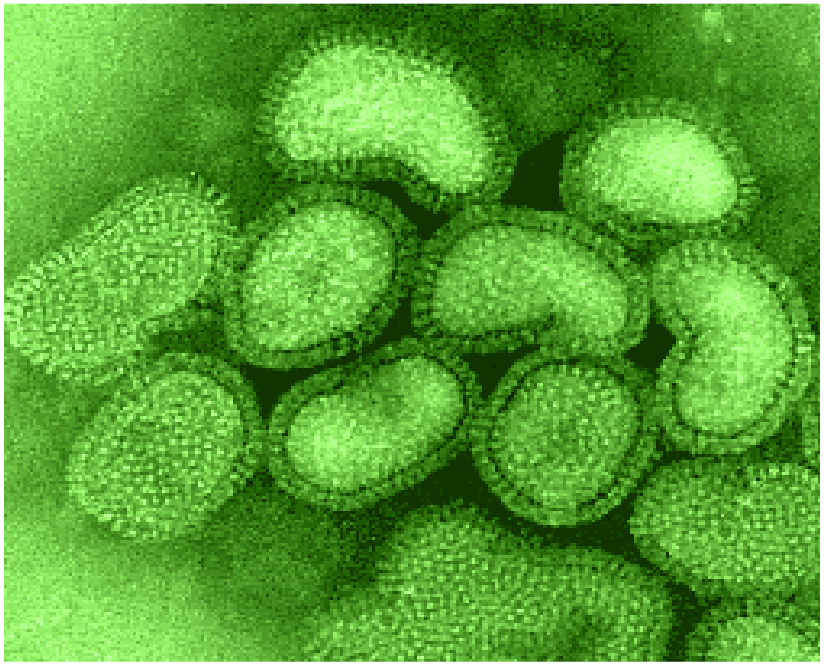
HKIOEH Round Table:

Updates on Human Swine Influenza – Facts and Strategies on Disease Control & Prevention in Occupational Hygiene Perspectives

9 July 2009

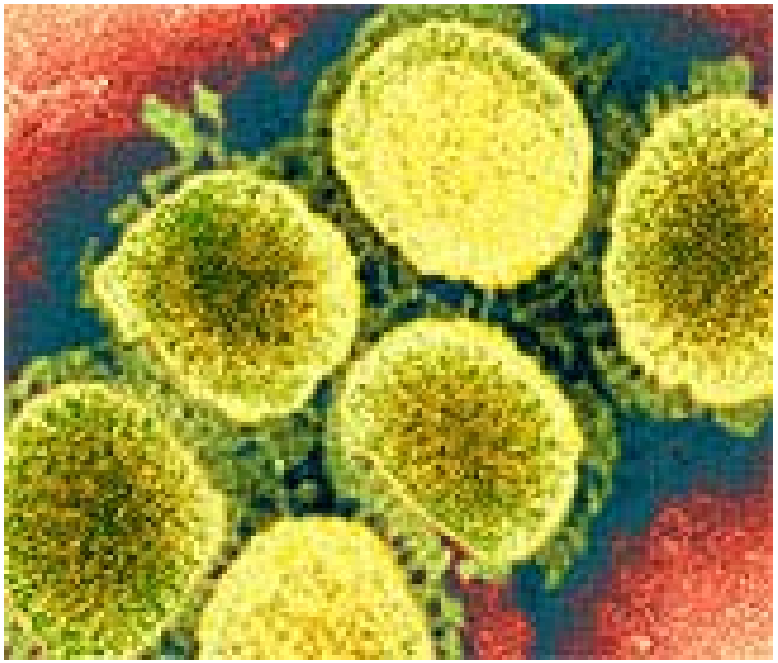
Ralph KY Lee
Honorary Secretary
HKIOEH

Influenza virus



Courtesy Inglis (1992)

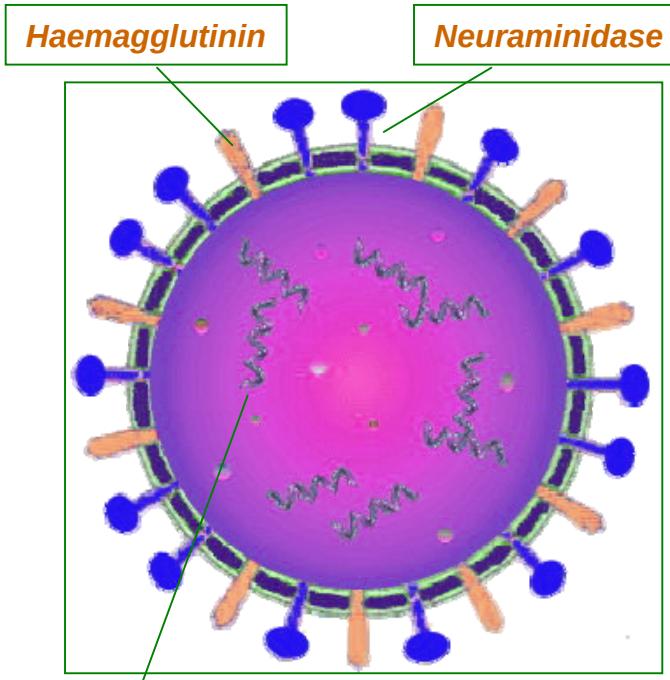
A/H1N1 virus



Courtesy HPA (2009)

Influenza virus

- Orthomyxoviridae
- Spherical virions (80-120nm diameter)
- 2 major antigenic glycoproteins:
  - *Haemagglutinin (HA) (H1-16)*
  - *Neuraminidase (NA) (N1-9)*
- Antigenic Drift
  - Change of genetic material due to lack of proof-reading during replication
  - Responsible for annual epidemic
- Antigenic Shift
  - reassortment and merging of genetic materials from different influenza strains
  - →novel viral subtype, most human lack immunity
  - Responsible for pandemics



The Influenza Virion

Types of Influenza

- Ordinary / Seasonal Influenza
- Pandemic Influenza
  - Occurrence
  - Cause
  - Severity

Common Human Influenza

- Influenza A (H3N2, H1N1)
- Influenza B
- Droplet transmission
- Typical Incubation Period (IP) 2-4 days with average of 2 days
- Symptoms: fever, headache, myalgia, running nose, cough, sore throat, usually subside in 2-7 days)

Swine-Origin Influenza A (H1N1)

- A respiratory disease of pigs regularly causes outbreaks of influenza among pigs
- Influenza virus was first isolated from pigs in 1930
- The H1N1 swine flu viruses are antigenically different from human H1N1 viruses and do not normally infect human
- First isolation of a swine influenza virus from a human occurred in 1974

Human Case of Swine Flu

- From **1958 – 2005**
- **50** cases of apparent zoonotic swine influenza virus infection
- **37** of which involved civilians and **13** of which involved military personnel
- Case-fatality rate of **14%** (7 of 50 persons)
- **61%** reported exposure to swine
- **~ 1/3** had probably or possible person-to-person transmission
- 33/37 (**89%**) H1N1; 4/37 (11%) H3N2

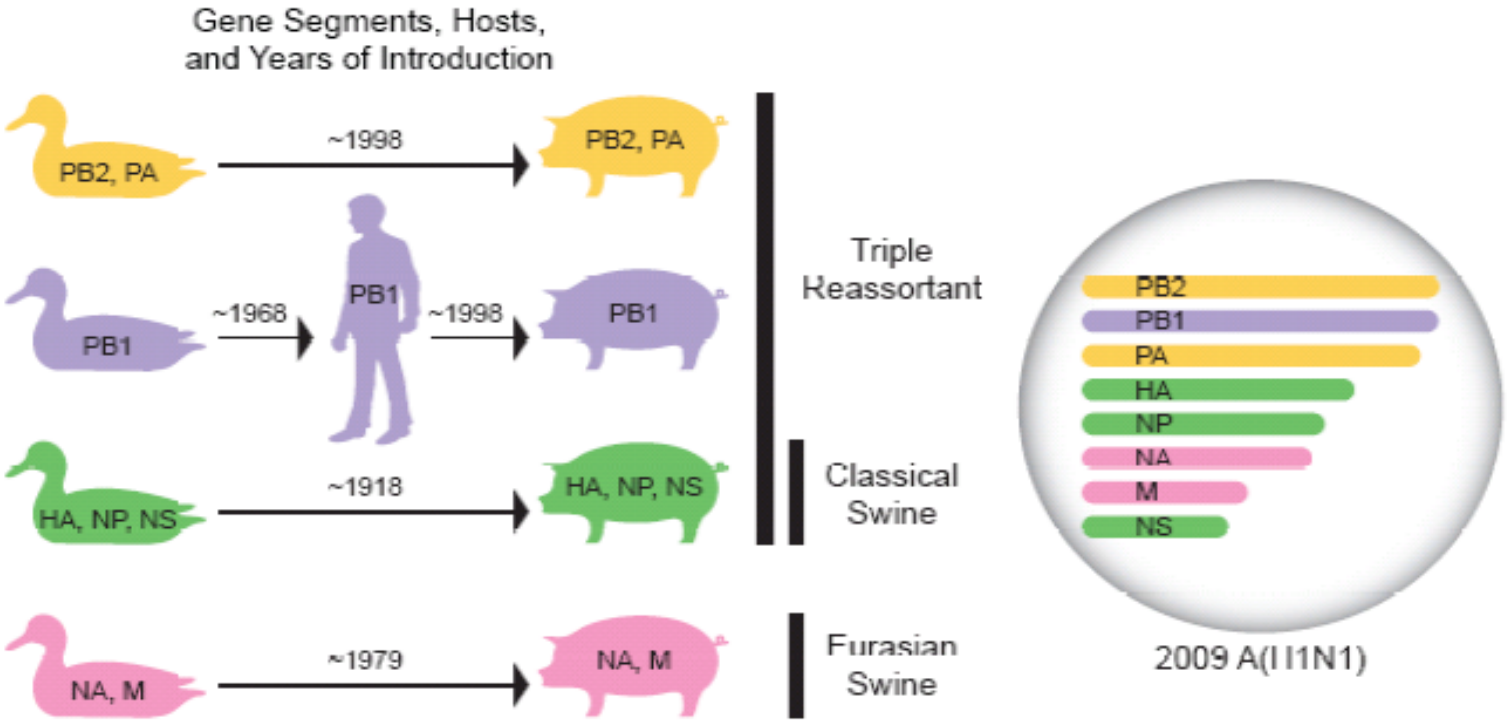
Myers KP, et al. Clin Infect Dis 2007;44:1084–8

Human Case of Swine Flu

- From Dec 2005 to Feb 2009
- **11** cases reported in US
- Triple-reassortant swine influenza A (H1) viruses: Human, Avian, Swine
- Age: 16M to 48y
- 7 male 4 female
- Incubation period: 1-10d, Common 3-4d
- **8** had swine contact, 3 unknown

Myers KP, et al. Clin Infect Dis 2007;44:1084–8

Triple Reassortment



(Garten R et al. Scienceexpress 22 May 2009)

Clinical Features

Symptoms	H1N1 virus[1,2] (n= 175 - 642)	Seasonal flu[3] (n= 2470)	H5N1[4,5] (n= 8 - 108)
Fever	***92-94%***	***68%***	***93-100%***
Cough	***75-92%***	***93%***	32-***100***%
Sputum	42%	NS	30-***76***%
Sore throat	***66-79%***	***84%***	25-***71***%
Diarrhea	25%	NS	7-***70***%
Vomiting	25-33%	NS	7-33%
Nasal congestion	***66%***	***91%***	17-***58***%
Malaise	***78%***	***94%***	NS
Myalgia	***62%***	***91%***	1-***53***%
headache	***77%***	***94%***	6-***100***%
Nausea	NS	NS	13%
Depressed consciousness	3%	NS	8-***50***%
SOB	24%	NS	9-***100***%
Conjunctivitis	15%	NS	NS

NS: Not stated
Red: > 50%

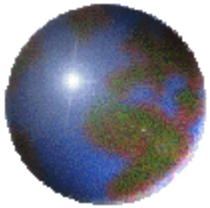
1. *Novel Swine-Origin Influenza A (H1N1) Virus Investigation Team. N Engl J Med 2009;361. Epub ahead of print*
2. *HPA. Euro Surveill 2009;14:1-3*
3. *AS Monto, et al. Arch Intern Med 2000;1603243–3247.*
4. *Kandun IN, et al. Lancet 2008; 372: 744–49.*
5. *The Writing Committee of the WHO Consultation on Human Influenza A/H5. N Engl J Med 2005;353:1374-85.*

Mode of Transmission

- Most likely when in close proximity to infected pigs
  - Human-to-human transmission can occur through coughing or sneezing of people infected
  - By touching something with flu viruses on it and then touching mouth or nose
- Not transmitted by food
- Eating properly handled and cooked pork and pork products is safe

Infectivity and Transmissibility

- Incubation period appears to range from 1 to 7 days
  - Studies of viral shedding to define the infectious period are under way
- Secondary attack rate ~ 22 – 33% (c.f. 5 – 15% for seasonal flu)
- Reproductive ratio in the Mexico < 2.2 – 3.1 (c.f. 2 – 5 in 1918 pandemic, 1.3 for seasonal flu); may increase in successive wave(s) of spread



Global Situation

Global Situation

- WHO named the virus as **influenza A (H1N1) virus**
  - [N.B. the term human swine influenza (HSI) is used in HK to ease communication]
- WHO declared the **pandemic (i.e. phase 6)** on 11 June 2009.
- According to WHO (as of 09:00 GMT, 7 July 2009), 94512 **cases** of confirmed HSI were reported, including 429 **deaths**.

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

26 April 2009: 2 countries, reporting 38 cases

Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

27 April 2009: 4 countries, reporting 73 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

28 April 2009, 19:15 GMT: 7 countries, reporting 105 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

29 April 2009, 18:00 GMT: 9 countries, reporting 148 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

30 April 2009, 17:00 GMT: 11 countries, reporting 257 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

01 May 2009, 23:30 GMT: 13 countries, reporting 367 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

02 May 2009, 18:00 GMT: 16 countries, reporting 658 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

03 May 2009, 16:00 GMT: 18 countries, reporting 898 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

04 May 2009, 18:00 GMT: 21 countries, reporting 1085 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

06 May 2009, 16:00 GMT: 23 countries, reporting 1893 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

07 May 2009, 18:00 GMT: 24 countries, reporting 2371 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

08 May 2009, 16:00 GMT: 25 countries, reporting 2500 cases

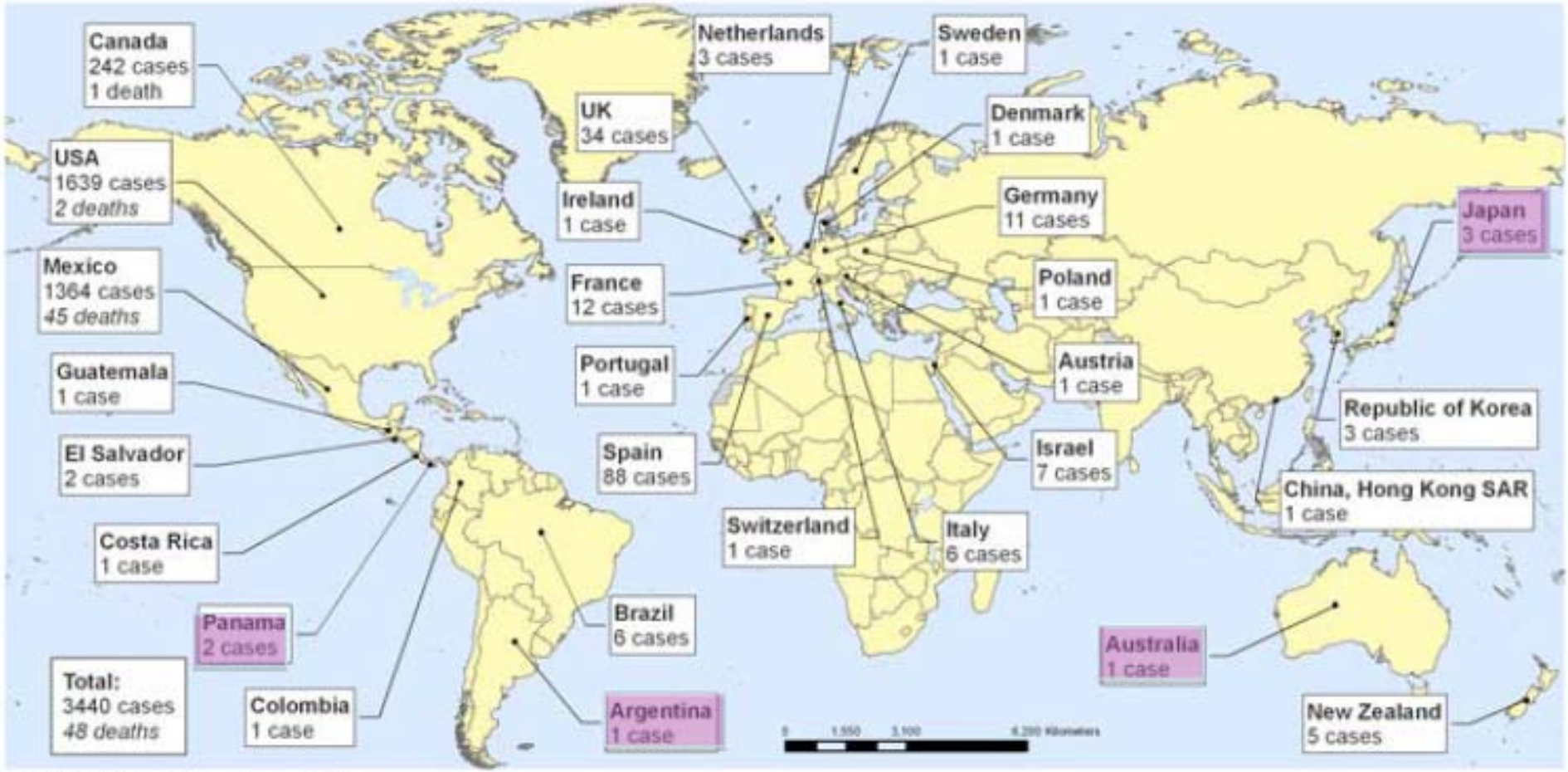
Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

09 May 2009, 06:00 GMT: 29 countries, reporting 3440 cases

Previous Next



World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

11 May 2009, 06:00 GMT: 30 countries, reporting 4694 cases

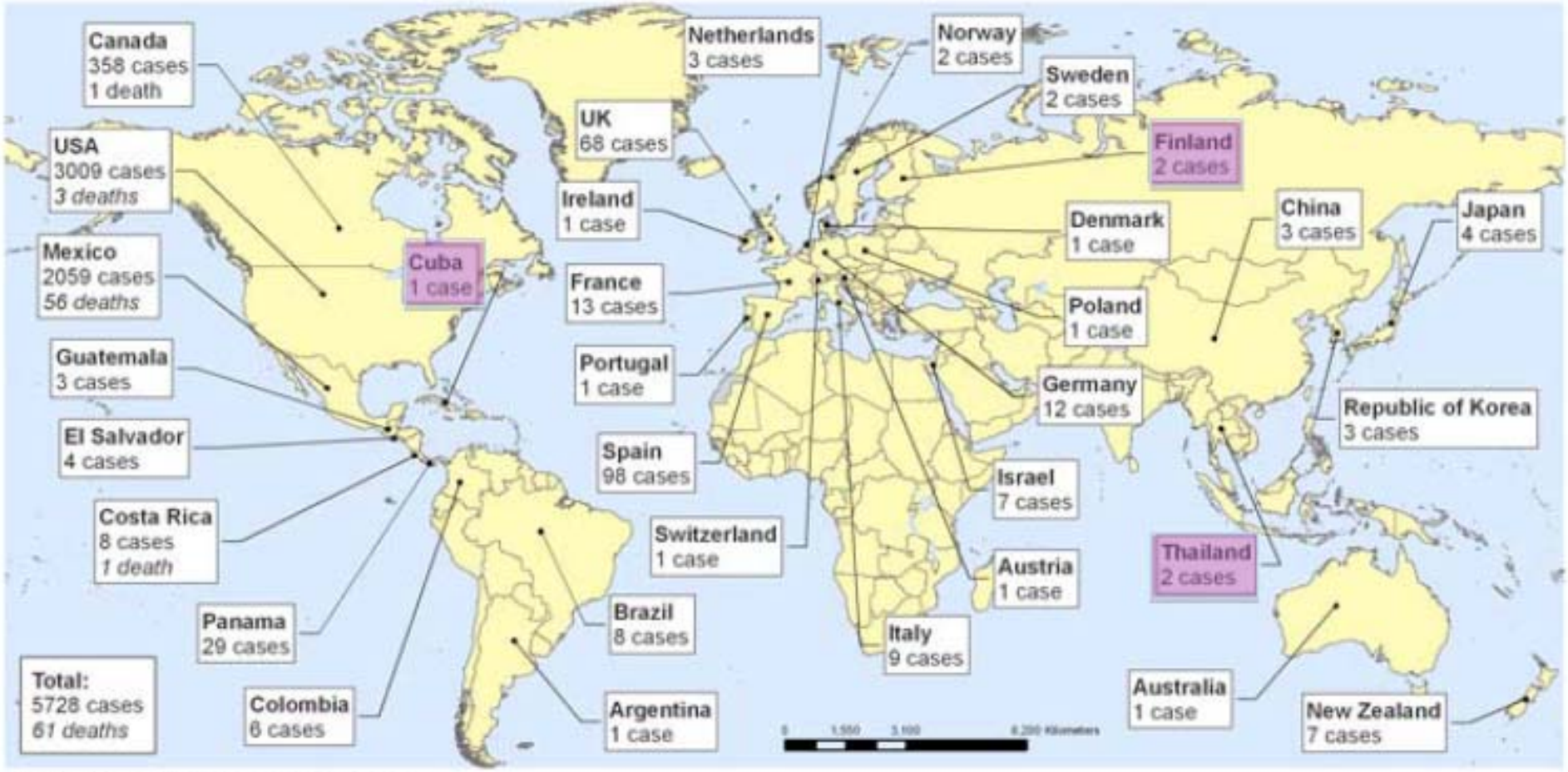
Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

13 May 2009, 06:00 GMT: 33 countries, reporting 5728 cases

Previous Next

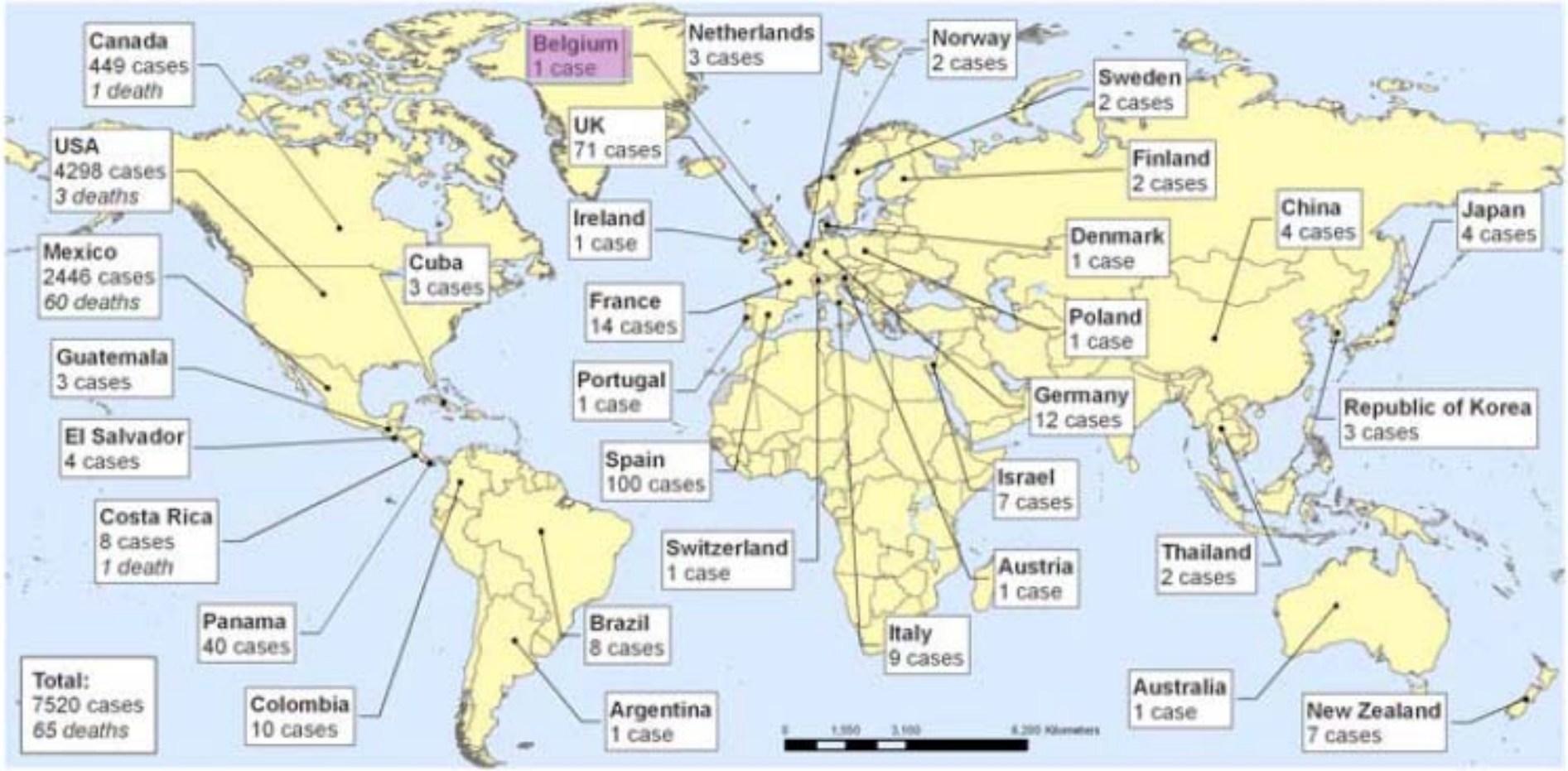


World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

15 May 2009, 06:00 GMT: 34 countries, reporting 7520 cases

Previous Next



World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

20 May 2009, 06:00 GMT: 41 countries, reporting 10 243 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

22 May 2009, 06:00 GMT: 42 countries, reporting 11 168 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

25 May 2009, 06:00 GMT: 46 countries, reporting 12 515 cases

Previous Next

World Health Organization

Timeline of influenza A(H1N1) cases
Laboratory confirmed cases and deaths
As reported to WHO

27 May 2009, 06:00 GMT: 48 countries, reporting 13 398 cases

Previous

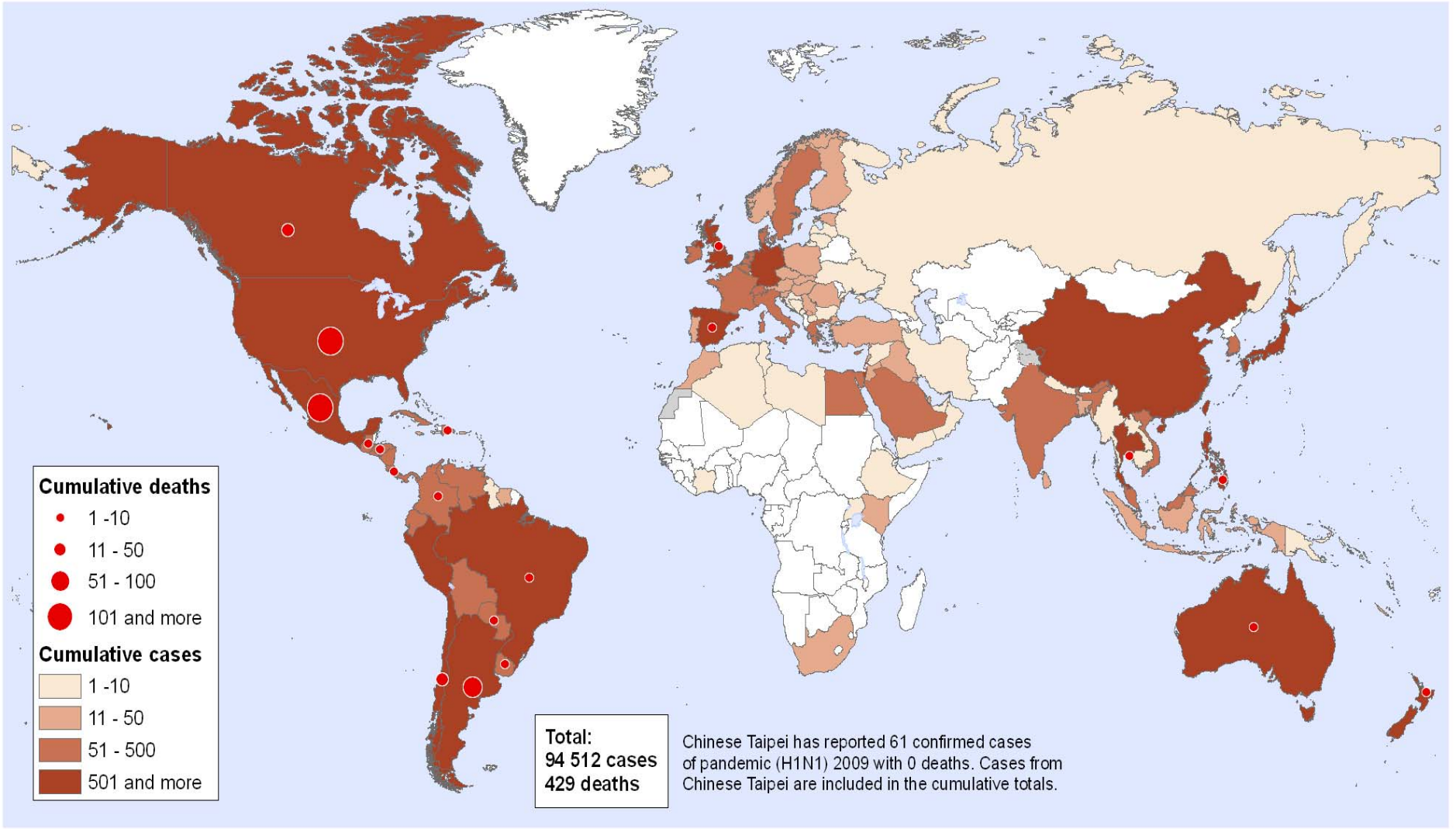
New Influenza A (H1N1),
Number of laboratory confirmed cases as reported to WHO

Status as of 15 June 2009
06:00 GMT

Name of Influenza events	Date	Deaths	Case fatality rate	Subtype
Asiatic (Russian) Flu	1889-1890	1 million	?	Possible H2N2
1918 Spanish flu	1918-1920	20-40 million	*> 2.5%*	H1N1
Asian flu	1957-1958	1-1.5 million	*0.1-0.5%*	H2N2
Hong Kong flu	1968-1969	0.75-1 million	*0.1-0.5%*	H3N2
Avian flu	1997-2009	262	*60.5%*	H5N1

Pandemic (H1N1) 2009, Number of laboratory confirmed cases as reported to WHO

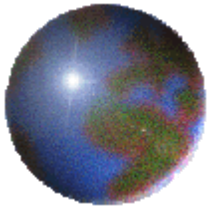
Status as of 06 July 2009 09:00 GMT



Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization

Map produced: 06 July 2009 09:00 GMT

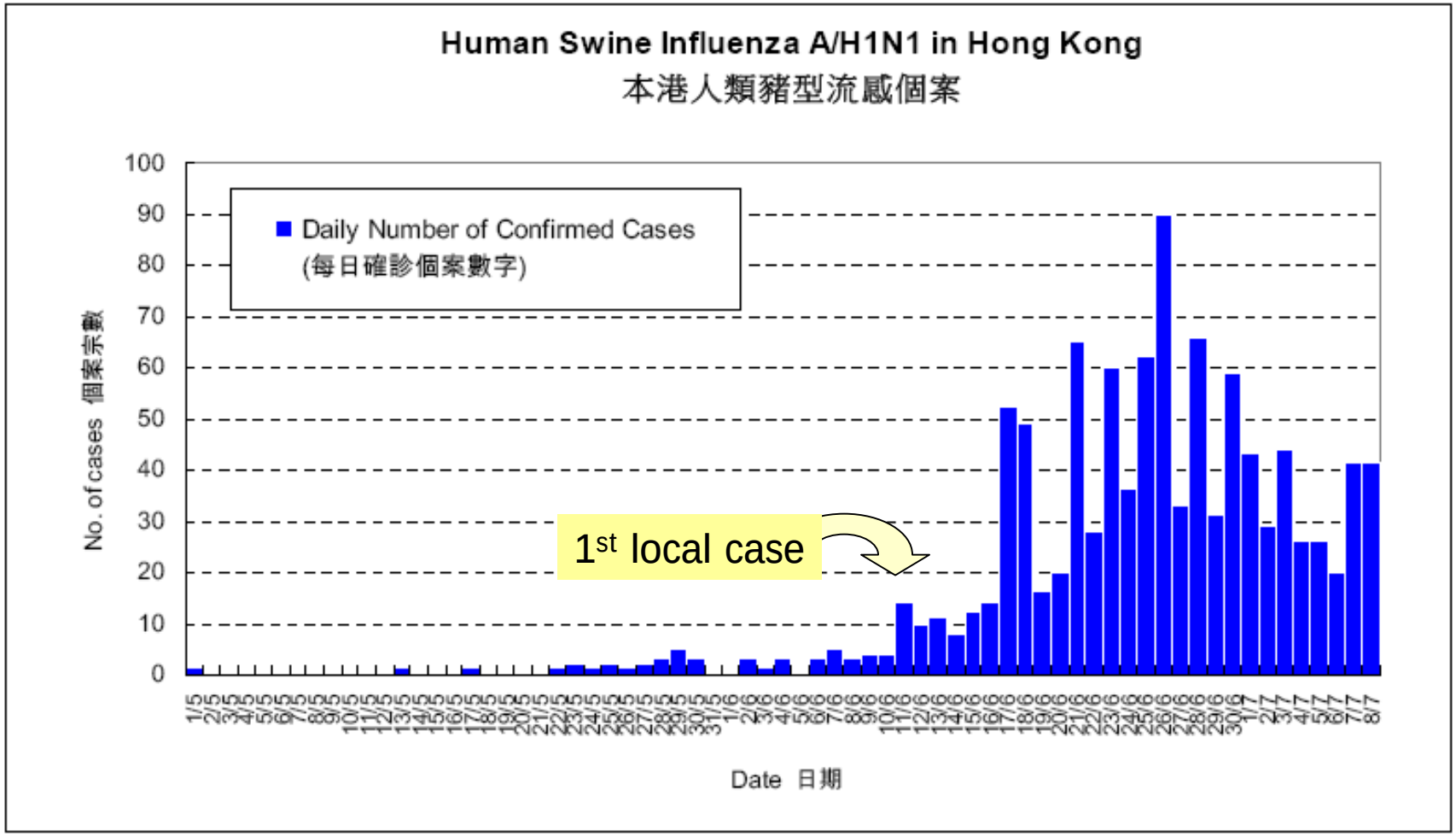


Daily Update of Local Situation
As of 2:30 pm, 8 July 2009

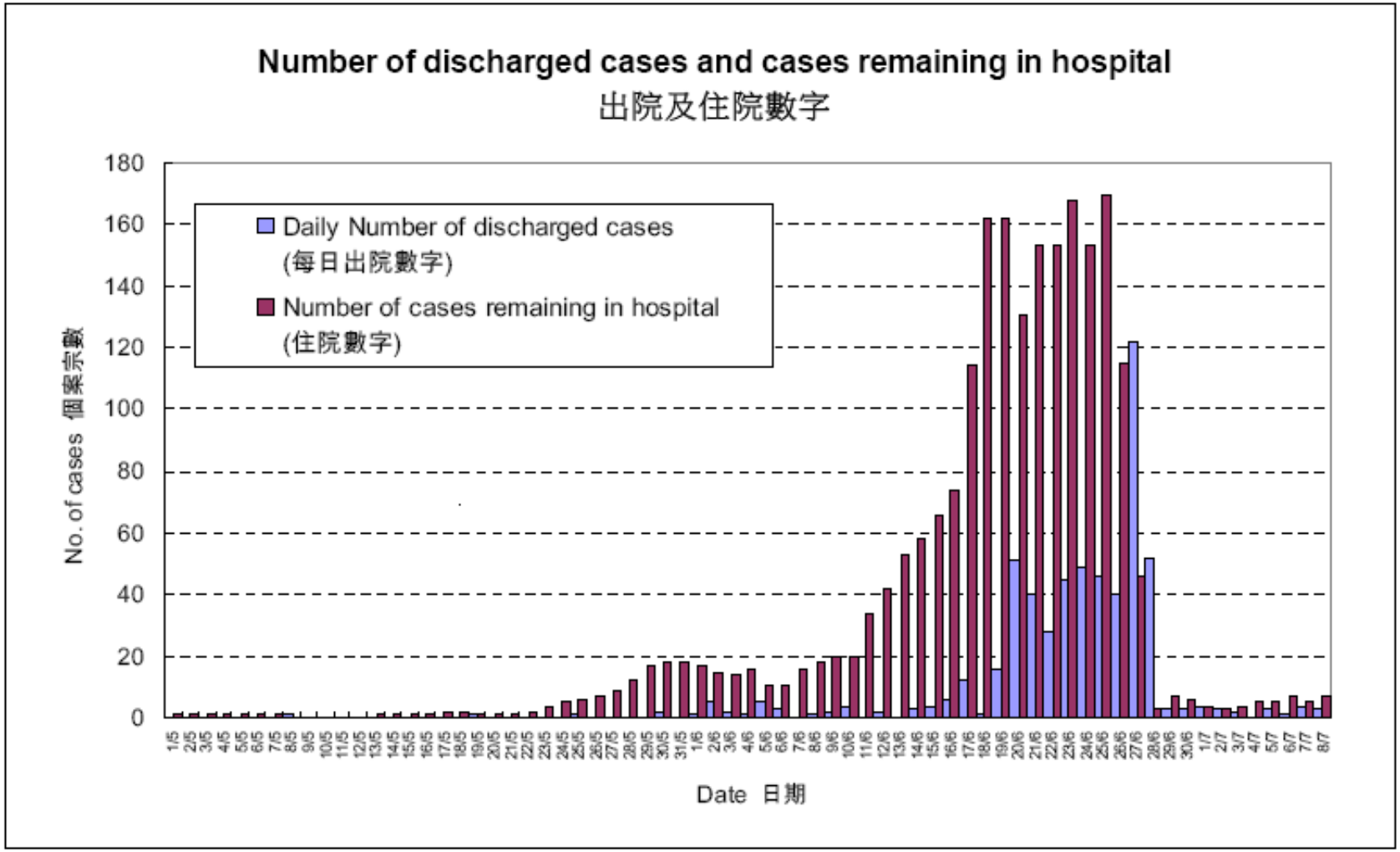
Situation in Hong Kong

- The Emergency Response Level under the Government's Preparedness Plan for Influenza Pandemic is activated.
- There have been 1055 confirmed cases of human swine influenza (Influenza A/H1N1) since the first case was diagnosed on 1 May 2009.

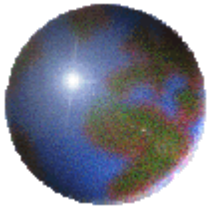
- The cumulative number of patients tested positive for swine influenza is 1055
- On 7 July 2009, 41 patients tested positive for swine influenza.
- As at 2:30 pm 8 July 2009, a total of 584 cases have been discharged and 7 cases are still in hospital
- None required intensive care and there were no fatal cases.


Human Swine Influenza A/H1N1 in Hong Kong
本港人類豬型流感個案
Daily Number of Confirmed Cases
(每日確診個案數字)
No. of cases 個案宗數
Date 日期
1st local case

(CHP, 2009)


Number of discharged cases and cases remaining in hospital
出院及住院數字
Daily Number of discharged cases
(每日出院數字)
Number of cases remaining in hospital
(住院數字)
No. of cases 個案宗數
Date 日期

(CHP, 2009)



What is Pandemic?

Endemic

- stable pattern of occurrence of the disease.

Epidemic

- occurrence of the disease greatly in excess of the expected rate.

Pandemic

- worldwide spread of a disease, outbreaks or epidemics occurring in many countries & in most regions of the world

Previous Influenza Pandemics

Year	Subtype	Source	Result
1918	H1N1 Spanish Flu	Swine & Birds	40–50 million death
1957	H2N2 Asian Flu	Human & Birds	>2 million excess mortality
1968	H3N2 Hong Kong Flu	Human & Birds	1 million excess mortality

Prerequisites for the start of flu pandemic

1. Emergence of new Haemagglutinin subtype of influenza A virus
2. General population have no or little immunity
3. Cause human disease in a high proportion of people infected
4. Efficient human to human transmission

Local Response Plan

Hong Kong Government Response Systems

- The Government's plan includes a three-level response system:
  - Alert Response Level
  - Serious Response Level
  - Emergency Response Level
- Basing on different risk-graded epidemiological scenarios relevant to Hong Kong
- Designed to match with the World Health Organization (WHO)'s guideline for pandemic influenza planning.

Alert Response Level

- Alert Response Level depicts the scenarios of confirmation of highly pathogenic avian influenza (HPAI) outbreaks in poultry populations **outside** Hong Kong; confirmation of HPAI **in** Hong Kong in imported birds in quarantine, in wild birds, in recreational parks, in pet bird shops or in the natural environment.
- Upon the advice of the Director of Agriculture, Fisheries and Conservation (DAFC), the Secretary for Food and Health (SFH) will activate this Response Level.

Alert Response Level (Con't)

- Another scenario depicts confirmation of human case(s) of avian influenza **outside** Hong Kong.
- SFH will activate this Response Level upon the advice of Director of Health (DoH).

Serious Response Level

- Serious Response Level depicts two possible scenarios:
  - The first scenario depicts confirmation of HPAI outbreaks in the environment of *or* among poultry population in retail markets, wholesale markets or farms **in** Hong Kong due to a strain with known human health impact. Upon the advice of DAFC or Director of Food and Environmental Hygiene, SFH will activate this Response Level.

Serious Response Level (Con't)

- The second scenario depicts the confirmation of human case(s) of avian influenza **in** Hong Kong **without** evidence of efficient human-to human transmission. Upon the advice of DoH, SFH will activate this Response Level.

Emergency Response Level

- Emergency Response Level depicts two possible scenarios:-
  - In the first scenario:-
    - There is evidence confirming efficient human-to-human transmission of **novel influenza** occurring overseas or in Hong Kong.
    - Efficient human-to-human transmission is defined as the ability of the virus to readily spread from person to person in the general population and cause multiple outbreaks of disease leading to epidemics.

- Clear evidence of human-to-human spread in the general population may be inferred when secondary cases result from contact with an index case, with at least one outbreak lasting over a minimum 2-week period in one country.

- The second scenario under Emergency Response Level is **pandemic influenza**.
  - The declaration of pandemic comes from WHO means the influenza strain is beginning to cause several outbreaks in at least one country, and spread to other countries, with consistent disease patterns indicating serious morbidity and mortality is likely in at least one segment of the population.

Risk Assessment…

- Increasing number of cases in many countries
- Based on the situation in Hong Kong
  - The virus has been widely circulating in Hong Kong and has become the dominant strain of influenza virus
    - Relatively mild disease
    - No report of severe / fatal case so far
  - No evidence for large-scale environmental transmission
- rate of evolution of human swine influenza virus no faster than other influenza virus

- The virus is sensitive to both oseltamivir and zanamivir
- Globally, most cases have been mild
- Vast majority of cases in all countries have occurred among adolescents and young adults
- Secondary household attack rates of new influenza A (H1N1) range from 22% to 33% (The rates of secondary attack of seasonal influenza range from 5% to 15%)

Monthly consultation rates of influenza-like illness reported by General Out-patient Clinics (GOPC) and General Practitioners (GP) 2008

Month	Rate (per 1000 consultations)	
	GOPC	GP
Jan	3.8	47.0
Feb	6.9	48.5
Mar	8.6	64.2
Apr	3.7	45.0
May	3.0	44.6
Jun	3.3	43.2
Jul	4.8	43.7
Aug	3.7	37.8
Sep	3.4	38.2
Oct	3.4	34.2
Nov	3.8	34.3
Dec	3.1	31.2

Data Courtesy: CHP

Monthly consultation rates of influenza-like illness reported by General Out-patient Clinics (GOPC) and General Practitioners (GP) 2009

Month	Rate (per 1000 consultations)	
	GOPC	GP
Jan	4.7	34.3
Feb	5.8	49.8
Mar	3.8	37.3
Apr	2.8	37.4
May	3.4	40.0
Jun		
Jul		
Aug		
Sep		
Oct		
Nov		
Dec		

Data Courtesy: CHP

Monthly summary tables of influenza virus isolation 2009

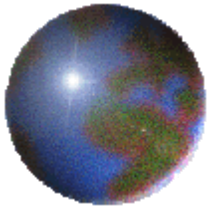
Month	No. of specimens	No. of Isolates					
		A				B	C
		H3N2	H1N1	H5N1	H9N2		
Jan	3643	101	444	0	0	43	1
Feb	4108	162	883	0	0	24	2
Mar	3695	92	228	0	0	48	0
Apr	3388	45	45	0	0	27	0
May							
Jun							
Jul							
Aug							
Sep							
Oct							
Nov							
Dec							
Total	**14834**	**400**	**1600**	**0**	**0**	**142**	**3**

Data Courtesy: CHP

However…WHO cautions

- New diseases (especially when the causative agent is an influenza virus) are often poorly understood when they emerge
- The same virus that causes mild illness in one country can result in much higher morbidity and mortality in another
- The inherent virulence of the virus can change over time as the pandemic goes through subsequent waves of national and international spread.

Continuous assessment with more understanding of the disease required



Strategies of Local Government

Public Health Strategies

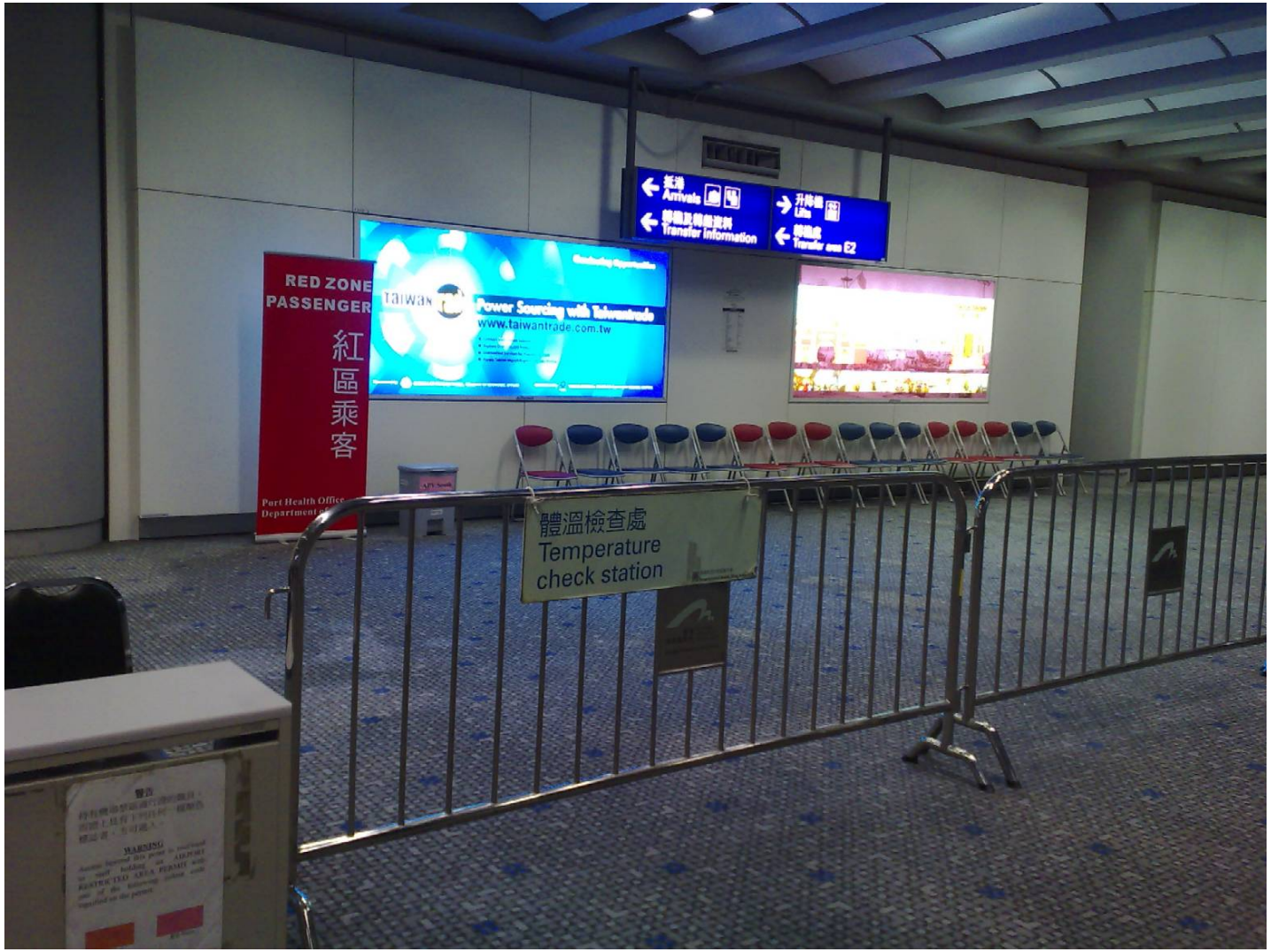
- Community spread of human swine influenza and the virus has been widely circulating locally
- Moving from the containment phase into the mitigation phase of our strategy
- Aim at relieving disease burden through hygiene measures, social distancing, medical resource mobilization, self-care and other measures.
- Continue to refine the strategy and measures based on latest knowledge and risk assessment to make it sustainable

- Implementation of mitigation measures depends on Epidemic progression
  - Disease severity (indicated by proportion of those infected with complications, requiring hospitalization and case fatality)
  - Burden to medical services, resource capacity
  - Effectiveness of containment
  - Broader considerations in the community

Mitigation measures employed at present

- Activation of 8 Designated Flu Clinics for managing patients with fever and influenza-like illnesses (ILI)
  - Priority would be given to pregnant women, those aged two or below, and high risk groups
  - Tamiflu would only be given to ILI patients with chronic diseases or in immuno-compromised states
- New hospital admission criteria
  - Based on clinical conditions of patients
  - Confirmed patients with mild symptoms would not be required for admission and would be provided with symptomatic treatment

- Focus epidemiological investigations on severely ill patients as well as outbreaks involving schools and institutions
  - Contact tracing for individual cases no longer necessary
- Port health measures
  - Temperature screening, health declarations and broadcast of health messages at the control points would remain unchanged
  - Starting June 29, travelers with mild symptoms and intercepted at all boundary control points would be provided with face mask and guidance notes for seeking medical consultation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Port Health Office
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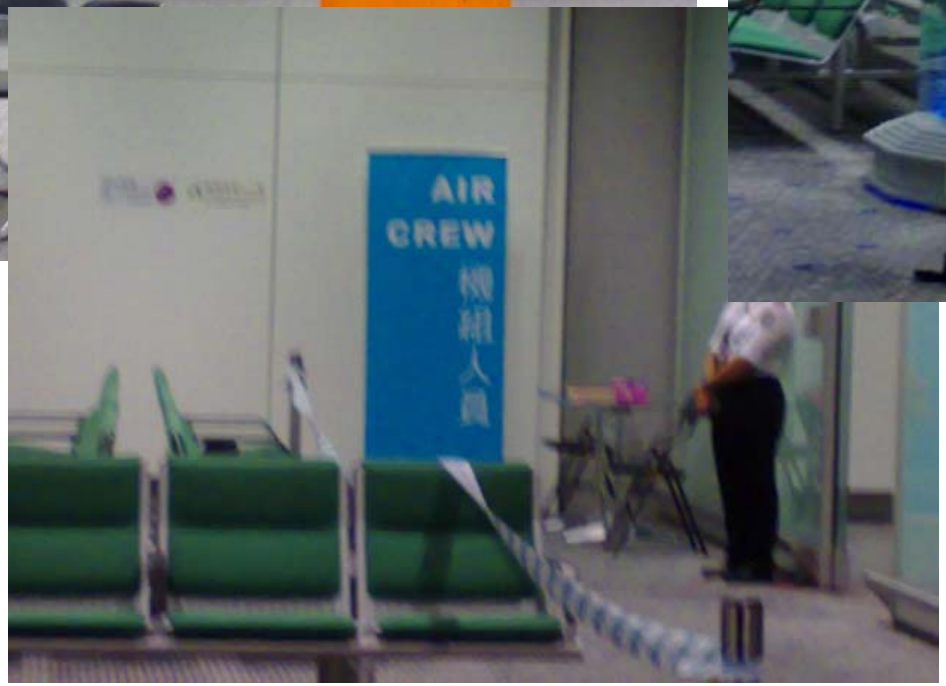
Taiwan
Power Sourcing with Taiwantrade
www.taiwantrade.com.tw
Arrivals
Transfer information
Transfer area E2
體溫檢查處
Temperature
check station
WARNING


EXIT
港口檢疫站
Health Post


ORANGE ZONE
PASSENGER
橙區乘

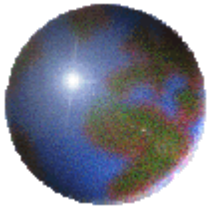

YELLOW ZONE
PASSENGER
黃區乘客


AIR
CREW

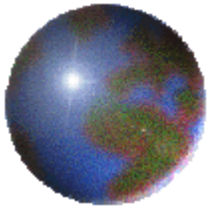
- Class suspension / early summer breaks for
  - All primary schools, kindergartens, child-care centres and special schools
  - Secondary schools with confirmed case(s)
- Active promotion and adoption of basic measures on personal and environmental hygiene.
- To further step up the cleansing and environmental hygiene efforts of the community.

Vaccine Strategies

- When available, provision of human swine influenza vaccines for
  - healthcare workers in both the public and private sectors
  - Children aged > 6 months and below 6 years old
  - Elderly persons aged > 65; and
  - Persons at higher risk of death and complications from human swine influenza due to pre-existing medical conditions
    - Give elderly aged > 65 pneumococcal and seasonal influenza vaccines for free



What's our role as occupational health and hygiene practitioners?



To be continued…
Stay tuned!