



**INFORMATION FOR THE VACCINES AND RELATED BIOLOGICAL PRODUCTS
ADVISORY COMMITTEE, CBER, FDA**

Teleconference

March 17, 2004

**WHO COLLABORATING CENTER FOR SURVEILLANCE,
EPIDEMIOLOGY AND CONTROL OF INFLUENZA**

**Influenza Branch
Division of Viral and Rickettsial Diseases
National Center for Infectious Diseases
Centers for Disease Control and Prevention
Atlanta, GA 30333**

SUMMARY OF ANTIGENIC AND GENETIC CHARACTERISTICS OF INFLUENZA B VIRUSES TESTED AT CDC

Fifty four influenza B viruses isolated between October 1, 2003 and the present were tested. Nineteen viruses belonged to the B/Victoria/2/87 lineage and 35 viruses belonged to the B/Yamagata/16/88 lineage. Viruses of the *B/Victoria/2/87 lineage* were from: North America – 4, South America -14 and Asia -1. Viruses of the *B/Yamagata/16/88 lineage* were from: North America - 26, South America – 2, and Asia – 7.

Antigenic characteristics of B HAs

Sixteen of 19 (84%) of the *B/Victoria/2/87 lineage* viruses have reduced HI titers to the vaccine strain, B/Hong Kong/330/2001.

Thirty of 35 (86%) of the *B/Sichuan/379/99 lineage* viruses have reduced HI titers as compared with the homologous titer for the B/Sichuan/379/99 ferret antiserum.

These strains demonstrate HI titers within 2-fold of the homologous titer when tested against B/Shanghai/361/2002 or B/Jilin/20/2003 ferret antisera.

Genetic characteristics of B/Victoria/2/87 lineage HAs

The majority of recent B/Victoria/2/87 lineage isolates belong to the group represented by the vaccine strain B/Shandong/7/97 and the reference strain B/Brisbane/32/2002. This group includes viruses from around the world.

Genetic characteristics of B/Yamagata/166/88 lineage HAs

Two main genetic groups continue to be identified:

- 1) The B/Sichuan/379/99 group. There were no viruses from this group received recently.
- 2) The second group has HA genes related to the B/Harbin/7/94 reference strain and constitutes the majority of B/Yamagata-lineage viruses sequenced from around the world during the 2003-2004 influenza season. The HAs of viruses from this genetic group have approximately 15 amino acid changes compared to those of the B/Sichuan/379/99 genetic group. Egg isolates are available for B/Shanghai/361/2002, B/Jilin/20/2003, B/Shandong/22/2003, B/Jiangsu/10/2003, all of which belong to the B/Yamagata-lineage (B/Harbin/7/94 group).

HEMAGGLUTINATION INHIBITION REACTIONS OF INFLUENZA TYPE B VIRUSES (03/10/04)

REFERENCE FERRET ANTISERA

REFERENCE ANTIGENS	A	B	C	D	E	F	G	H	I	collected	Date
	SIC/379	SHI/15	SHA/361	JIL/20	UL/06	JIA/10	HK/1434	HK/330	BRI/32		Passage
1 B/SICHUAN/379/99	640	320	320	80	160	160	20	10	20	12/2/1999	E2/E2
2 B/SHIZUOKA/15/2001	1280	640	320	160	320	160	40	20	40	1/17/2001	E3/E3
3 B/SHANGHAI/361/2002	1280	640	320	80	160	160	20	10	10	6/12/2002	E2/E2
4 B/JILIN/20/2003	160	160	160	160	160	160	10	5	5	2/21/2003	E2/E2
5 B/ULAN-UDE/06/03	160	160	80	40	160	80	10	5	10	3/6/2003	E1/E3
6 B/JIANGSU/10/03	80	80	80	80	80	640	20	5	5	9/11/2003	E3/E2
7 B/HONG KONG/1434/2002	5	5	5	5	5	5	640	1280	640	1/15/2002	E5
8 B/HONG KONG/330/2001	10	5	5	5	10	5	640	1280	1280	4/9/2001	E3
9 B/BRISBANE/32/2002	10	10	5	5	5	5	640	1280	1280	7/2/2002	E2/E4

TEST ANTIGENS

10 B/WISCONSIN/02/2004	160	160	160	80	80	320	20	5	5	1/28/2004	C1/C1
11 B/HAWAII/12/2003	160	160	160	80	80	320	10	5	5	12/16/2003	X/C1
12 B/MASSACHUSETTS/07/2003	160	160	160	80	160	320	10	5	5	12/24/2003	X/C1
13 B/ALASKA/01/2004	320	320	160	80	320	160	20	5	5	2/17/2004	M1/C1
14 B/SHANDONG/22/03	160	320	160	80	160	160	10	10	20	1/13/2003	E4/E3
15 B/CANADA75/2003	320	320	320	320	160	640	10	5	5	12/8/2003	X/C1
16 B/CANADA/76/2003	160	160	160	80	80	320	10	5	5	12/11/2003	X/C1
17 B/CANADA/78/2003	160	160	160	80	160	640	20	5	5	12/16/2003	X/C1
18 B/CANADA/79/2003	160	320	160	160	160	640	20	5	5	12/31/2003	X/C1
19 B/CANADA/81/2004	160	320	160	160	160	640	20	5	5	1/2/2004	X/C1
20 B/PERU/7272004	80	160	160	80	160	320	20	5	5	2/2/2004	X/C1
21 B/INDIA/6801/2003	160	160	160	80	160	320	10	5	5	8/11/2003	X/C1
22 B/TAIWAN/1543/2004	160	160	160	80	160	320	10	5	5	2/7/2004	C2/C1
23 B/TAIWAN/1536/2004	160	160	160	80	80	320	10	5	5	2/8/2004	C2/C1
24 B/TAIWAN/1539/2004	160	160	160	80	160	320	10	5	5	12/1/2003	C2/C1
25 B/PARAGUAY/520/2003	5	5	5	5	5	5	40	160	320	10/9/2003	X/C1
26 B/PARAGUAY/528/2003	5	5	5	5	5	5	160	160	320	10/14/2003	X1/C2
27 B/PARAGUAY/563/2003	5	5	5	5	5	5	160	160	320	10/29/2003	X/C1
28 B/PARAGUAY/546/2003	5	5	5	5	10	5	80	160	320	10/22/2003	X/C1
29 B/PARAGUAY/469/2003	5	5	5	5	5	5	80	160	320	10/31/2003	X/C1
30 B/PARAGUAY/570/2003	5	5	5	10	10	5	80	80	320	10/31/2003	X/C1
31 B/PARAGUAY/585/2003	5	5	5	5	5	5	80	80	320	11/11/2003	X/C1
32 B/PARAGUAY/580/2003	5	5	5	5	5	5	80	160	320	11/6/2003	X/C1
33 B/PARAGUAY/636/2003	5	5	5	5	10	5	80	80	320	12/13/2003	X/C1

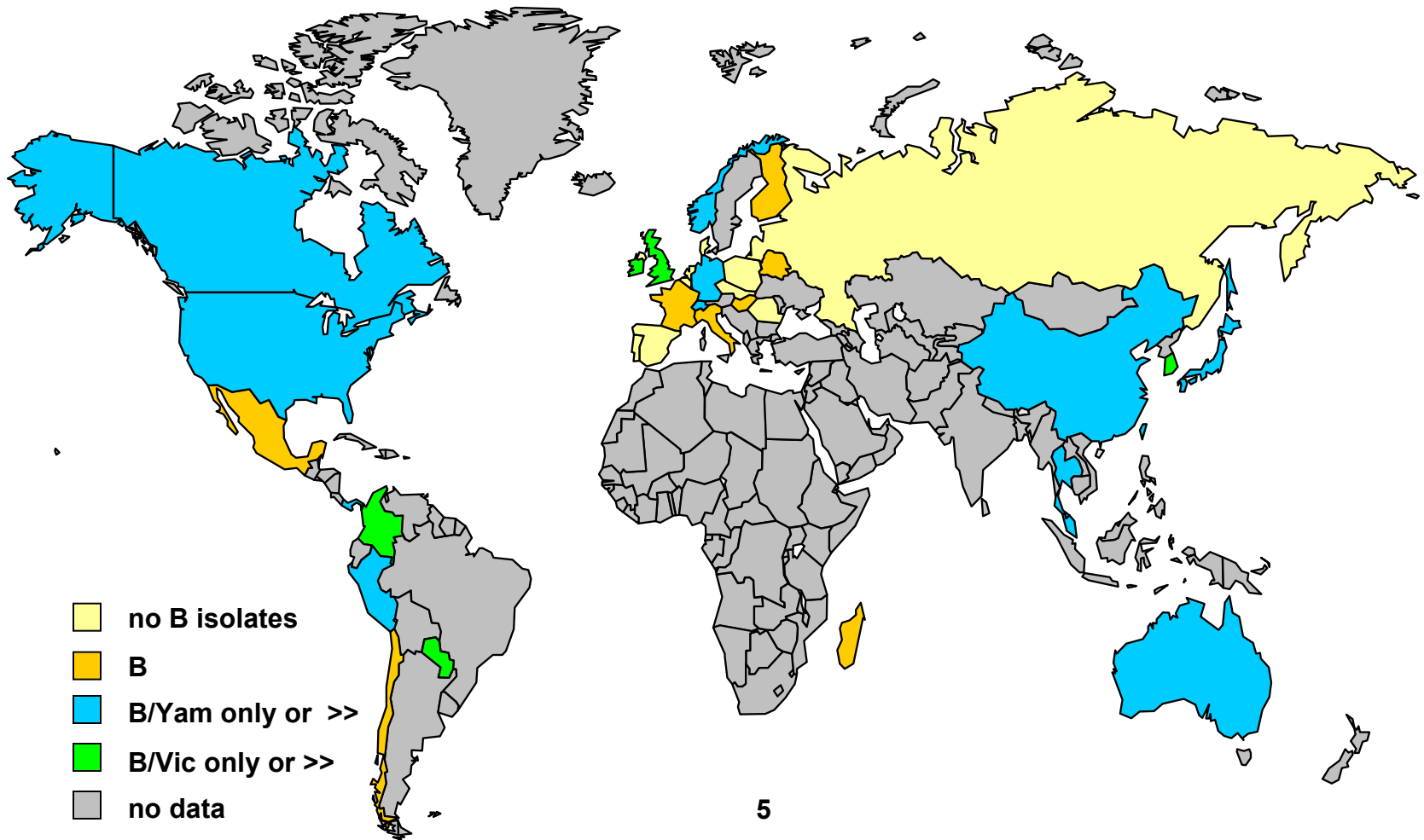
Influenza B Isolates Antigenically Characterized by CDC

	U.S.A.	North America	Europe	Asia	Cent/So America	Africa, Australia, New Zealand	Total (%)
April 2002 - September 2002							
B/Sichuan/379/99-like	2			10	2		14 (4%)
B/Sichuan/379/99 (low)	1			6	8		15 (4%)
B/Hong Kong/330/2001-like	56			22	60	17	155 (43%)
B/HK/330/2001-like (low)	41			68	49	16	174 (49%)
						Total	358
October 2002 - March 2003							
B/Sichuan/379/99-like				10			10 (2%)
B/Sichuan/379/99 (low)	1		1	10			12 (2%)
B/Hong Kong/330/2001-like	130		12	95	6	1	244 (52%)
B/HK/330/2001-like (low)	135	2	8	52	5	6	208 (44%)
						Total	474
April 2003 – September 2003							
B/Sichuan/379/99-like				1			1 (2%)
B/Sichuan/379/99 (low)	1			11		1	13 (24%)
B/Hong Kong/330/2001-like	5	3		4	4	1	17 (32%)
B/HK/330/2001-like (low)	11				6	5	22 (42%)
						Total	53
October 2003 – March 2004							
B/Sichuan/379/99-like	5	1		1			7 (13%)
B/Sichuan/379/99 (low)	15	5		6	2		28 (52%)
B/Hong Kong/330/2001-like	3	1					4 (7%)
B/HK/330/2001-like (low)				1	14*		15 (28%)
						Total	54
Total	406	12	21	297	156	47	939

* 12 from Paraguay

Preliminary Data 03/10/2004

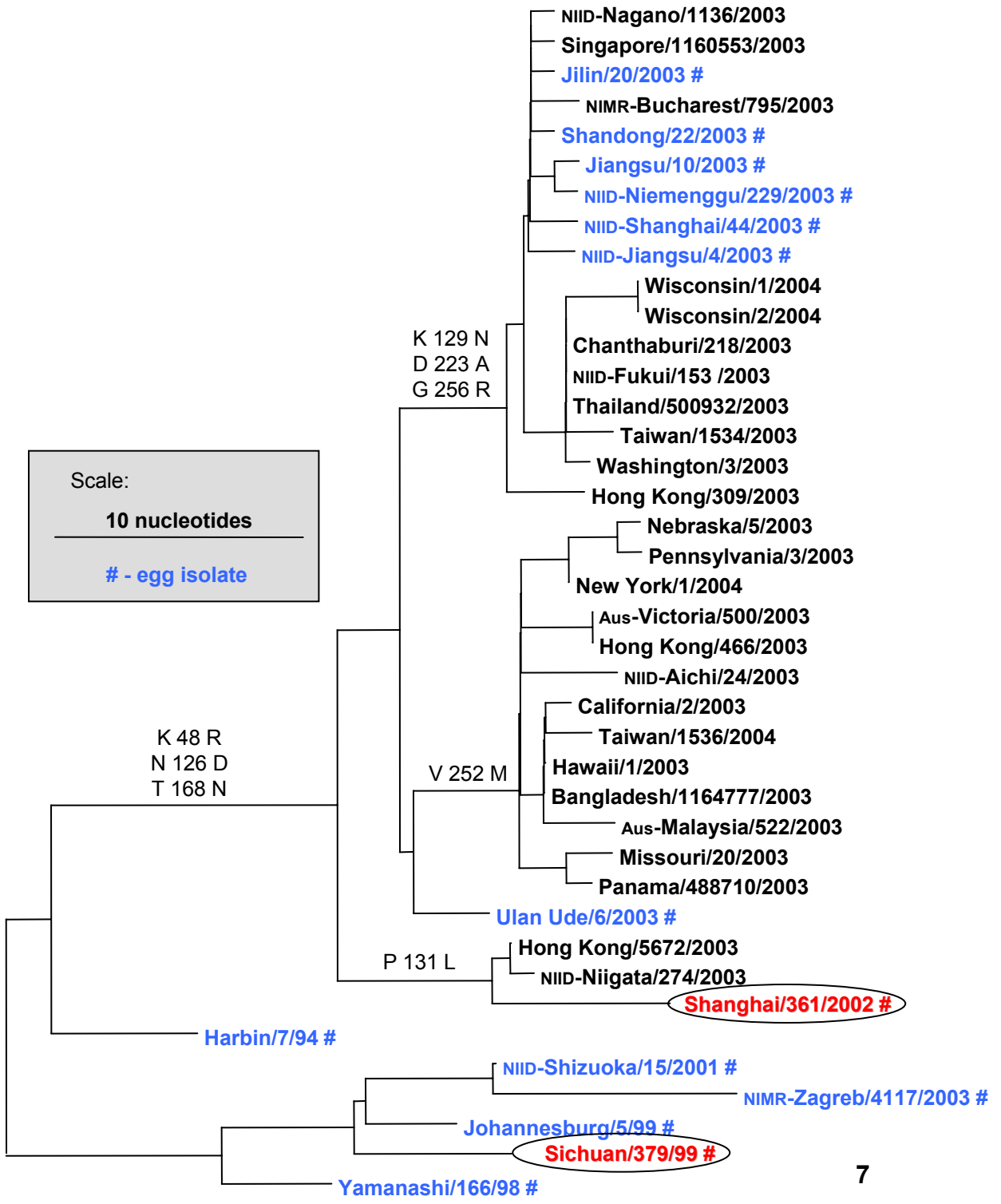
Geographic Distribution of Influenza B Viruses (October 2003 - March 2004)



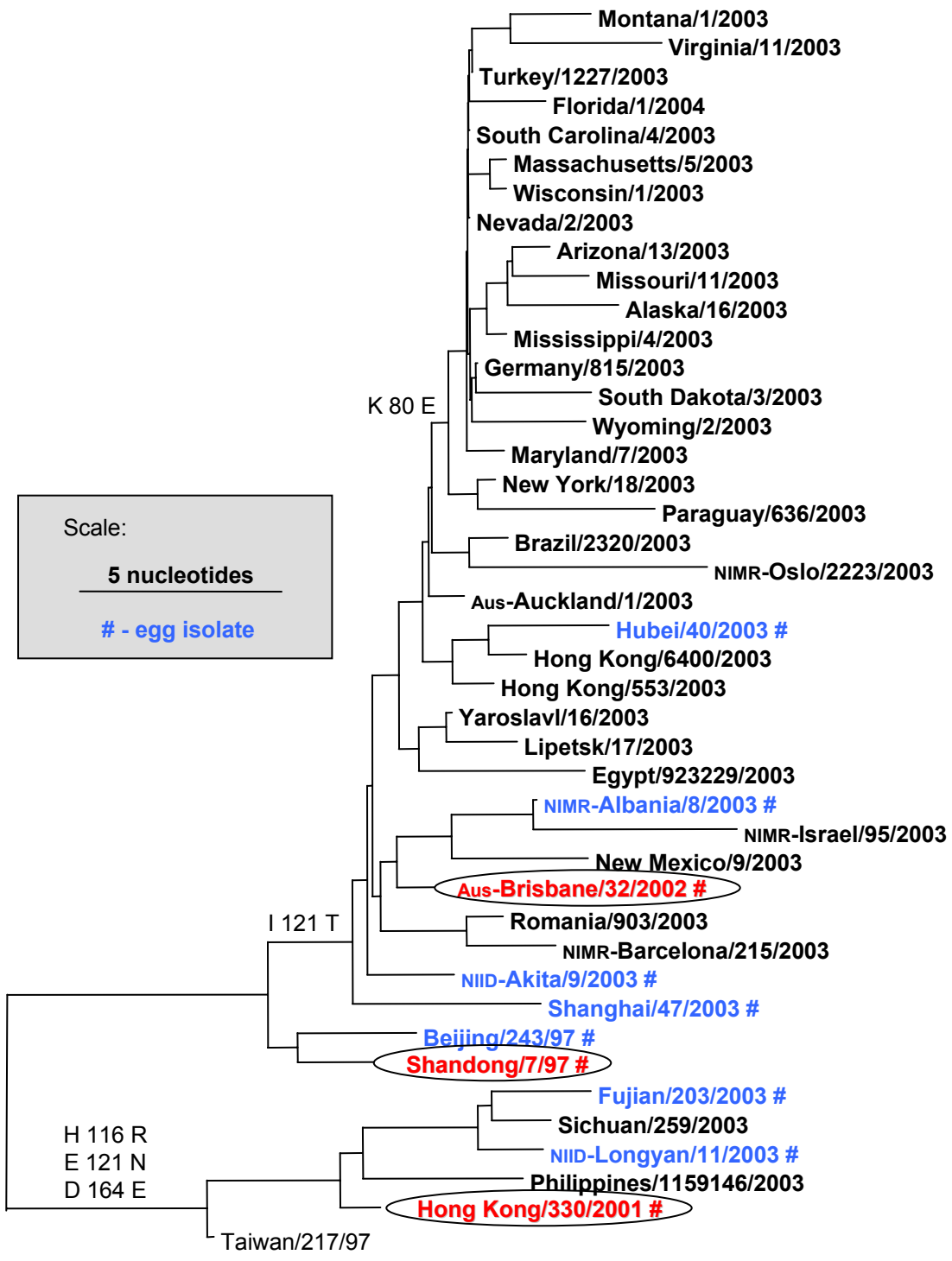
**Influenza B Viruses from Different Countries
Received and Tested by WHO Influenza Network
(October 1, 2003 – March 10, 2004)**

Country	B/Vic lineage	B/Yam lineage
USA	2	20
Canada	2	8
Colombia	2	
Panama		1
Peru		2
Paraguay	12	
Australia		1
Switzerland		1
Norway		1
England	2	
Ireland	2	
Japan	3	64
Hong Kong	2	18
Taiwan		1
Malaysia		6
Thailand		19
China	3	49
S. Korea	19	
Total:	49 (20%)	191 (80%)

Evolutionary Relationships Among Influenza B Hemagglutinin (HA1) genes (Yamagata Lineage)



Evolutionary Relationships Among Influenza B Hemagglutinin (HA1) genes (Victoria Lineage)



Evolutionary Relationships Among Influenza B Neuraminidase Genes

