B, **H1(pdm)	*B,**H1(pdm)		

Country, area or territory	September 09	October 09	November 09	December 09	January 10
America					
Argentina	*H1, ***H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)
Barbados	**H1(pdm)	**H1(pdm)			
Bolivia (Plurinational State of)	*H1(pdm)	*H1(pdm)			*H1(pdm)
Brazil	***H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)
Canada	*H1,*H3, ***H1(pdm)	*H1,*H3, *B, ****H1(pdm)	*H3, *B, ****H1(pdm)	*H1, *H3, *B, *H1(pdm)	*B, *H1(pdm)
Chile	*H1(pdm)	*B,*H1(pdm)	*H1(pdm)	*H1, *H1(pdm)	*H1(pdm)
Colombia	**H1(pdm)	**H1(pdm)	**H1(pdm)	**H1(pdm)	*H1(pdm)
Costa Rica	****H1(pdm)	****H1(pdm)	****H1(pdm)	*H1(pdm)	*H1(pdm)
Cuba		**H1(pdm)	**H1(pdm)		
Dominican Republic	**H1(pdm)		*H3,*B	*H3,*B, *H1(pdm)	
Ecuador	****H1(pdm)	****H1(pdm)	****H1(pdm)	****H1(pdm)	****H1(pdm)
El Salvador	*H3, *B, ***H1(pdm)	***H1(pdm)	***H1(pdm)		*H1(pdm)
France, French Guiana	*H1, *H3, *B, ****H1(pdm)	*H1,*B, ****H1(pdm)	*B,***H1(pdm)	*B, *H1(pdm)	*H1(pdm)
France, Guadeloupe	*H3, ****H1(pdm)	*H3, ****H1(pdm)	***H1(pdm)	**H1(pdm)	*H1(pdm)
France, Martinique	****H1(pdm)	****H1(pdm)	**H1(pdm)	*H1(pdm)	*H1(pdm)
France, Saint Barthélemy	*B	*H3, *H1(pdm)	**H1(pdm)	**H1(pdm)	**H1(pdm)
France, Saint Martin	*H1(pdm)	**H1(pdm)	*B, **H1(pdm)	*H1(pdm)	*H1(pdm)
Guatemala	*H1, **H1(pdm)	**H1(pdm)	*H1, *H3, **H1(pdm)	*H3, *B	
Haiti	*H3,*B, * H1(pdm)	*H1(pdm)	*B	*H3	
Honduras	****H1(pdm)	****H1(pdm)	*B, ****H1(pdm)	*B, ****H1(pdm)	
Jamaica			*H1(pdm)	*H1(pdm)	*H1(pdm)
Mexico	*H1, *H3, *B,***H1(pdm)	*H3, *B,***H1(pdm)	*H3, ***H1(pdm)	***H1(pdm)	*H1(pdm)
Nicaragua	**H1(pdm)	**H1(pdm)			
Panama	**H1(pdm)				
Paraguay	*H1(pdm)	**H1(pdm)			**H1(pdm)
Peru	**H1(pdm)	**H1(pdm)	**H1(pdm)		*H1(pdm)
Saint Kitts and Nevis				*H1(pdm)	*H1(pdm)
Saint Lucia	*H1(pdm)				
Trinidad and Tobago	*H1(pdm)	*H1(pdm)			
United Kingdom of Great Britain and Northern Ireland, Anguilla		*H1(pdm)			

Country, area or territory	September 09	October 09	November 09	December 09	January 10
United Kingdom of Great Britain and Northern Ireland, Bermuda		*H1(pdm)			
United Kingdom of Great Britain and Northern Ireland, Cayman Islands		*H3			
United Kingdom of Great Britain and Northern Ireland, Turks and Caicos Islands		*H1(pdm)			
United States of America	*H1, *H3, *B, ****H1(pdm)	*H1, *H3, *B, ****H1(pdm)	*H1, *H3, *B, ****H1(pdm)	*H1,*H3, *B, ***H1(pdm)	*H3, *B, ***H1(pdm)
Uruguay	***H1(pdm)	***H1(pdm)			
Venezuela (Bolivarian Republic of)	**H1(pdm)	**H1(pdm)	**H1(pdm)		*H1(pdm)
Asia					
Afghanistan	*H1(pdm)	*H1, *H1(pdm)	*H1,*B, *H1(pdm)	*H1,*B, *H1(pdm)	
Azerbaijan			**H1(pdm)	**H1(pdm)	
Bahrain					****H1(pdm)
Bangladesh	***B, ***H1(pdm)	***B, ****H1(pdm)	***B, ***H1(pdm)	***B, **H1(pdm)	***H1(pdm)
Bhutan	***H1(pdm)				
Brunei Darussalam	****H1(pdm)	**H1(pdm)	**H1(pdm)	**H1(pdm)	**H1(pdm)
Cambodia	*H1,*H3,*B, ***H1(pdm)	*H3,*B, ***H1(pdm)	H3,*B, ***H1(pdm)	*H3,*B, ***H1(pdm), *H5	H3,*B, **H1(pdm)
China	*H1,***H3,*B, ****H1(pdm)	*H1,**H3,*B, ****H1(pdm)	*H1,*H3,**B, ***H1(pdm)	*H1,*H3,***B, ***H1(pdm)	*H1,*H3,***B, ***H1(pdm)
China, Hong Kong SAR	**H1,***H3,*B, ****H1(pdm)	*H1,*H3,*B, ****H1(pdm) , *H9	*H3,*B, *H1(pdm)	*H3,*B, *H1(pdm),*H9	*B,*H1 (pdm)
Democratic People's Republic of Korea			*H1(pdm)	***H1(pdm)	***H1(pdm)
Indonesia					*H1,*H3,*B, *H1(pdm), *H5
India	*H1,*H3,*B, ***H1(pdm)	*H1,*H3,*B, ***H1(pdm)	*H1,*H3, ***H1(pdm)	***H1(pdm)	****H1(pdm)
Iran (Islamic Republic of)	*H1,*H3, *H1(pdm)	**H1(pdm)	**H1(pdm)	*B, **H1(pdm)	*B,*H1(pdm)
Iraq					****H1(pdm)
Israel	***H1(pdm)	*B,**H1(pdm)	*H3,*B, ****H1(pdm)	*H3,*B, ****H1(pdm)	*B,*H1(pdm)
Japan	*H3, ****H1(pdm)	*H3, ****H1(pdm)	*B, ****H1(pdm)	*B, ****H1(pdm)	*B, ****H1(pdm)
Jordan					****H1(pdm)
Kazakhstan		*H3,*B	*H1(pdm)		
Kyrgyzstan	*H1(pdm)	*H1(pdm)	**H1(pdm)	*H1(pdm)	**H1(pdm)
Lao People's Democratic Republic		****H1(pdm)	****H1(pdm)	****H1(pdm)	****H1(pdm)

Country, area or territory	September 09	October 09	November 09	December 09	January 10
Mongolia	*H1,*H1(pdm)	***H1(pdm)	****H1(pdm)	***H1(pdm)	*B, **H1(pdm)
Myanmar	**H1(pdm)	**H1(pdm)	**H1(pdm)	**H1(pdm)	**H1(pdm)
Nepal			*H1(pdm)	**H1(pdm)	***H1(pdm)
Oman					***H1(pdm)
Pakistan	*H3	*H1(pdm)			
Philippines	*B, *H1(pdm)	*H3,*B, ****H1(pdm)	****H1(pdm)		
Republic of Korea					****H1(pdm)
Saudi Arabia					****H1(pdm)
Singapore	*H1(pdm)	*H1,*H3,*B, *H1(pdm)	*H3,*B, *H1(pdm)	*H3,*B, *H1(pdm)	*H3,*B, *H1(pdm)
Sri Lanka	*B, *H1(pdm)	*H1(pdm)			
Thailand	*H1,*H3, *H1(pdm)	*H1,*H3,*B, *H1(pdm)	*H3,*H1(pdm)	*H3,*B, *H1(pdm)	***H1(pdm)
Viet Nam				*H5	
Yemen					****H1(pdm)
Europe					
Albania	*H1(pdm)	*H1(pdm)	*H1(pdm)	**H1(pdm)	*H1(pdm)
Armenia			*H1(pdm)		***H1(pdm)
Austria	*H1,*H3, *H1(pdm)	*H3, ****H1(pdm)	*B, ****H1(pdm)	****H1(pdm)	**H1(pdm)
Belarus	*B,*H1(pdm)	**H1(pdm)	****H1(pdm)	*H1(pdm)	*H1(pdm)
Belgium	*H1(pdm)	***H1(pdm)	***H1(pdm)	****H1(pdm)	*H1(pdm)
Bosnia and Herzegovina	*H1(pdm)	*H1(pdm)	***H1(pdm)	*H1(pdm)	
Bulgaria	*H1(pdm)	*H1(pdm)	*H1,*H3, ****H1(pdm)	***H1(pdm)	*H1(pdm)
Croatia	*H1(pdm)	*H1(pdm)	****H1(pdm)	****H1(pdm)	****H1(pdm)
Cyprus	*H1(pdm)	*H1(pdm)			*H1(pdm)
Czech Republic	*H1(pdm)	*H1(pdm)	***H1(pdm)	***H1(pdm)	*H1(pdm)
Denmark	*H3, *H1(pdm)	*H3, ***H1(pdm)	****H1(pdm)	****H1(pdm)	*H1(pdm)
Estonia	*H1(pdm)	*B,*H1(pdm)	*H3,*B, ***H1(pdm)	*B, ***H1(pdm)	**H1(pdm)
Finland	**H1(pdm)	*H3, ***H1(pdm)	****H1(pdm)	***H1(pdm)	*H1(pdm)
France	*H1,*H3,*B, *H1(pdm)	*H1,*H3,*B, *H1(pdm)	*H3,*B, ***H1(pdm)	****H1(pdm)	**H1(pdm)
Georgia	*H1(pdm)	*H1(pdm)	***H1(pdm)	****H1(pdm)	****H1(pdm)
Germany	*H1,*H3, *H1(pdm)	*H1,**H1(pdm)	*B, ****H1(pdm)	****H1(pdm)	*H1(pdm)
Greece	*H1(pdm)	***H1(pdm)	****H1(pdm)	****H1(pdm)	****H1(pdm)
Hungary	*H1(pdm)	**H1(pdm)	***H1(pdm)	****H1(pdm)	**H1(pdm)
Iceland		****H1(pdm)	****H1(pdm)	**H1(pdm)	*H1(pdm)
Ireland	*H1(pdm)	*H1,*H3, ****H1(pdm)	****H1(pdm)	***H1(pdm)	*H1(pdm)
Italy	*H1,**H1(pdm)	***H1(pdm)	*H1, ***H1(pdm)	*H1,*H3, ***H1(pdm)	*H1(pdm)

Country, area or territory	September 09	October 09	November 09	December 09	January 10
Kosovo (i/a/w Security Council resolution 1244 (1999))			**H1(pdm)	*H1(pdm)	
Latvia	*H1,*H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)
Lithuania	*H1,*H1(pdm)	**H1(pdm)	***H1(pdm)	*B, ****H1(pdm)	*H1(pdm)
Luxembourg	*H1(pdm)	*H1(pdm)	****H1(pdm)	*B, ****H1(pdm)	*H1(pdm)
Malta	*H1(pdm)	***H1(pdm)			*H1(pdm)
Netherlands	*B,**H1(pdm)	*B, ****H1(pdm)	*B, ****H1(pdm)	****H1(pdm)	*H1(pdm)
Norway	*B,*H1(pdm)	*H3,*B, ****H1(pdm)	****H1(pdm)	*B, ****H1(pdm)	*H1(pdm)
Poland	*H1,*B, *H1(pdm)	*H1, ***H1(pdm)	*B, ****H1(pdm)	*B, ****H1(pdm)	*B,*H1(pdm)
Portugal	*H1(pdm)	*H1(pdm)	****H1(pdm)	****H1(pdm)	*H1(pdm)
Republic of Moldova	*H1(pdm)	*H1(pdm)	****H1(pdm)	****H1(pdm)	****H1(pdm)
Romania	*H1(pdm)	*H3,**H1(pdm)	***H1(pdm)	***H1(pdm)	***H1(pdm)
Russian Federation	*H1,*H3,*B, *H1(pdm)	*H1,*H3,*B, ***H1(pdm)	*H1,*H3,*B, ****H1(pdm)	*H1, *H3,*B, ****H1(pdm)	*H1,*H3,*B, **H1(pdm)
Serbia	*H1(pdm)	*H1(pdm)	***H1(pdm)	***H1(pdm)	***H1(pdm)
Slovakia	*H3,*H1(pdm)	*H1(pdm)	**H1(pdm)	***H1(pdm)	*H1(pdm)
Slovenia	**H1(pdm)	*H1(pdm)	****H1(pdm)	*H1, ****H1(pdm)	****H1(pdm)
Spain	***H1(pdm)	***H1(pdm)	***H1(pdm)	***H1(pdm)	*H1(pdm)
Sweden	*H3,*H1(pdm)	***H1(pdm)	*H3,*B, ****H1(pdm)	****H1(pdm)	*B,**H1(pdm)
Switzerland	*H1(pdm)	*H1(pdm)	***H1(pdm)	***H1(pdm)	*B,**H1(pdm)
The former Yugoslav Republic of Macedonia	*H1(pdm)	*H1(pdm)	***H1(pdm)	****H1(pdm)	*H1(pdm)
Turkey	*H1,*H1(pdm)	***H1(pdm)	*H3,*B, ***H1(pdm)	*H3,*B, ***H1(pdm)	*H3, ***H1(pdm)
Ukraine	*H1(pdm)	*H1(pdm)	***H1(pdm)	***H1(pdm)	**H1(pdm)
United Kingdom of Great Britain and Northern Ireland	*H1,*H3, *H1(pdm)	*H3,**H1(pdm)	*B, **H1(pdm)	*H1,*H3,*B, **H1(pdm)	*B, *H1(pdm)
United Kingdom of Great Britain and Northern Ireland, Gibraltar	*H3	*H3			
Oceania					
Australia	*H1,*H3, **H1(pdm)	*H3,*H1(pdm)	*H1,*H3,*B, *H1(pdm)	*H3,*H1(pdm)	*B,*H1(pdm)
Fiji	*H3,*H1(pdm)				
France, New Caledonia	*H1(pdm)				
France, Tahiti	*H1(pdm)				
Maldives					**H1(pdm)

Country, area or territory	September 09	October 09	November 09	December 09	January 10
Micronesia (Federated States of) Chuuk	*H1(pdm)				
Micronesia (Federated States of) Pohnpei	*H1(pdm)				
Micronesia (Federated States of) Yap	*H1(pdm)				
New Zealand	**H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)	*H1(pdm)
Palau	*H1(pdm)				
Solomon Islands	*H1(pdm)				
United States of America, Guam	*H1(pdm)				

Data in table 1 were provided by the Global Influenza Surveillance Network and other partners.

*** = Sporadic activity**	**A = Influenza A (not subtyped)**
**** = Local activity**	**B = Influenza B**
***** = Regional outbreaks**	**H1(pdm) = Pandemic Influenza A(H1N1) 2009**
******= Widespread outbreaks**	**H1 = Influenza A(H1N1)**
	H3 = Influenza A(H3N2)

Annex

Declarations of interest

The WHO recommendation on viruses for influenza vaccines for the northern hemisphere 2010-2011 was made on the basis of a technical consultation with relevant WHO Collaborating Centres on Influenza (CCs) and Essential Regulatory Laboratories (ERLs).

In accordance with WHO policy, all WHO CC and ERL representatives, in their capacity as representatives of their respective institutions ("Advisers") completed a WHO form for Declaration of Interests for WHO experts before being invited to the consultation. At the start of the consultation, the interests declared by the Advisers were disclosed to all consultation participants.

The Advisers declared the following personal current or recent (past 4 years) financial or other interests related to commercial entities:

Institution	Representative	Personal interest
WHO CC Atlanta*	Dr Nancy Cox	None
	Dr Alexander Klimov	None
WHO CC London	Dr John McCauley	None
WHO CC Melbourne	Dr Anne Kelso	Shareholdings in a vaccine manufacturer
WHO CC Memphis	Dr Richard Webby	None
WHO CC Tokyo	Dr Masato Tashiro	None
ERL CBER	Dr Zhiping Ye	None
ERL NIBSC	Dr John Wood	None
ERL TGA	Dr Gary Grohmann	None

* Represented by Dr Nancy Cox on 14 February 2010 and by Dr Alexander Klimov from 15 to 17 February 2010

The interest declared by Dr Kelso was reviewed by the WHO Secretariat and determined not to present a conflict of interest with the objectives of the technical consultation. Furthermore, the interest was disclosed to all consultation participants. In view of the foregoing, Dr Kelso participated in the consultation as an Adviser.