

EPIDEMICS!

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Definitions

- **Epidemic** is the occurrence of more cases of a disease than would be expected in a community or region during a given time period.
- **Pandemic** is a worldwide epidemic that according to the WHO has to meet 3 conditions.
 - 1.) The infection causes serious infection in humans.
 - 2.) Humans do not have immunity to the microbe.
 - 3.) The infection spreads easily from person to person and survives within humans.

Organism

- New or modified.
- Transmission.
- Infectious dose.
- Environmental conditions eg survival, a/b pressure.

Host Factors

- Lack of Immunity
- Travel
- Hygiene
- Crowding

Epidemiology

- Study of the behaviour of the disease in the population.
- General ie usual
- What is happening locally.
- Who, What, Why, Where and How?
- Need this information for interventions.
- Focus on diagnosis, transmission, immunity, treatment.

Disease Factors

- Incubation period.
- Known means of transmission (not always clear at the start)
- How long is patient infectious for ?
- Is there treatment/clearance or test required?

Transmission: small and large droplets



Recent Epidemics

- SARS
- Influenza
- Norovirus
- MDROs



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Location: [WHO](#) > [WHO Sites](#) > [CSR Home](#) > [Disease Outbreak News](#)

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Acute respiratory syndrome in Hong Kong Special Administrative Region of China/ Viet Nam

12 March 2003

Disease Outbreak Reported

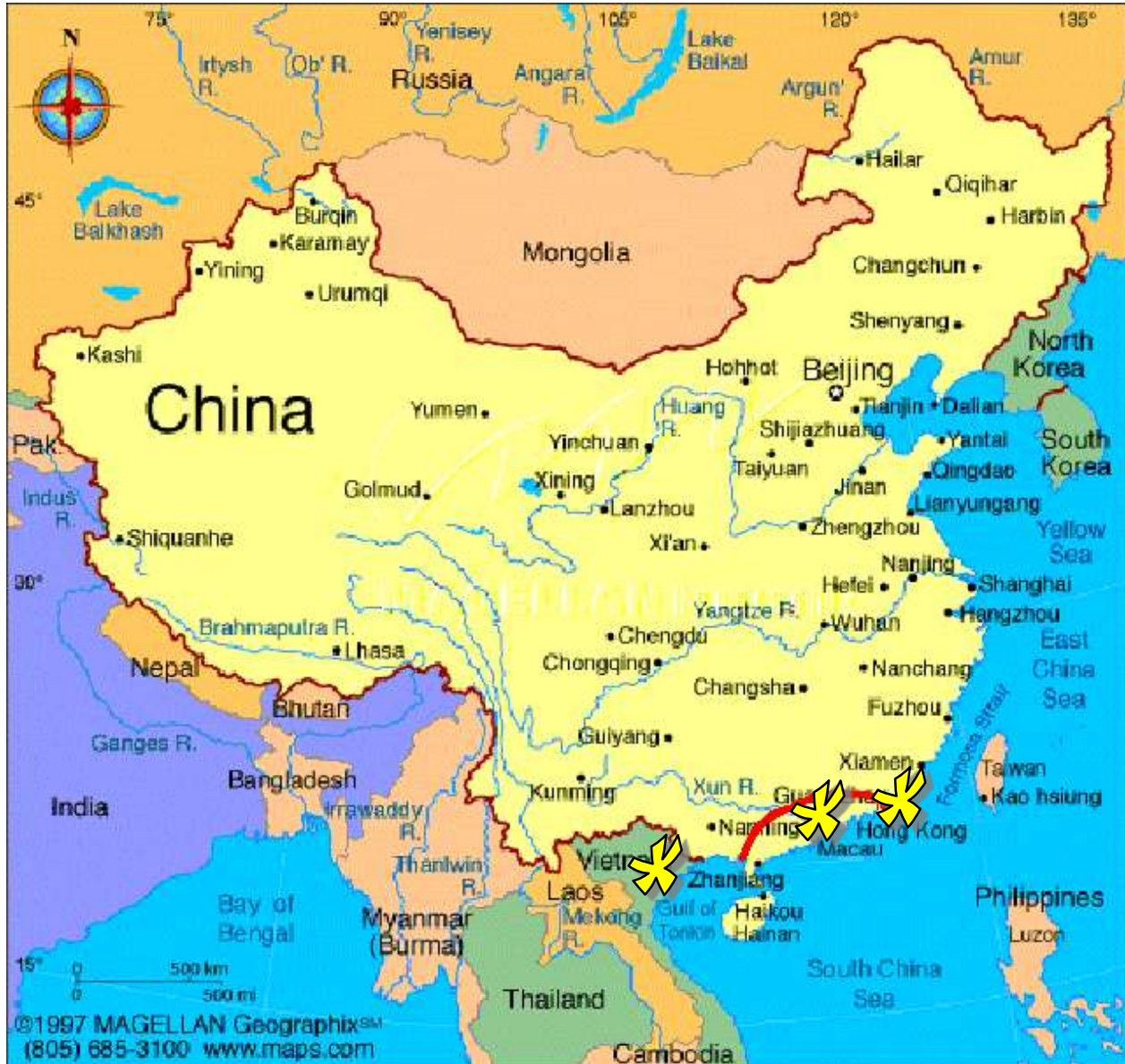
PRESS RELEASE ISSUED BY WHO
12 March 2003

WHO issues a global alert about cases of atypical pneumonia

Cases of severe respiratory illness may spread to hospital staff

12 March 2003 | GENEVA -- Since mid February, WHO has been actively working to confirm reports of outbreaks of a severe form of pneumonia in Viet Nam, Hong Kong Special Administrative Region (SAR), China, and Guangdong province in China.





SARS: WHO Case Definition

Suspected case

- high fever (>38 degrees C)
- **AND** cough, shortness of breath, difficulty breathing
- **AND** within 10 days of onset

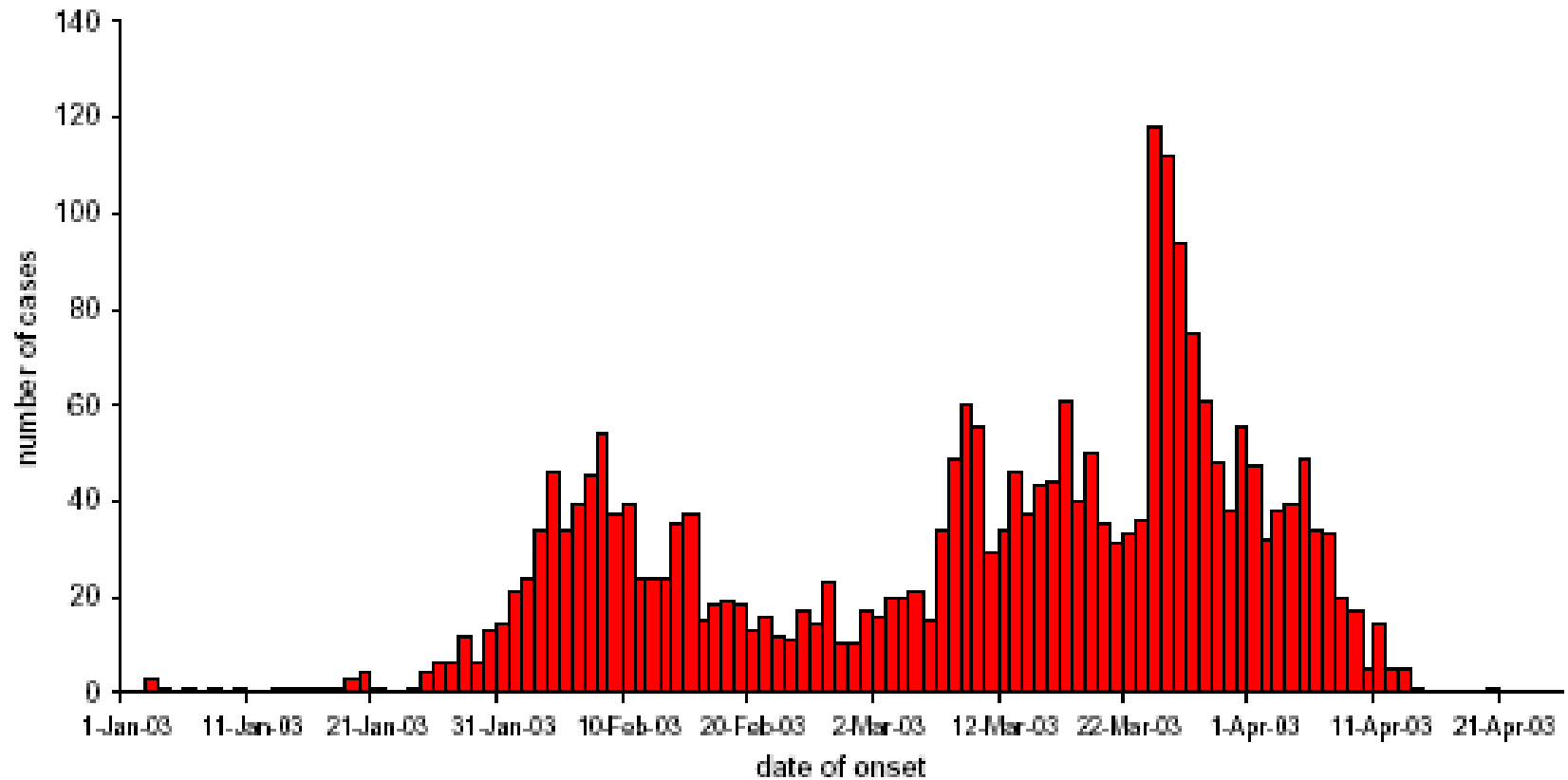
close contact with a person diagnosed with SARS or travel within 10 days to area with documented or suspected community transmission of SARS

- **Close contact** is defined as having cared for, lived with, or had direct contact with respiratory secretions or body fluids of a person with SARS.

Probable case

- interstitial shadowing or pneumonia in chest radiograph

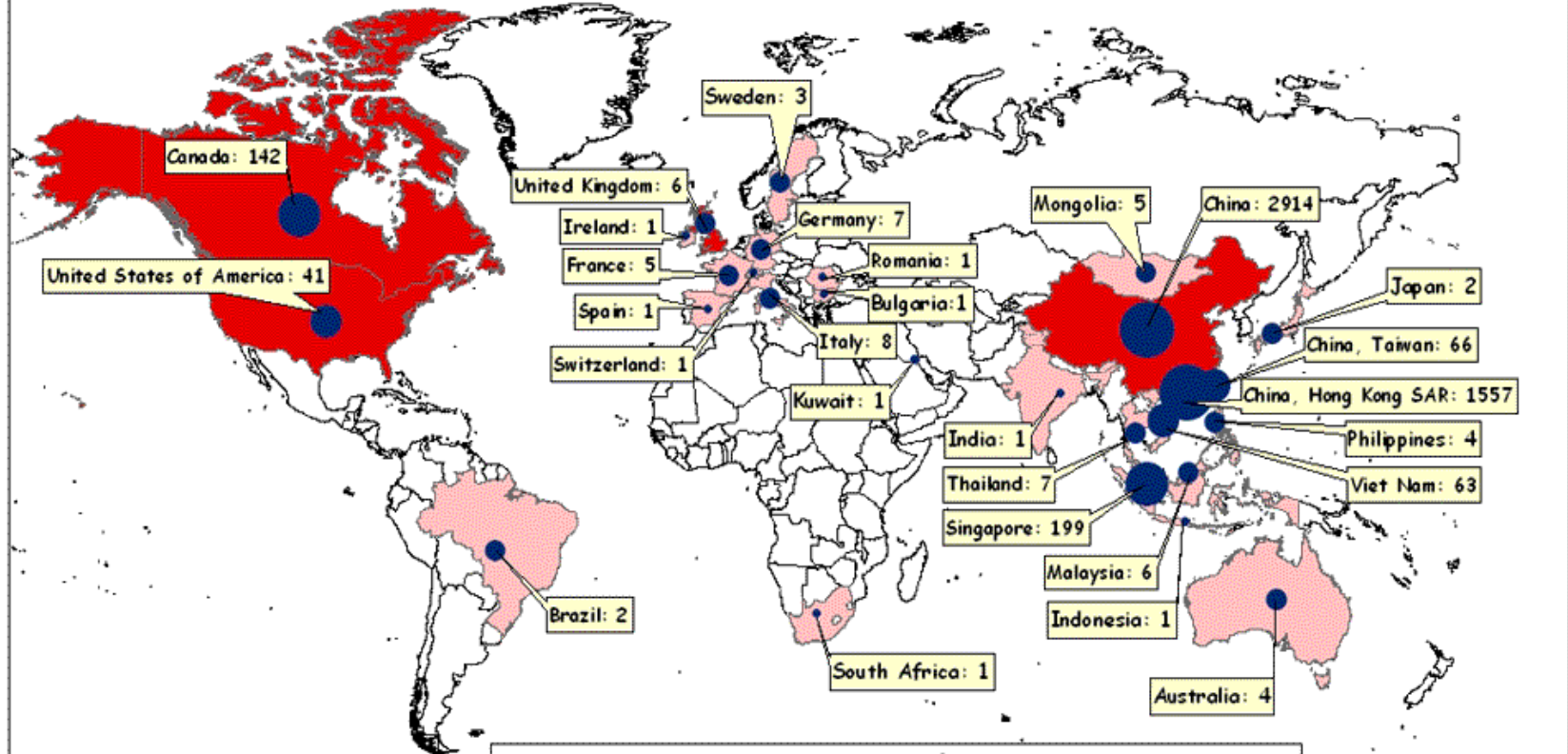
Probable cases of SARS by date of onset
 Worldwide (n=2,563*)
 1 January - 22 April 2003




* Excludes 1,725 reported probable cases with no available dates of onset as of 23 April 2003.

SARS : Cumulative Number of Reported Probable Cases

Total number of cases: 5050 as of 28 April 2003, 17:00 GMT+2



Cumulative number of Reported Cases (From 1 November 02 to 28 April 03)		Type of transmission			
•	1	● (small)	101 - 1000	■ (pink)	no local transmission
● (small)	2 - 10	● (medium)	> 1000	■ (red)	local transmission
● (medium)	11 - 100	● (large)			

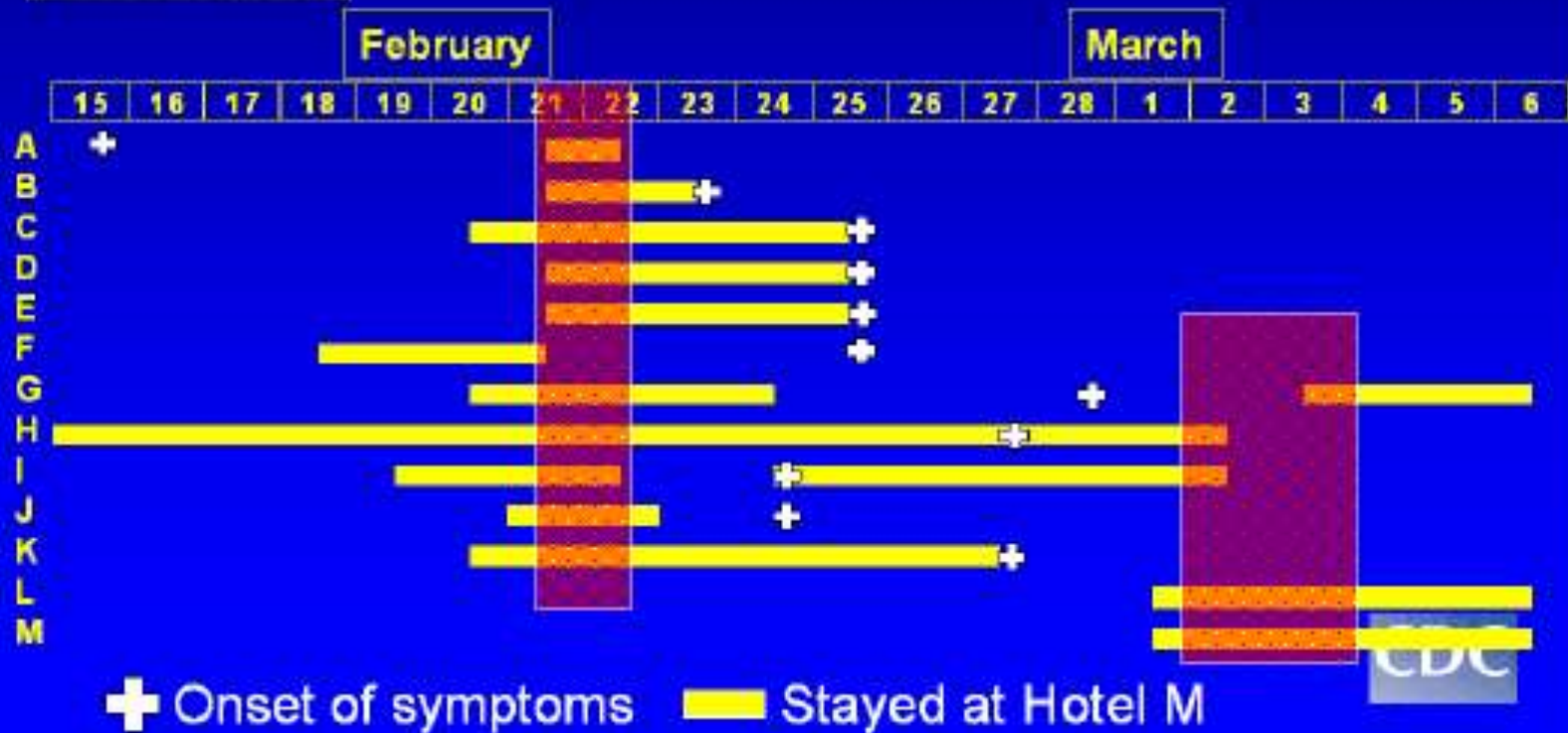


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Data Source: World Health Organization
 Map Production: Public Health Mapping Team
 Communicable Diseases (CDS)
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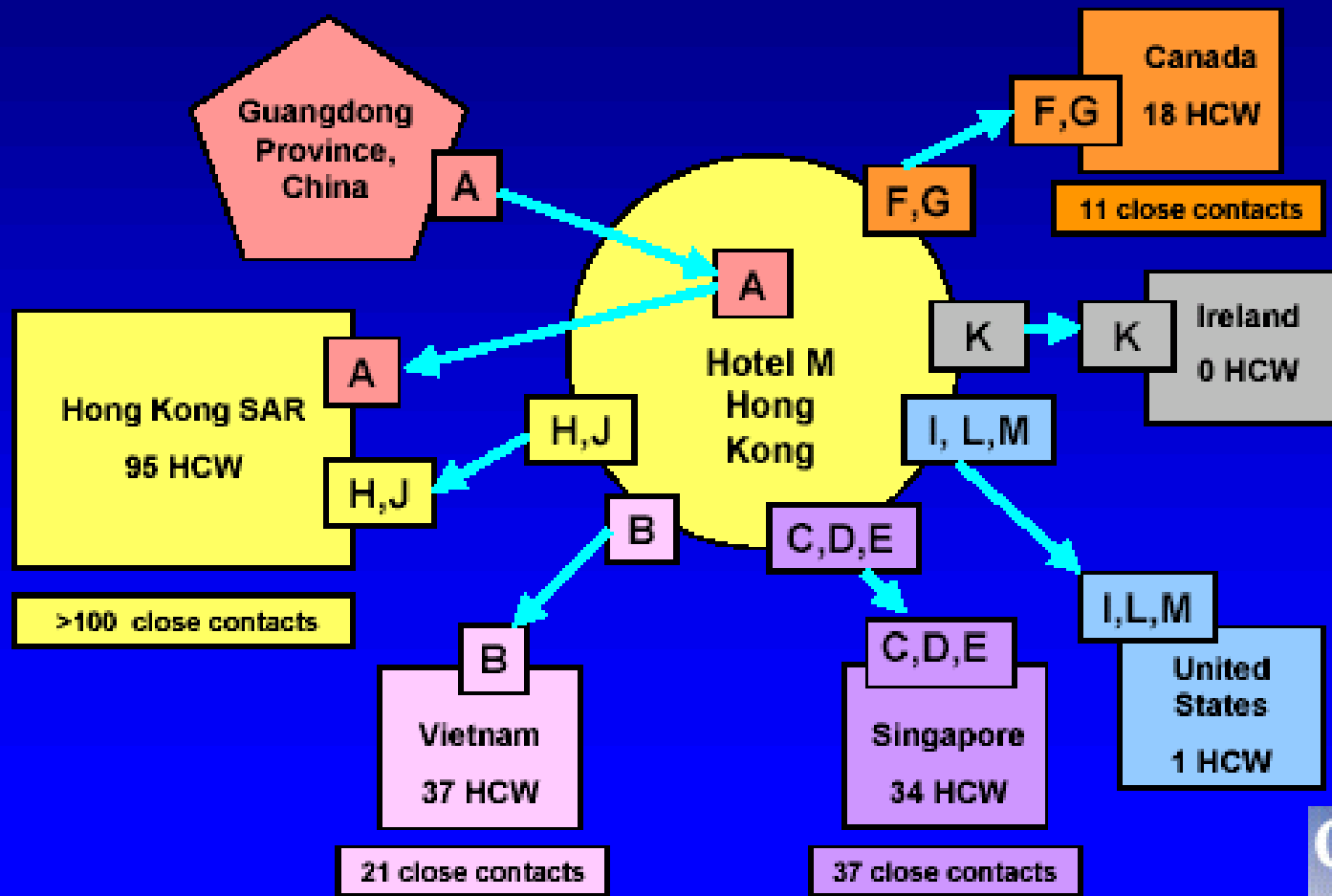


The Hong Kong connection: Hotel M



Spread from Hotel M

Reported as of March 28, 2003



Coronavirus

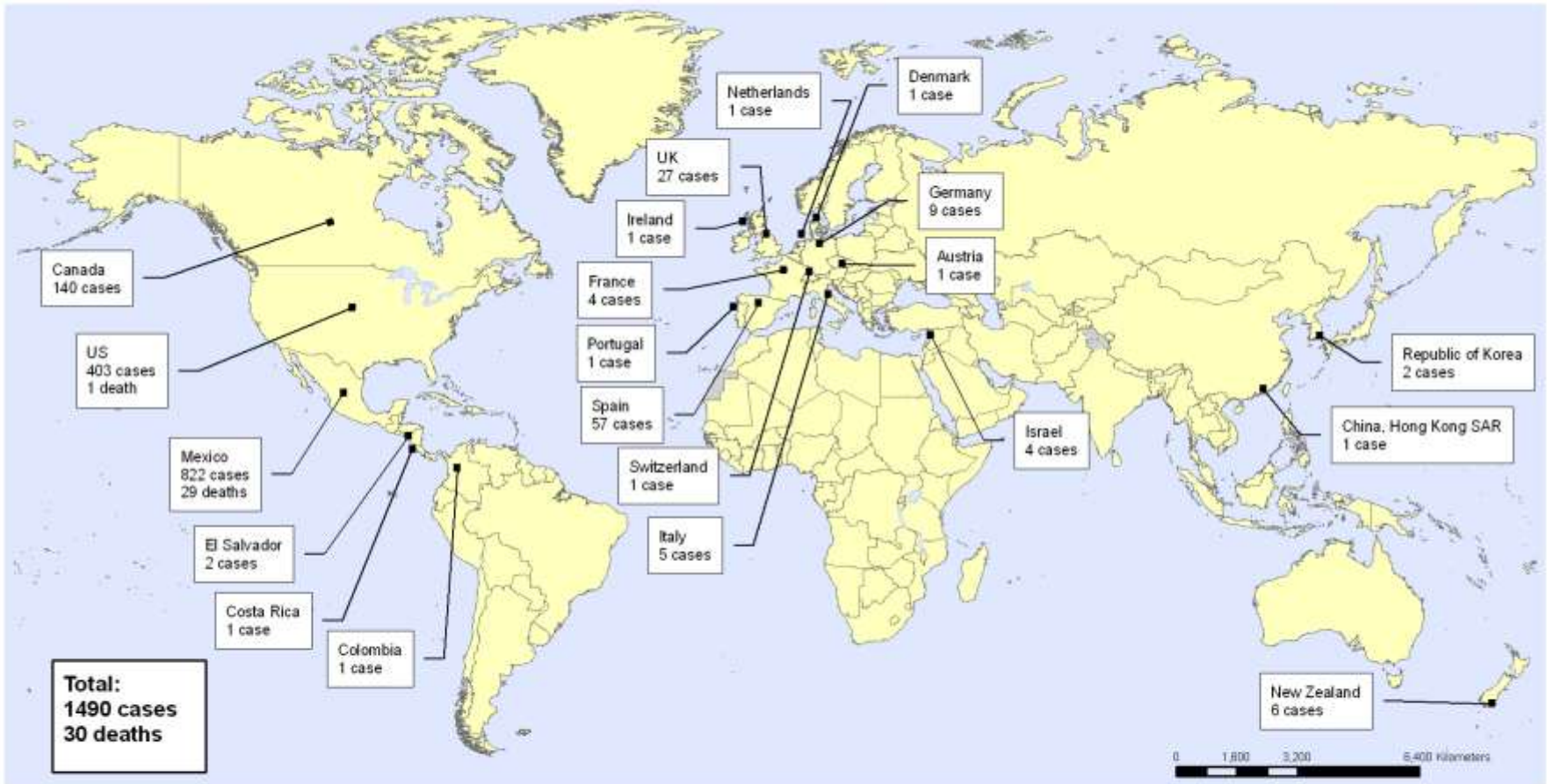
- Detected in high titres in Respiratory Secretions:
 - Sputum, Nasopharyngeal aspirate, pernasal swab.
- Conjunctival secretions
- Faeces
 - up to 28 days after symptom onset

SARS - clinical features at presentation

- **Fever** 100%
- **Malaise** 100%
- **Chills or rigors** 73%
- **Myalgia** 61%
- **Cough** 57%
- **Headache** 56%
- **Dizziness** 43%
- **Sputum production** 29%
- **Sore throat** 23%
- **Coryza** 23%
- **Nausea/vomiting** 20%
- **Diarrhoea** 20%

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

Status as of 5 May 2009
16:00 GMT



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Map produced: 5 May 2009 16:10 GMT

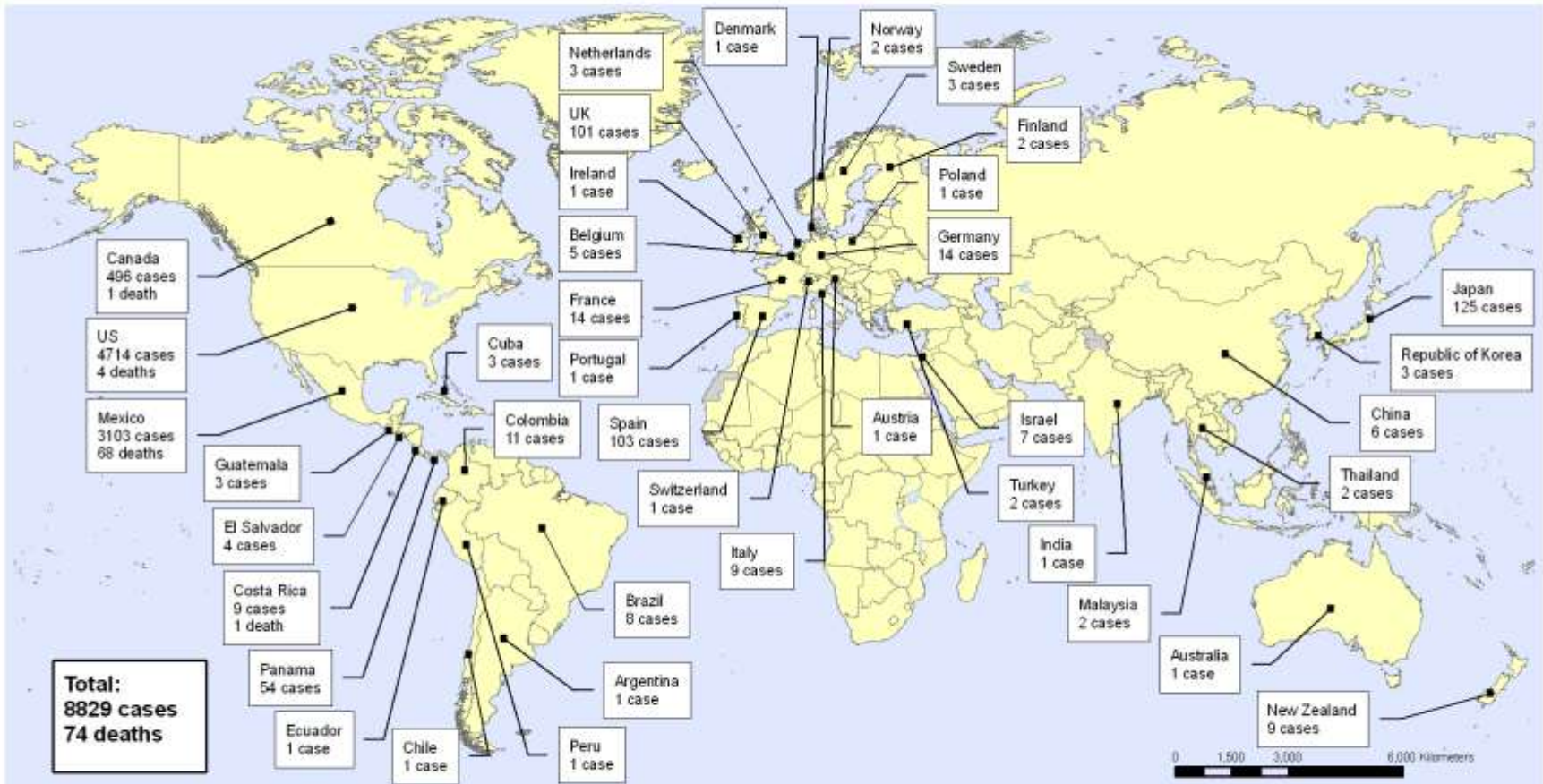
Data Source: World Health Organization
Map Production: Public Health Information
and Geographic Information Systems (GIS)
World Health Organization



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

Status as of 18 May 2009
6:00 GMT



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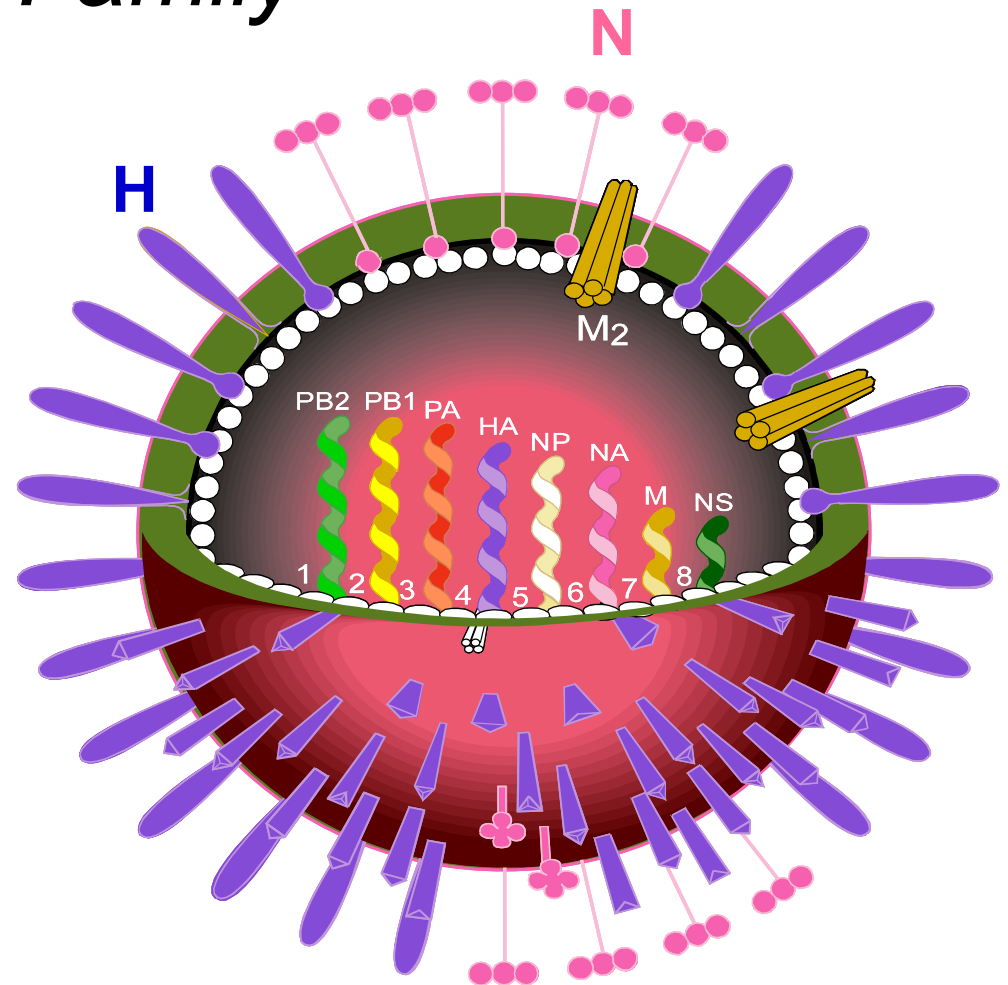
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Map produced: 18 May 2009 6:10 GMT

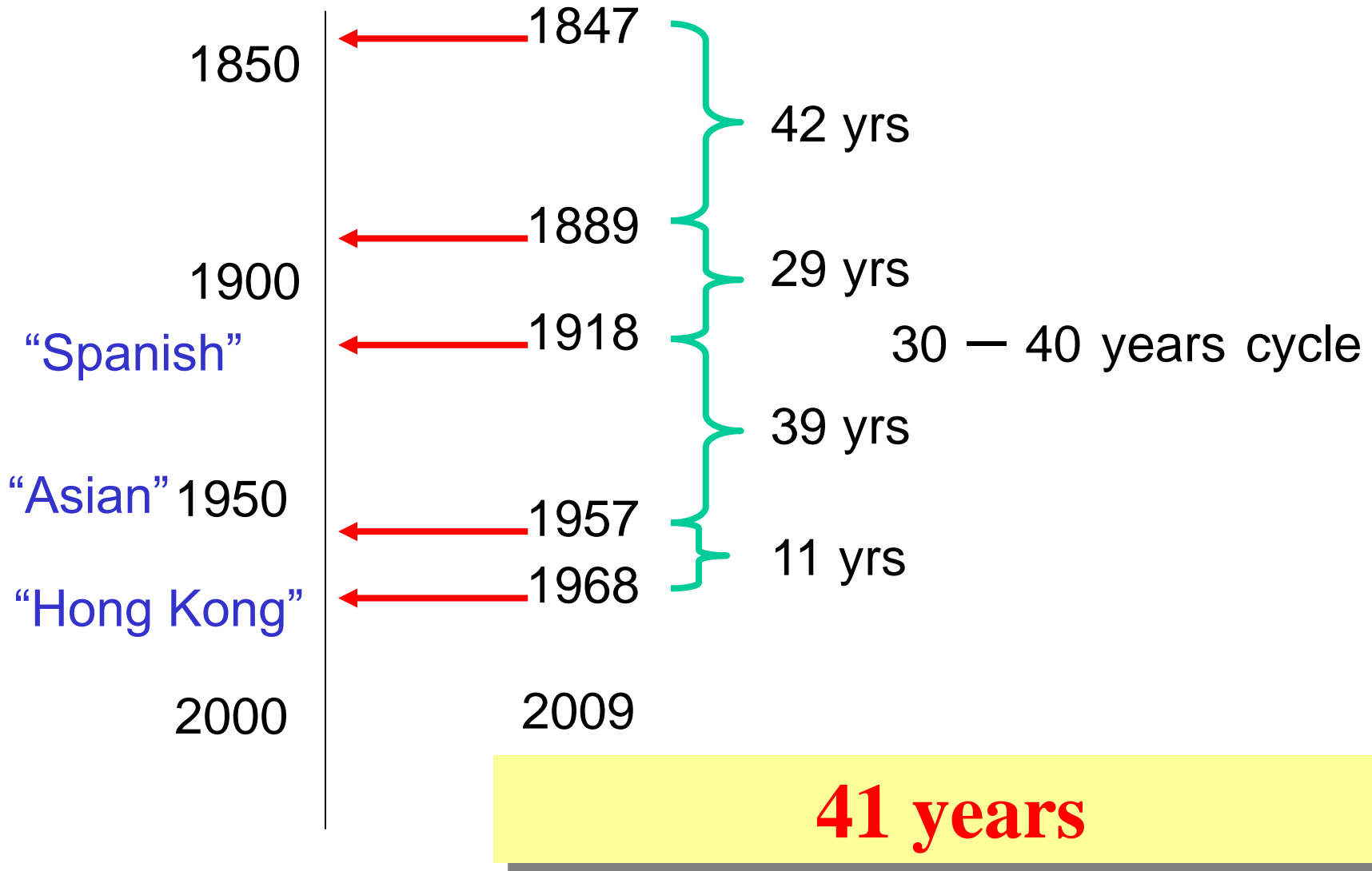
Influenza Virus:

Orthomyxoviridae Family

- Negative sense ss RNA genome
- Each segment encodes a different protein
 - two spike glycoproteins **haemagglutinin (H)** & **neuraminidase (N)**
 - one membrane-channel protein (M2)



Past Influenza Pandemics



Influenza Pandemics in the 20th Century



1918: “Spanish Flu”

~50 million deaths

H1N1



1957: “Asian Flu”

1-4 million deaths

H2N2



1968: “Hong Kong Flu”

1-4 million deaths

H3N2

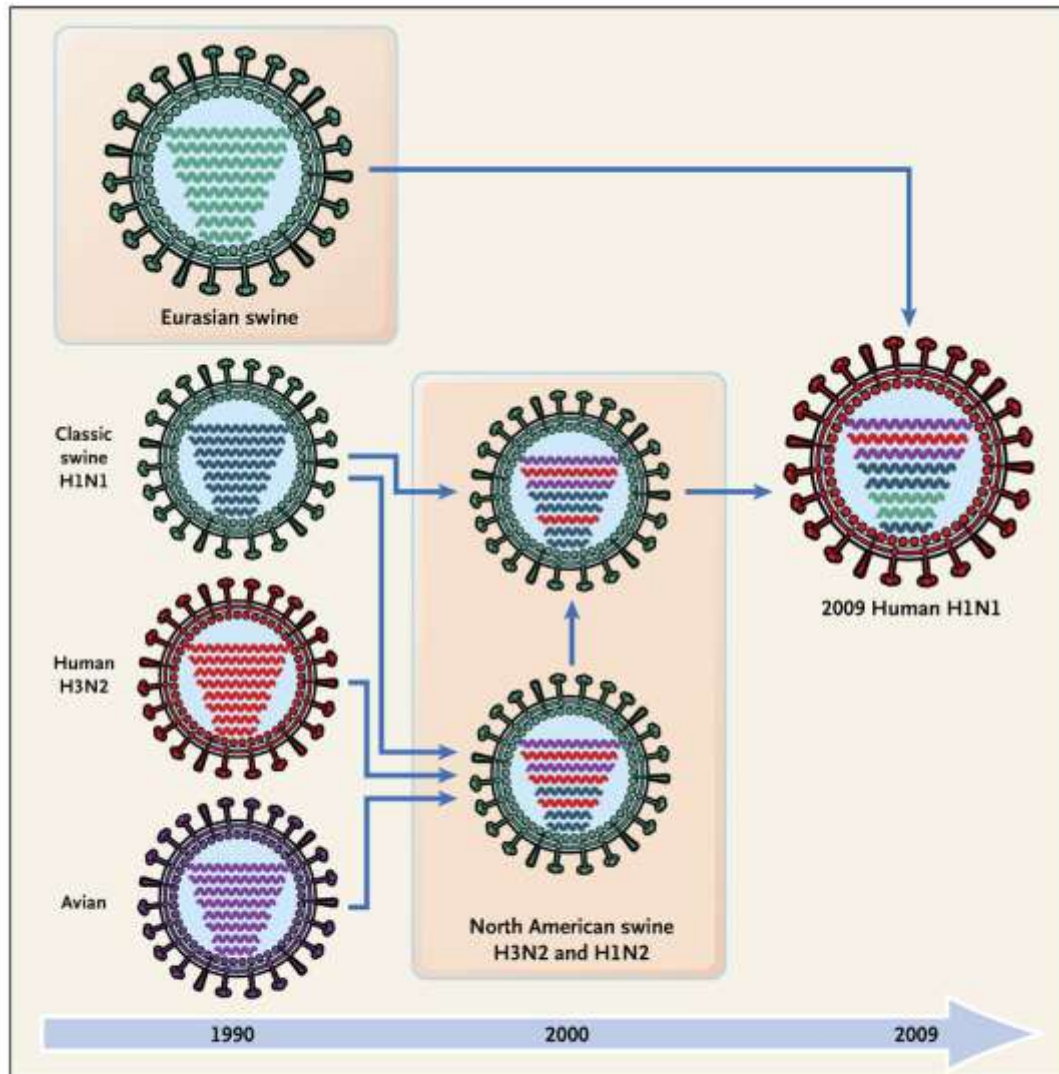


Figure 1. History of Reassortment Events in the Evolution of the 2009 Influenza A (H1N1) Virus.

The eight segments shown within each virus code for the following proteins of the influenza A virus (top to bottom): polymerase PB2, polymerase PB1, polymerase PA, hemagglutinin, nuclear protein, neuraminidase, matrix proteins, and nonstructural proteins. The segments of the human 2009 influenza A (H1N1) virus have coexisted in swine influenza A virus strains for more than 10 years. The ancestors of neuraminidase have not been observed for almost 20 years. The mixing vessel for the current reassortment is likely to be a swine host but remains unknown.

Influenza Antivirals

NZ Antiviral Stockpile

- Tamiflu™ (oseltamivir)
- Tablets taken orally
- Paediatric suspension
- 855,000 courses by December 2005, enough for 21.3% population



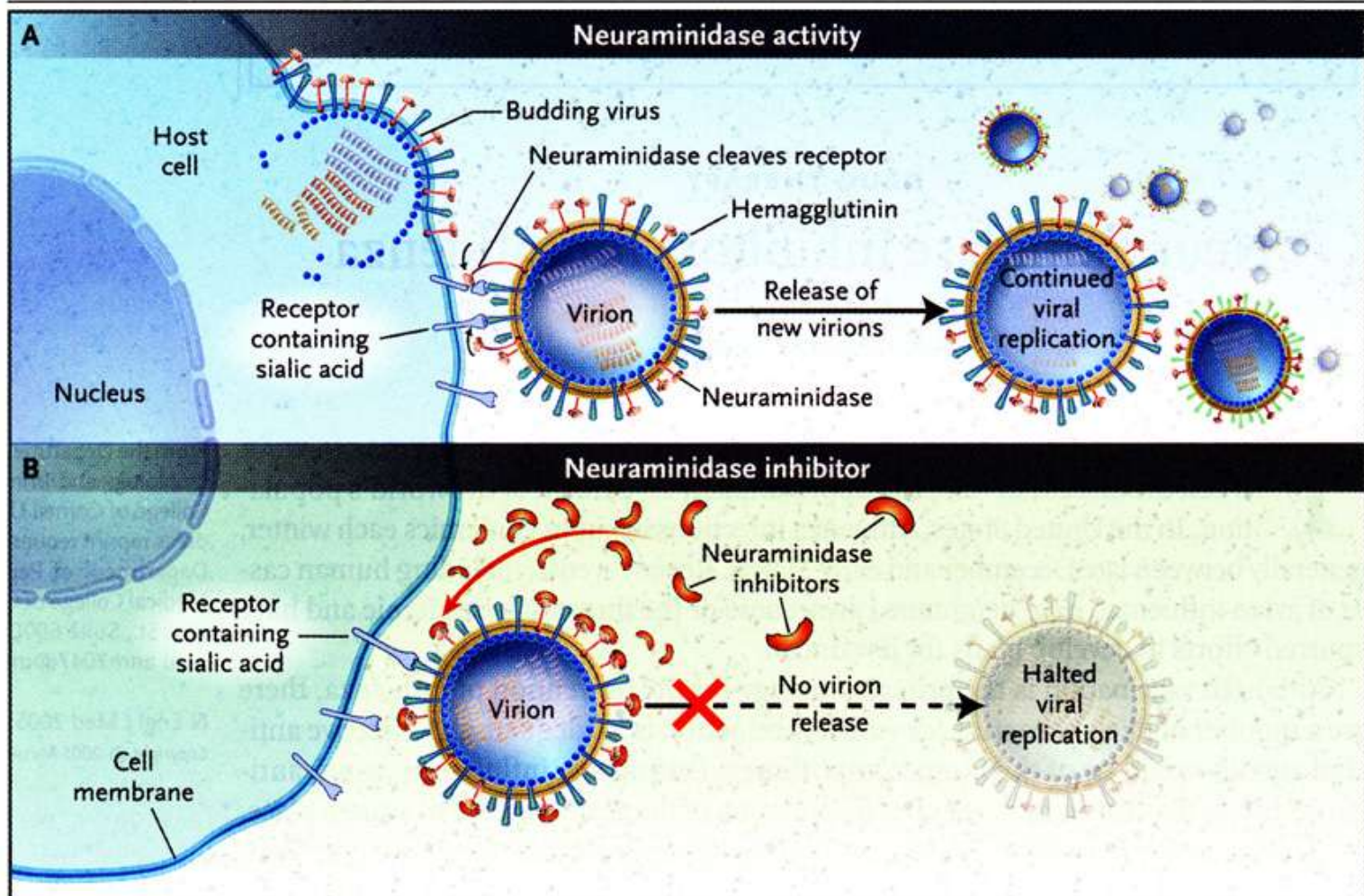
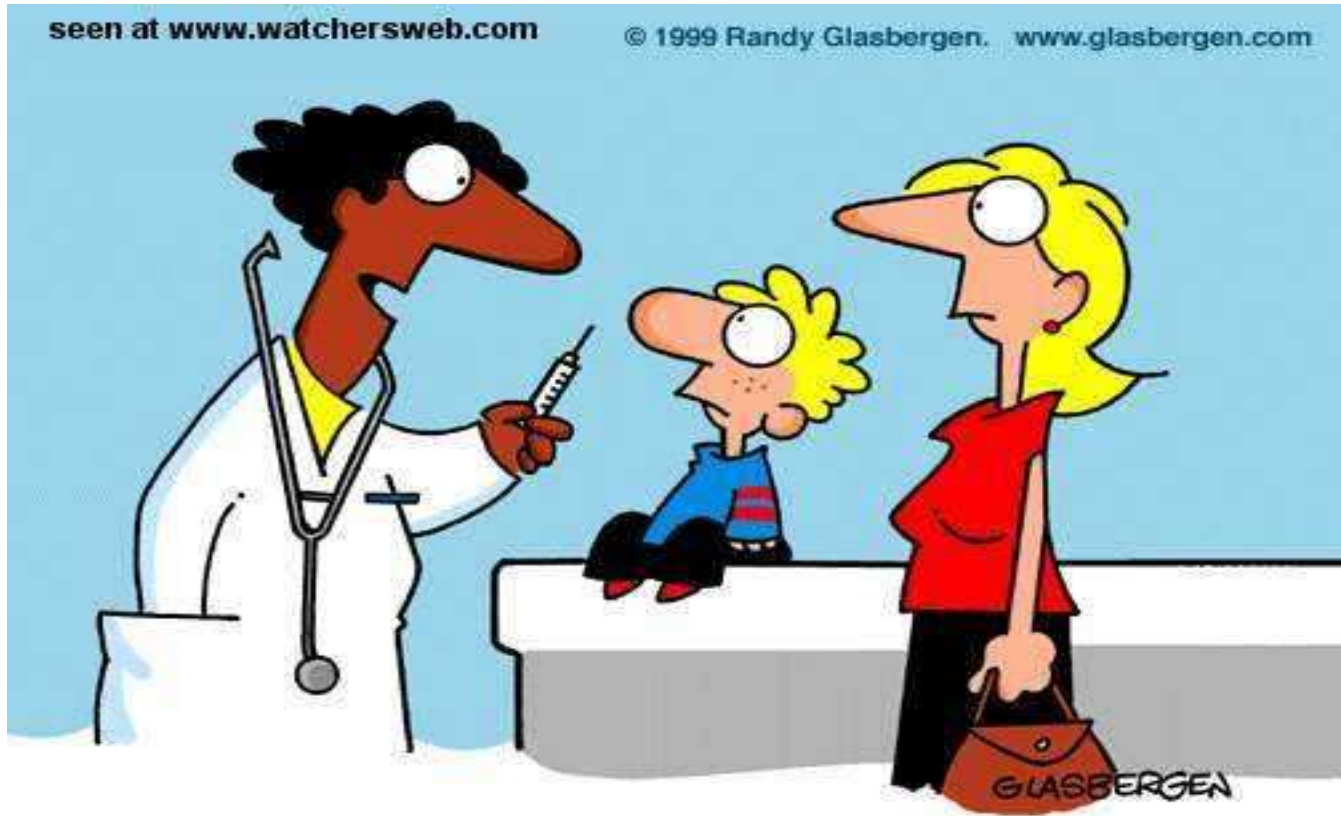


Figure 1. Mechanism of Action of Neuraminidase Inhibitors.

Panel A shows the action of neuraminidase in the continued replication of virions in influenza infection. The replication is blocked by neuraminidase inhibitors (Panel B), which prevent virions from being released from the surface of infected cells.

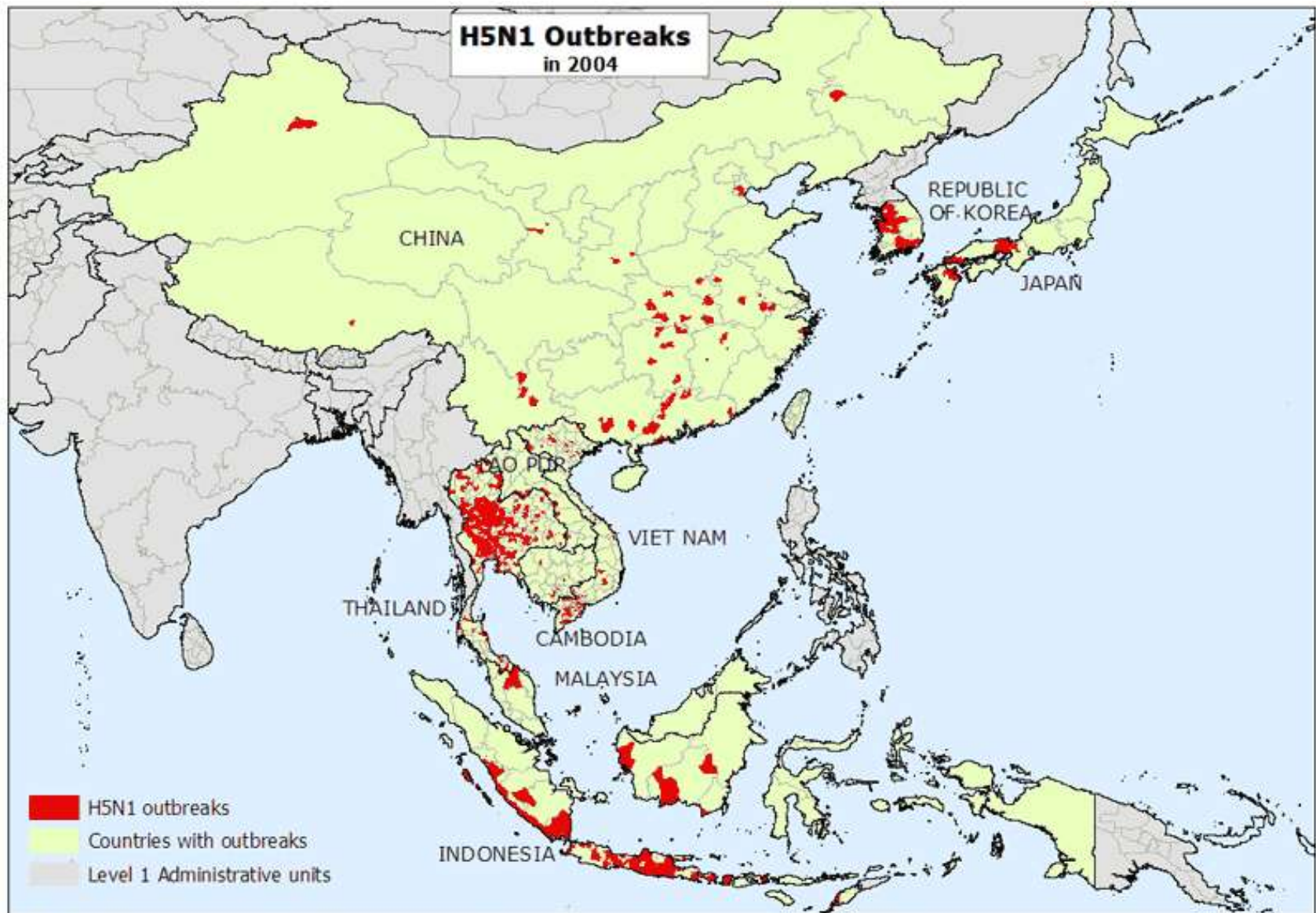
Pandemic Influenza Vaccines will be different from seasonal vaccines



**“Don’t think of it as getting a flu shot.
Think of it as installing virus protection software.”**

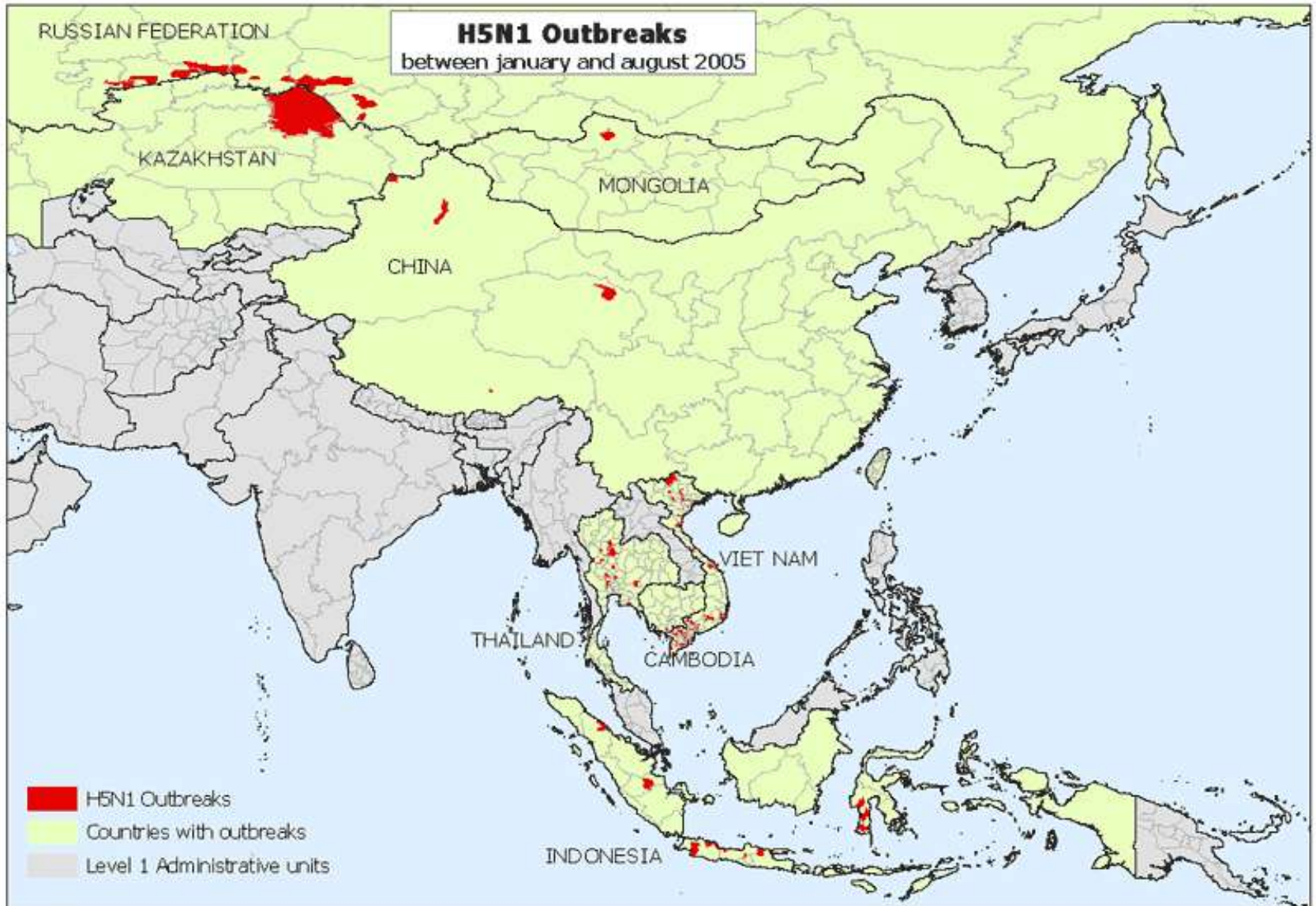
Avian Influenza Viruses

- “Fowl plague” first identified in 1878.
- 1st avian subtype isolated 1961 from a South African tern.
- Found in waterfowl, shorebirds and gulls.
- Swine, horses, humans and sea mammals are aberrant hosts in which increased virulence occurs. Chickens and turkeys may also be considered aberrant hosts.



This map represents the districts or provinces that experienced outbreaks of H5N1 type of Avian Influenza between January and December 2004. The original data have been collected and aggregated at the most detailed administrative level and for the units available for each country.

Data source: OIE, FAO and Government sources



This map represents the districts or provinces that experienced outbreaks of H5N1 type of Avian Influenza since January 2005 (map updated to 31 August 2005). The original data have been collected and aggregated at the most detailed administrative level and for the units available for each country.

Data source: OIE, FAO and Government sources

Risk Factors For Human Infections

- Still not fully understood
- Most cases have occurred in domestic settings
- High-risk human behaviours continue
- Unhygienic animal husbandry practices

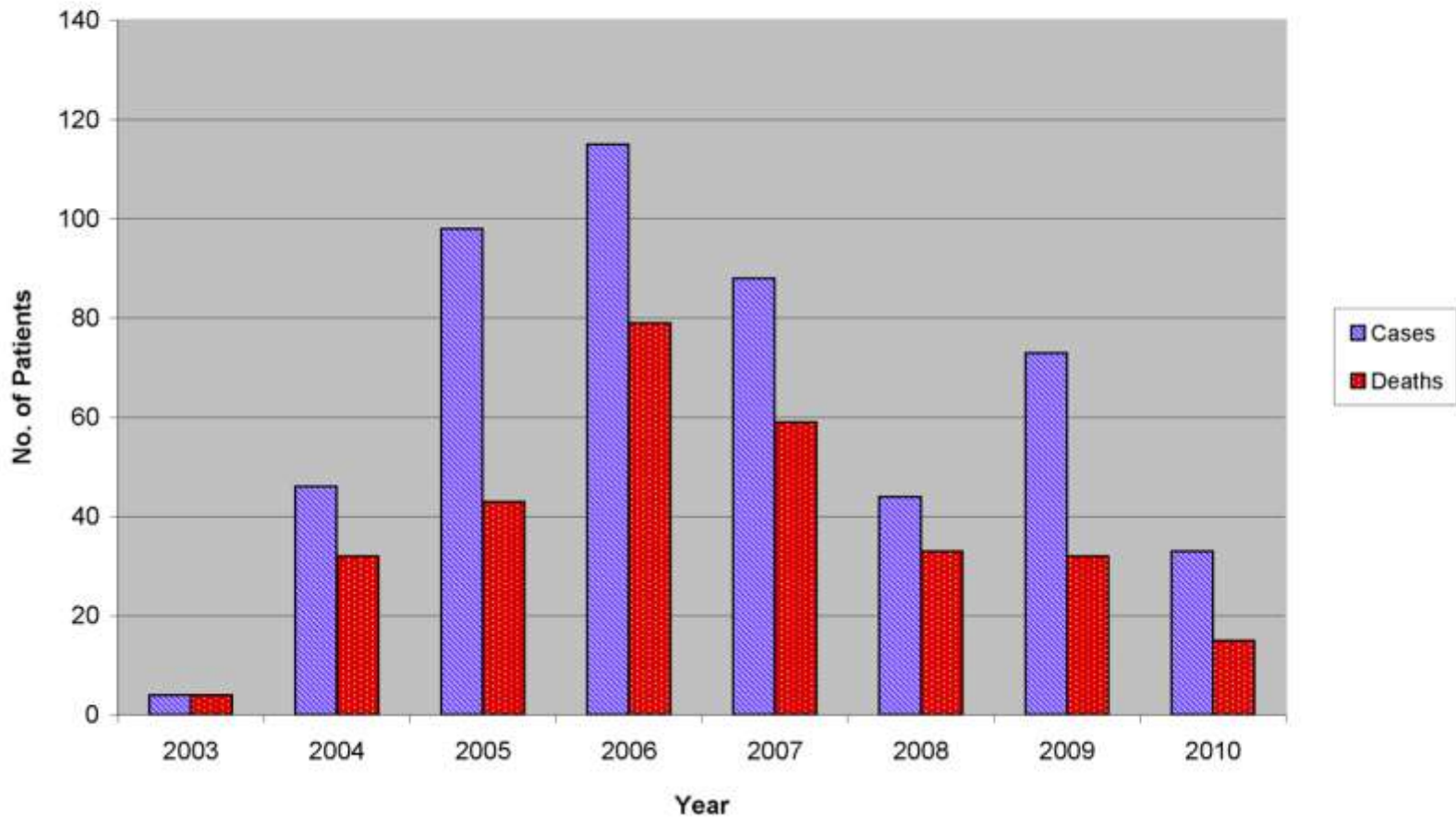




Transmission

**Direct exposure
to infected poultry**

Cumulative Number of Confirmed Human Cases of Avian Influenza A/(H5N1) Reported to WHO (22 July 2010)





Epidemiology

- Norovirus is one of the most frequent causes of acute non bacterial diarrhoea.
- Endemic cases occur.
- Outbreaks in hospitals, residential care are a feature of the epidemiology of this virus.
- Outbreaks on cruises and 50% foodborne outbreaks of gastroenteritis.
- First described in 1968 in a school outbreak in Norwalk USA.

Epidemiology NZ

April – July 2009

- 35 Norovirus outbreaks involving 961 cases.
- 20 ‘gastroenteritis’ outbreaks involving 320 cases.
- Outbreaks in healthcare setting close facilities and interrupt elective health treatment.

Frequency

- A cause of non bacterial acute infectious diarrhoea, defined as 3 loose stools for < 14 days.
- Study endemic cases in ChCh looking at 1200 samples 7% (88) were due to Norovirus. 56% G1 and 44% G2.
- Estimated 60-95% outbreaks of acute nonbacterial diarrhoea are caused by Norovirus.



Clinical

- Information comes from volunteer studies, sporadic cases and cases in outbreaks.
- 82% inoculated subjects acquire the infection.
- Of these 68% symptomatic and 32% trivial or no symptoms.
- All ages can be affected.

Clinical (cont.)

- Symptoms
 - diarrhoea 87%
 - vomiting 74%
 - abdominal pain 51%
 - abdominal cramps 44%
 - nausea 49%
 - fever 32%
 - mucus in stool 19%
 - bloody stools 0%

Clinical (cont.)

- Vomiting occurs on the first day of illness.
- Symptoms for median of 5 days.
- Diarrhoea median 4 days but durations up to 28 days occur.
- Symptoms longer in older patients.
- Duration symptoms tend to be shorter in outbreaks.

Morbidity and Mortality

- Almost all patients recover quickly with no sequelae.
- Most deaths occur in hospital and sometimes in residential care.
- Some strains may be more virulent.

Outbreaks

- Food - particularly shellfish but also food handlers.
- Water - river water, swimming pools, drinking fountains.
- Person to person.
- Environmental surfaces.

Environmental Surfaces

- Important sources of infection.
- When investigated during outbreaks found on lockers ,curtains and commodes.
- Can easily be transmitted from surface to surface on the cleaning cloth.
- Most frequently contaminated sites associated with defaecation eg bathroom door handles, toilet taps, light switches.

Aerosolised Droplets

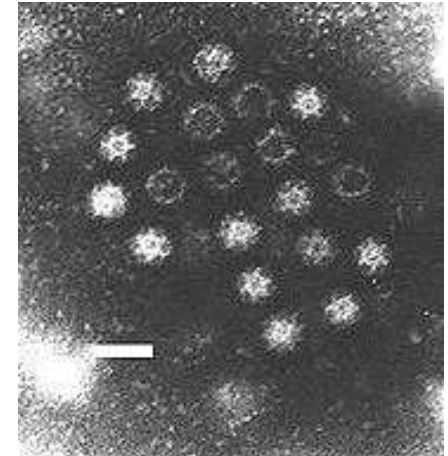
- Airborne transmission well documented.
- Occurs often in association with vomiting eg 300 cases from an index case who vomited in a concert hall.

Susceptibility and Immunity

- 20% Caucasians are not susceptible because they do not express histo-blood group antigens on their epithelial cells (non secretors)
- Volunteer studies show that immunity is short lived (months) and is strain specific.

Calicivirus family ('cup' or "calyx')

- Vesivirus
 - Vesicular dx in pigs, cats, etc
- Lagovirus
 - Haemorrhagic dx in rabbits
- Sapovirus
 - Saporovirus human gastro-enteritis
- Norovirus
 - Norwalk and others



Diagnosis

- Mostly clinical
- Laboratory

Traffic Light System

- Green
 - No symptoms or exposure
- Orange
 - Exposed to D&Vs but asymptomatic
- Red
 - Symptomatic
- Blue
 - Recovered patient



Reduce Ward Access



- Restrict entry of non-essential staff
- Request staff not to work on other wards
- Send unwell staff home
 - Return after >48 hours symptom free
- Restrict visitors
 - Especially children
 - Visitors to sign declaration of no symptoms?

Draconian Measures Required?

- Ban consumption of food by staff on ward
 - Out with the cookie jar
- Remove the water cooler
- Send the laundry out



Hygiene

- Thorough washing of hands followed by cleaning with alcohol solution before and after patient contact strongly encouraged
- Increased cleaning of wards with bleach
- Enable staff to shower before going home



An Emerging Pathogen

- Recent years have seen a global increase in norovirus outbreaks
- Norovirus will be with us for a long time
- We need to be ready to respond to outbreaks to contain both morbidity and costs