Emerging Infectious Diseases: SARS and Avian Influenza

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Recent Outbreaks in SE Asia

• 1997
  – Influenza A (H5N1) in Hong Kong
  – Spread from chickens to humans, 6 deaths

• 1999
  – Large outbreak of encephalitis in Malaysia
  – Spread from pigs to humans
  – Newly emergent paramyxovirus, Nipah virus
International Emerging Infections Program

Welcome to the IEIP-Thailand

Thailand is the site of the first International Emerging Infections Program (IEIP). IEIP-Thailand is headquartered on the spacious campus of the Thai Ministry of Public Health (MOPH), about 30 minutes north of downtown Bangkok. With the stated mission of strengthening Thai capacity to identify and control emerging infections of regional and global significance, IEIP-Thailand focuses on four main pillars of activity – surveillance, research, training, and outbreak support. IEIP is part of the overall Thailand MOPH–U.S. CDC Collaboration that also includes the Global AIDS Program (GAP) and HIV/AIDS research activities. The priorities of the IEIP are developed in weekly meetings of the Thai MOPH working group.

Recent Outbreaks in SE Asia

• 2002-3
  – Outbreak of Severe Acute Respiratory Syndrome
  – Likely spread from animals to humans

• 2003-4
  – Avian influenza A (H5N1)
  – Spread from chickens to humans
  – Human cases in Viet Nam and Thailand
Sars: Four months that shook Asia

After four traumatic months, Asia appears to have brought Sars under control, ending for now early fears the outbreak would escalate into a pandemic to rival the 1918 influenza.

But as the region breathes a sigh of relief and a palpable optimism returns to Asia's streets, its leaders have begun picking through the economic and

Everyone is feeling a lot better the epidemic is dying down, but a full recovery cannot be expected for quite some time yet. In the meantime, there has been the silver lining of Beijing being more open with the world.

a team of its experts from travelling there to investigate and even denied any Sars problem on the mainland.

The April 2 advisory, however, turned international ire on China and pressure to come clean on a cover-up arguably responsible for what had by then become a full-blown worldwide outbreak with 180 dead and 3,000 infected was immense.
Probable cases of SARS by week of onset
Worldwide* (n=5,910), 1 November 2002 - 10 July 2003

* This graph does not include 2,527 probable cases of SARS (2,521 from Beijing, China), for whom no dates of onset are currently available.

SARS Caused by a Coronavirus

Origin of SARS

• Animal origin
  – Masked palm civet
  – Raccoon dog
  – Chinese ferret badger

• Studies in China
  – Animals
  – Humans who work with animals
Epidemiologic Characteristics

- Incubation period 4 days (range, 2-10)
- Transmission through direct contact or droplet spread
  - Most transmission to close contacts
  - 21% of cases in health care workers
  - Infectious period peaks on days 5-15
- Mortality 15% overall
  - 0%(0-24), 6%(25-44), 15%(45-64), 52%(>64)
<table>
<thead>
<tr>
<th>Event</th>
<th>Number of secondary infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotel M</td>
<td>16</td>
</tr>
<tr>
<td>Apartment Complex</td>
<td>321</td>
</tr>
<tr>
<td>Airline</td>
<td>22 (+41 in Beijing)</td>
</tr>
</tbody>
</table>
Chain of Transmission at Hotel M

MMWR March 28, 2003
Apartment Complex

• 321 cases identified
  – 66% reported having diarrhea
  – 4% reported contact with SARS patient
  – 8% reported recent travel to mainland China

• Transmission
  – Sewage system – small droplet, airborne
  – Person-to-person
  – Shared communal facilities
Airline Transmission of SARS

22 infections
5 deaths

Olsen et al. New Engl JMed 2003;349:2416
Measures to Reduce Airline Transmission of SARS

Aircraft Decontamination

Voluntary Use of Masks

Fever Screening

Bangkok Post
Good Infection Control

- Full airborne precautions
- Double gloves
- Double Gown
- Tight-fitting mask (N100) (N95)
- Cap and Goggles
- Shoe covers
Repercussions of SARS

• Large economic impact

Airlines to lose US$10 billion: IATA

• Strain on health care

SARS drives nurses and doctors to quit in Taiwan

• High profile
Avian Influenza

- Discovered in Italy over 100 years ago
- Can occur in most species of birds
- Outbreaks have occurred throughout the world
- Viruses vary widely in pathogenicity
Avian Influenza A (H5N1) in Asia
Current H5N1 Outbreak

- H5 avian disease is widespread across Asia
  - At least 9 affected countries in 2004
  - >100 million birds culled or died
- Human infections limited to Viet Nam and Thailand
  - 40 cases
  - 73% mortality
- Concerns about a pandemic if H5 reassorts with H1 or H3
Three Possible Control Points to Prevent Reassortment

1. H1 or H3
2. H5
3. X
Prevent Human Infection Through Vaccination

• Key factors
  – Burden of influenza is substantial
    • 42,371 cases reported in passive surveillance system (2003)
    • True burden 92-fold greater
  – Seasonal coincidence of avian and human influenza
  – Vaccine not currently recommended
Human Influenza Burden is Substantial in Thailand

<table>
<thead>
<tr>
<th>Data source</th>
<th>Sa Kaeo annual rate/100,000</th>
<th>Number in Thailand (population 62m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza-like illness (Household survey in Sa Kaeo*)</td>
<td>39,095</td>
<td>24,238,900</td>
</tr>
<tr>
<td>Proportion of influenza-like illness caused by influenza virus**</td>
<td>16%</td>
<td></td>
</tr>
<tr>
<td>Influenza</td>
<td>6,255</td>
<td>3,878,224</td>
</tr>
</tbody>
</table>

*Annualized
**Prospective population-based virologic surveillance for influenza in patients with influenza-like illness
Control avian H5 disease

• Key factors
  – Bird surveillance shows avian disease is widespread in Thailand
  – Culling has not eradicated the disease
  – Substantial economic costs due to infection and culling
  – Poultry vaccine currently banned in Thailand
January - May 2004

- 61 affected provinces
- Poultry culled in 5km radius around H5 infected poultry
  - 30 million dead or culled

http://www.dld.go.th/home/bird_flu/birdflu.html
July - September 2004

- 34 affected provinces

- Culled only infected poultry
  - 1 million dead or culled

http://www.dld.go.th/home/bird_flu/birdflu.html
Broadened Species Range in 2004

- Poultry
  - Chicken
  - Ducks
  - Geese
  - Turkeys
  - Ostriches
  - Quails
  - Peacocks
  - Pigeons
  - Crows

- Other animals
  - Domestic cats
  - White tiger
  - Clouded leopard
  - Humans
Reduce human-avian interaction through public education

- Key factors
  - Poultry exposure is extremely common
  - Most cases are in children
  - Public is knowledgeable about bird flu yet some risk remains
  - Difficult to change behavior
Poultry Exposure is Common
Sa Kaeo, Thailand

- 1.3% of poultry is on commercial farms
  - 178 farms
  - 31,221 poultry

- 98.7% of poultry is in backyards
  - 73% of households have backyard birds
  - 2,410,820 poultry

178 farms
81,695 households with backyard birds
Recent Development

• Family cluster
  – 3 family members, 1 lived in another province
  – H5N1 confirmed infection

• Person-to-person transmission
  – No further spread
  – No significant mutation to virus
Summary: SARS and Avian influenza

• SARS redefined emerging zoonoses
  – Broad economic and public health impact

• Avian flu: unprecedented & unpredictable
  – Scale of the epizootic unprecedented
  – Ongoing potential for re-assortment event
Expect the Unexpected

- Monkeypox
- West Nile virus
- Nipah virus
- Avian influenza
- SARS