30th year of publication

Epidemiological News Bulletin

QUARTERLY

APRIL - JUNE 2004 VOL. 30 NO. 2 A PUBLICATION OF MINISTRY OF HEALTH, SINGAPORE

CONTENTS

MOH Weekly Infectious Diseases Bulletin
http://www.moh.gov.sg/corp/publications/idbulletin

ISSN 0218-0103
http://www.moh.gov.sg/corp/publications/enb

Review of Epidemiological News Bulletin

The Ministry of Health (MOH), continues with its publication, the Epidemiological News Bulletin (ENB), for the 30th consecutive year, with the objective of keeping medical practitioners informed of current developments in the surveillance and control of infectious diseases in Singapore.

Early this year, a comprehensive review of the publication was carried out to improve the relevance of the publication in view of the various real-time information platforms currently available. It was decided that the frequency of this publication revised to quarterly since the contents of ENB are usually not time-sensitive. In addition, the revision in frequency will enable the repositioning of ENB to focus on more analytical-based articles, reviews and detailed investigation reports on infectious disease outbreaks. Overall, the aim of these revisions is to improve the quality of the publication and its relevance to readers.

Catering to the increasing demand for more timely information in providing alerts on infectious disease outbreaks, the Weekly Infectious Disease Bulletin published online by MOH provides detailed information on the weekly incidences of infectious diseases including graphs demonstrating trends and comparisons with the preceding year. Hence, the table of monthly statistics on infectious disease notifications will be discontinued. However, a hyperlink to the MOH Weekly Infectious Disease Bulletin is provided on the contents column of the ENB.

It is hoped that readers will continue to find the Bulletin useful in keeping themselves abreast of the infectious disease situation in Singapore.

Oyster-associated outbreaks of gastroenteritis

Notifications

Between 16 December 03 and 4 Jan 2004, Ministry of Health was notified of 14 outbreaks of gastroenteritis. In these outbreaks, half-shelled raw oysters served in hotels, clubs and restaurants were suspected.

Epidemiological investigations

Epidemiological investigation was conducted as soon as each notification was received. Information was obtained on the clinical symptoms, onset of illness, food items eaten and medical treatment sought. Food remnants were collected and sent for microbiological analyses. To determine the vehicle of transmission, a case-control study was carried out for each of the outbreaks based on the food menu provided by the food establishment. As oysters were suspected, invoices for the sale of oysters were obtained and the distributors and importers traced.

A case of gastroenteritis was defined as a person who had partaken of a meal on a specified date in the implicated food establishment and who subsequently vomited or developed three or more bouts of diarrhoea within a 24-hour period.

Results

A total of 305 cases (21.7%) were identified out of 1408 persons who had partaken of the meals (lunch and dinner) in various food establishments. The median age of the cases was 29 years (range: 6 years – 77 years) and 73% were males. The ethnic distribution of the cases was Chinese, 93.7% ; Malays, 5.8%; and Indians, 0.4%. The clinical symptoms were diarrhea (94 %), abdominal cramps (72%), vomiting (69%), fever (54%) and headache (49%). More than half of the cases (52.8%) sought medical treatment and 12.8% were hospitalized. The others self-medicated. Most of the cases recovered within two to three days The median incubation period was 29 hours (range: 3 – 103 hours).The onset of illness of the reported cases is shown in *Fig 1*.

Analyses of the food-specific attack rates based on 223 cases and 209 controls in 6 of the outbreaks showed that consumption of raw half-shelled oysters was signifcantly associated with illness in each outbreak ($p < 0.0001$) (*Table 1*).

The frozen half-shelled oysters (*Crassostrea virginica*) were traced to a specific shipment (11.4 tonnes) imported from Shandong, China, on 4 Nov 2003. All remaining 21 cartons distributed to 4 seafood suppliers were voluntary recalled by the importer. The recalled shipment implicated in the outbreak was tested for bacterial enteropathogens, norovirus and rotavirus at the Veterinary Public Health Laboratory, Agri-Food Veterinary Authority of Singapore. RT-PCR found that 9 out of 12 samples tested were positive for norovirus. A sample was also sent to the Institute of Environmental Science & Research Ltd, New Zealand for reference testing. The RT-PCR result was confirmed positive for norovirus. EM performed at the National University of Singapore detected particles of around 35-50nm, suggestive of norovirus-like viruses.

Investigation into the preparation of the oysters at the various implicated food establishments showed that there was no violation of the food hy-

giene procedures. None of the foodhandlers in the implicated food establishments reported a recent history of gastroenteritis. No pathogenic enterobacteria were cultured from stool samples of hospitalised cases. However, 4 of the 5 stool samples obtained in one of the outbreaks were tested positive for norovirus group II RNA at the DEMRI laboratory.

Comments

Two types of oysters are imported into Singapore based on health certificates issued by the exporting countries: live oysters and frozen half-shelled oysters. Live oysters are imported from Australia, New Zealand, Canada, France, Ireland and the Netherlands,

Figure 1
Onset of symptoms of 223 cases of oyster-associated gastroenteritis

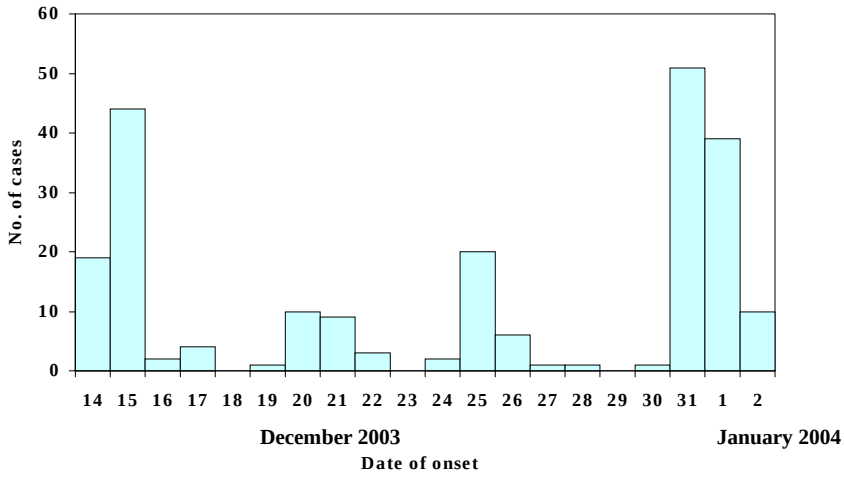


Table 1

Association between oyster consumption and illness in 6 outbreaks of gastroenteritis

Outbreak	Ate			Did not eat			OR	P value*
	Ill	Well	Attack rate (%)	Ill	Well	Attack rate (%)		
1	63	13	82.89	6	72	7.69	10.78	<0.0001
2	23	1	95.83	0	17	0	-	<0.0001
3	16	2	88.89	1	10	9.09	9.78	<0.0001
4	14	3	82.35	1	30	3.23	25.53	<0.0001
5	82	1	98.80	4	47	7.84	12.60	<0.0001
6	15	1	93.75	1	13	7.14	13.13	<0.0001

* Fisher's exact test

while frozen oysters are imported from China, New Zealand, Australia, Japan, Korea, Chile, France, and USA. Chilled shucked oysters were prohibited following a nationwide outbreak of hepatitis A associated with the consumption of raw or partially-cooked oysters served in oyster-omelette in 1980. Random samples are routinely taken from each imported consignment for laboratory tests which include *E.coli, S.aureus, Salmonella, Shigella, Vibrio cholerae, Vibrio parahaemolyticus ,Vibrio vulnificus* and shellfish toxins.

The outbreaks were caused by a consignment of frozen oysters imported from China. The frozen oysters were thawed and then served raw in various food outlets. No further oyster-associated cases were reported since the remaining supply of the shipment was recalled.

The clinical and the epidemiological characteristics of these outbreaks are suggestive of gastroenteritis caused by norovirus. The aetiology was based on the following findings: more than 50% of the cases had vomiting, the median incubation period was 29 hours, the duration of illness was 1-2 days, and stool cultures of the hospitalized cases were negative for enterobacteria or parasite. These would meet Kaplan's clinical and epidemiological criteria for norovirus gastroenteritis devised to assist in the recognition of norovirus outbreak when no molecular diagnostics are available. The aetiology of the outbreaks was confirmed by the detection of norovirus in four of five stool samples in one of the outbreaks and in 75% of the oyster samples taken from the implicated shipment. Further analyses are being carried out on the norovirus detected in the stools and implicated oyster samples.

Outbreak of food poisoning in a secondary school

Notification

An outbreak of food poisoning in a secondary school was notified to Ministry of Health by the school administrator on 12 Jan 04. This is a newly-completed single-session school with a total enrolment of 1550 secondary 1 to 4 students. It has a staff strength of 100 (teaching and non-teaching). The school operates from 0730 – 1445 hrs although students and teachers may stay back for other activities. The school is served by a canteen which operates from 1000 – 1340 hrs under a staggered recess/ lunch time schedule

Epidemiological investigations

Epidemiological investigations, including questionnaires survey and collection of food samples for laboratory analyses, were conducted immediately.

A case of food poisoning was defined as a student of the school who developed abdominal cramps, vomiting or diarrhoea, and whose onset of symptoms was from 12 Jan 04.

Findings

Based on this case definition, 28 cases were identified. 17 cases sought medical treatment and

11 self-medicated. . The onset of illness was from 1200 hrs to 1800 hrs (*Fig 2*). The clinical symptoms were abdominal cramps (100%), vomiting (85.7%), diarrhoea (57.1%), nausea (28.6%) and fever (17.9%).

Analysis of the food-specific attack rates based on the food items consumed by 28 cases and 68 controls on 12 Jan 2004 showed that consumption of mixed chicken bolognoise, mixed beef bolognoise and crabmeat stick pasta served by stall No. 4 were significantly associated with illness (*Table 2*).

All the ingredients used in the food items implicated were also found to be statistically significantly associated with illness (*Table 3*). Multiple logistic regression analysis further showed that cases were more likely to consume spaghetti noodles than non-cases after controlling for significant factors from univariate chi square test (OR=585, P<0.0001 and 95% CI= 58.2-5877)

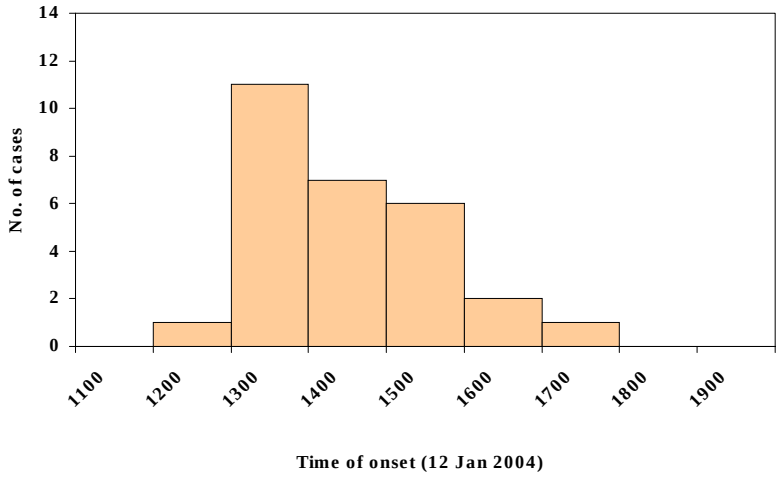
The mean and median incubation periods based on the interval between time of food consumption and time of onset of illness were 3 hrs and 2.9 hrs, respectively.

Nine out of 13 food remnants analysed were positive for enterotoxigenic *Staphylococcus aureus* and *E. coli*. No *Salmonella* was detected (*Table 4*). All the 23 foodhandlers from the implicated stall as well as other stalls in the canteen had no recent history of gastrointestinal or respiratory illness and no septic skin lesions were detected on examination. Their stool cultures were negative for enteropathogens.

Preparation of implicated food item

A total of 11 packets (500g each) of spaghetti noodles were boiled for 10 minutes at about 0830 hrs on 12 Jan. The boiled noodles were placed in a basket, cooled with tap water and then mixed with cooking oil. At about 0930 hrs, the noodles were placed in individual serving bowls. When the food item was ordered by the students, the spaghetti noodles and other ingredients (with sauces added) were boiled for a few seconds before it was served.

Figure 2
Onset of illness of 28 cases of food poisoning in a secondary school



Comments

The outbreak was probably caused by *Staphylococcus aureus* as the clinical symptoms were predominantly abdominal cramps and vomiting and the incubation period was short, about 3 hours Enterotoxigenic *Staphylococcus aureus* was isolated from the implicated foods. The presence of *E coli* in the food samples indicates poor personal and food hygiene practices at the canteen stall. The food items could have been contaminated during preparation. Subsequent storage at room temperature for several hours before consumption during recess and lunchtime would have allowed rapid multiplication and production of exotoxin by the Staphylococcal bacteria.

Based on the findings of the investigations, appropriate recommendations, in particular, the need to maintain a high standard of personal and food hygiene by the foodhandlers at all times, were given to the school principal and licensees of the stalls.

Table 2

Analyses of food-specific attack rates in an outbreak of food poisoning in a secondary school

Food items	Case (n=28)			Control (n=68)			P value
	Ate	Did not eat	% ate	Ate	Did not eat	% ate	
Minced chicken bolognaise	11	17	39.3	1	67	1.5	<0.0001
Minced beef bolognaise	6	22	21.4	1	67	1.5	0.002
Crabmeat stick pasta	6	22	21.4	2	66	2.9	0.007

Table 3

Analyses of food-specific attack rates based on ingredients used in the implicated food items

Food items	Case (n=28)			Control (n=68)			P value	OR	95% CI
	Ate	Did not eat	% ate	Ate	Did not eat	% ate			
Crabmeat stick*	8	20	28.6	2	66	2.9	0.001	-	-
Minced chicken*	9	19	32.1	0	68	0	<0.0001	-	-
Minced beef*	7	21	25	1	67	1.5	0.001	-	-
Mixed vegetables #	23	5	82.1	3	65	4.4	<0.0001	99.7	22-450
Spaghetti noodles #	28	0	100	3	65	4.4	<0.0001	585	58-5877
Sauce*	8	20	28.6	2	66	2.9	0.001	-	-

*Fisher's exact test
Chi square test

Table 4
Isolation of food poisoning bacteria from food remnants in an outbreak of food poisoning

Food items	*Staphylococcus aureus**	*E. coli (cfu/gm)*	*Salmonella*
Boiled prawns	Positive	35	Not detected
Crabmeat	Positive	53	Not detected
Fish cake	Positive	3.6	Not detected
Mixed seafood	Positive	1100	Not detected
Sliced beef	Positive	36	Insufficient sample
Sliced chicken	Positive	1100	Insufficient sample
Chicken meat	Positive	53	Not detected
Spaghetti noodles (small packet)	Positive	29	Not detected
Spaghetti noodles (Large packet)	Positive	3.6	Not detected
Black pepper sauce	Not detected	<3.0	Not detected
Tomato sauce	Not detected	<3.0	Not detected
Beef sauce	Not detected	<3.0	Not detected
Chicken sauce	Not detected	<3.0	Not detected

*The strain of *Staphylococcus aureus* isolated was found to be enterotoxigenic

Perspectives on influenza vaccination

Introduction[1]

Influenza is caused by a virus that attacks mainly the upper respiratory tract (nose, throat and bronchi and rarely also the lungs). The infection usually lasts for about a week. Symptoms include a sudden onset of high fever, myalgia, headache, severe malaise, non-productive cough, sore throat and rhinitis. The disease is normally self-limiting and most people recover within one to two weeks without requiring any medical treatment. However, influenza poses a serious risk in the very young, the elderly and people suffering from medical conditions such as lung diseases, diabetes, cancer, kidney or heart problem. In these people, the infection may lead to severe complications of underlying diseases, pneumonia and death.

Characterisation of influenza viruses[1, 2]

Influenza viruses belong to the *Orthomyxoviridae* family. The current circulating influenza viruses that cause human diseases are divided into two groups: A and B. Influenza A has 2 subtypes of human importance: A(H3N2) and A(H1N1), the former being associated with higher mortality. Influenza viruses are characterised by 2 different protein components, known as surface antigens. These surface antigens are glycoproteins called haemagglutinin (HA) and neuraminidase (NA) components. The HA and NA antigens are responsible for virus attachments to and penetration into cells, and release of progeny virus from infected cells, respectively. Minor mutations continuously create small changes in

these surface glycoproteins resulting in "antigenic drift". Conversely, "antigentic shifts" involve major changes caused by reassortment of genetic materials from different type A-strains. These changes require close surveillance to advise annual reformulation of vaccines to ensure efficacy.

WHO maintains a global surveillance programme with the cooperation of a network of 112 National Influenza Centres in 83 countries. This network is responsible for monitoring the influenza viruses circulating in humans and rapidly identifying new strains. WHO formulates the annual vaccine recipe targeting the 3 most virulent strains in circulation based on information collected by the network.

Transmission and pandemic potential[2]

Transmission of the influenza virus is by means of infected droplets when infected individuals sneeze or cough. The incubation period ranges from 1-5 days with an average of 2 days and the period of transmission is probably 3-5 days from clinical onsets in adults (up to 7 days in young children).

Influenza spreads rapidly around the world in seasonal epidemics caused by drifted variants of influenza A and B viruses, infecting about 10-20% of the population each season and resulting in considerable economic burden in the form of productivity losses, hospitalisation and other health care costs.

In addition, global pandemics (caused by a new virus subtype due to antigenic shift whereby immunity in the human population does not exist) could occur at unpredictable intervals. Three times in the last century (1918, 1957, 1968), the influenza A viruses have undergone major genetic changes mainly in the H-component, resulting in global pandemics with large tolls in morbidity and mortality. The most severe was the 1918 Spanish Flu which infected 50% of the world's population with an estimated total mortality of between 20 and 40 million.

The sporadic outbreaks in humans due to the highly pathogenic avain influenza virus (HPAI) with potential threat for global pandemics have occurred in 1997, 1999 and 2003 in Hong Kong, and in 2004 in Vietnam and Thailand. Fortunately, there was no person- to- person transmission.

Burden of disease in Singapore

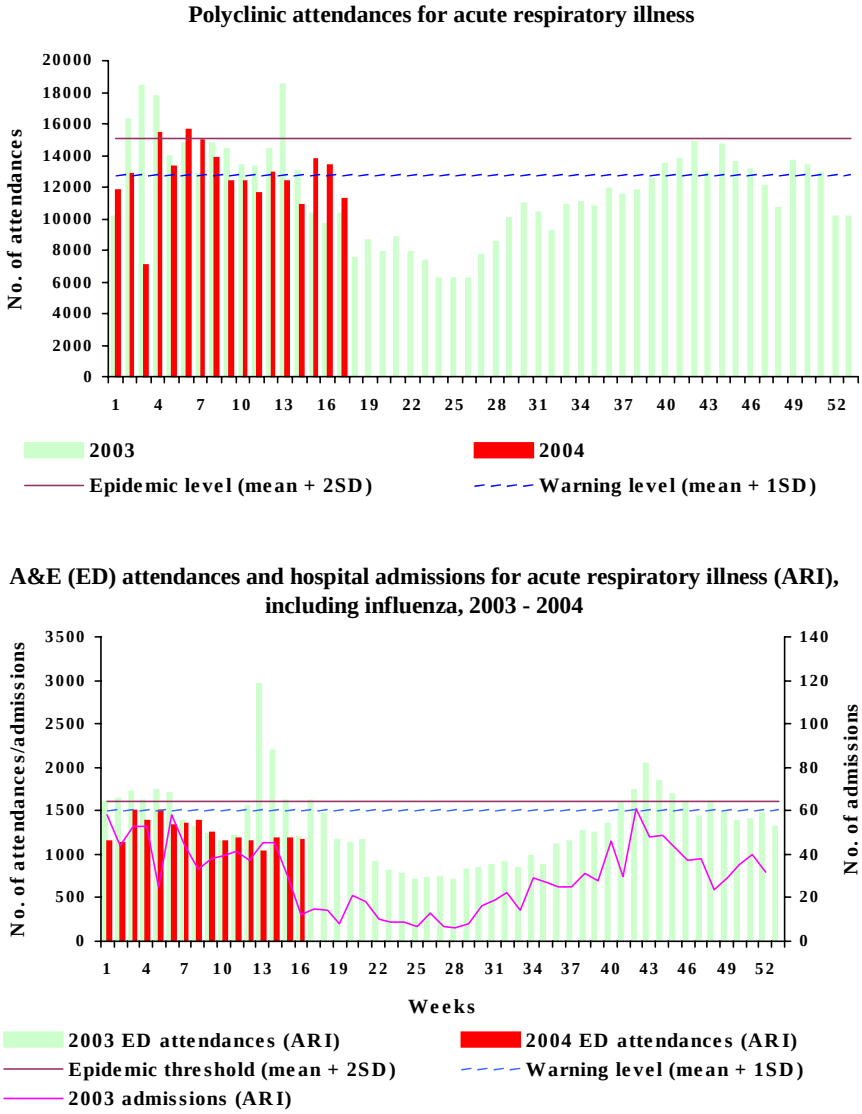
In tropical regions, the virus may cause disease throughout the year, often displaying a biannual pattern. In Singapore, the attendances due to influenza-like illnesses (ILI) were not recorded at the polyclinics. However, based on the trend in the reported number of attendances for acute respiratory illness (ARI), it is possible that the morbidity due to influenza may be throughout the year, consistent with the bimodal-peak pattern (*Fig. 3*).

Prophylaxis: influenza vaccination[2, 3]

The currently available influenza vaccines are effective in preventing influenza-related illness and highly effective in preventing hospitalization and deaths. Vaccination is the principal measure for preventing influenza and reducing the impact of epidemics.

In Singapore, advisories were sent out to all medical practitioners and hospitals advising all workers in healthcare institutions to be vaccinated against influenza. Medical practitioners were also advised to offer influenza vaccination to patients who are at high risk of complications from influenza infection. The groups at risk[4] are:

Figure 3
Morbidity due to acute respiratory illness (ARI), including influenza, 2003 - 2004



- persons aged 65 years and older;
- adults and children who have chronic disorders of the pulmonary or cardiovascular systems, including asthma;
- adults and children who required regular medical follow-up or hospitalization during the preceding year because of chronic metabolic diseases (including diabetes mellitus), renal dysfunction, haemoglobinopathies or immunosup-

pression (including immunosuppression caused by medications or by the human immunodeficiency virus);

- children and teenagers aged 6 months to 18 years who are receiving long-term aspirin therapy and therefore might be at risk for developing Reye's syndrome after influenza infection; and
- women who will be in the second or third trimester of pregnancy during the influenza season.

These preventive measures were intended to reduce the unnecessary alarms caused by influenza-related illnesses during a period of heightened surveillance for a possible resurgence of the severe acute respiratory syndrome (SARS). It is also believed that mass vaccination of high-risk persons would cut down the morbidity and mortality from influenza experienced by this group of persons.

Over the northern hemisphere winter of 2003/2004, Europe and North America experienced a relatively severe influenza season which peaked in late December/early January. Several deaths were reported in children. The severity was exacerbated by a prevailing circulating strain (H3N2 Fujian strain) that was different from the H3N2 strain (Panama-like) contained in the vaccine. Although it appeared that the vaccine strain provided some cross-protection against the Fujian strain, this protection was not complete, and vaccinated persons might still come down with symptoms if infected with the Fujian strain.

Singapore similarly experienced an increase in acute respiratory infections (ARIs) with patients seeking medical advice at polyclinics and general practitioner clinics from October 2003 to February 2004. The numbers exceeded the epidemic threshold in October 2003, and again in February 2004. The Fujian strain was also the prevailing circulating strain in Singapore in late November/December 2003.

Timing and administration of vaccination[3]

In the northern hemisphere, inactivated influenza vaccines are normally administered between October and November, and in the southern hemisphere from March to May.

In general, all healthcare workers and persons at risk of complications from influenza infection should be vaccinated at least once a year, and re-vaccinated within the year if the strain composition of the current influenza vaccine differed from the composition of the preceding vaccine.

The reasons for this are:

a) The unadjuvanted influenza vaccine generally lasts 4-6 months, and antibody titres will gradually drop to below protective level in that period. Re-vaccination would be necessary to ensure ongoing protection against influenza;

b) Protection of high-risk groups to decrease mortality and morbidity from influenza infection, and to reduce the unnecessary alarms and background noise caused by influenza-like illnesses during a period of heightened SARS surveillance.

Re-vaccination with the 2004 southern hemisphere influenza vaccine is encouraged when it becomes available in April 2004, reason being that the vaccine will contain the Fujian strain. The Fujian strain is still circulating, and is likely to be the prevailing strain for the year. The vaccine compositions are shown in *Table 5*.

Table 5

WHO's recommendations for vaccine composition for northern hemisphere 2003-2004, southern hemisphere 2004, and northern hemisphere 2004-2005

Vaccine	Composition	Remarks
Northern hemisphere 2003-2004[5]	• an A/New Caledonia/20/99(H1N1)-like virus • an A/Moscow/10/99(H3N2)-like virus* • a B/Hong Kong/330/2001-like virus**	* The widely used vaccine strain is A/Panama/2007/99. ** Currently used vaccine strains include B/Shandong/7/97, B/Hong Kong/330/2001, B/Hong Kong/1434/2002
Southern hemisphere 2004[6]	• an A/New Caledonia/20/99(H1N1) -like virus • an A/Fujian/411/2002(H3N2) - like virus* • a B/Hong Kong/330/2001-like virus**	* A/Kumamoto/102/2002 and A/Wyoming/3/2003 are egg-grown A/Fujian/411/2002-like viruses. ** Currently used vaccine viruses include B/Shandong/7/97, B/Hong Kong/330/2001, B/Hong Kong/1434/2002. B/Brisbane/32/2002 is also available as a vaccine virus.
Northern hemisphere 2004-2005[7]	• an A/New Caledonia/20/99(H1N1) -like virus • an A/Fujian/411/2002(H3N2)-like virus* • a B/Shanghai/361/2002-like virus**	* The currently used vaccine virus is A/Wyoming/3/2003. A /Kumamoto/102/2002 is also available as a vaccine virus. ** Candidate vaccine viruses include B/Shanghai/361/2002 and B/Jilin/20/2003 which is a B/Shanghai/361/2002-like virus.

References

1. WHO. Influenza Fact Sheet No. 211, revised March 2003

2. WHO. Weekly Epidemiological Record 2002; 77: 229-240

3. WHO. Weekly Epidemiological Record 2000, 75: 281-288

4. Bridges C, Fukuda K, Uyeki TM, et al. *Prevention and Control of Influenza: Recommendations of the Advisory Committee on Immunization Practices. MMWR 2002; 51(RR03): 1-31*

5. WHO. Weekly Epidemiological Record 2003; 78: 58-62

6. WHO. Weekly Epidemiological Record 2003; 78: 375-379

7. WHO. Weekly Epidemiological Record 2004; 79: 88-92

The Epidemiological News Bulletin is published quarterly by the Ministry of Health Singapore

The data in this Bulletin are provisional, based on reports to the Communicable Diseases Division, Ministry of Health. Any comments or questions should be addressed to:

The Editor
Epidemiological News Bulletin
Communicable Diseases Division, Ministry of Health
College of Medicine Building, 16 College Road,
Singapore169854
E-mail : Goh_Kee_Tai@moh.gov.sg
Angela_Chow@moh.gov.sg