Emerging Infectious Disease in Southeast Asia

Paul Ananth Tambyah

Case presentation

- 24 year old pig chaser
- Admitted February 1999
- 4 day history of fever and confusion
- Initial temperature 39°C
- Neck stiff, drowsy
- Became comatose
- Treated with ceftriaxone, Acyclovir, RHEZ

Progress II

- Fifth hospital day:
  - Began to improve spontaneously
  - Able to respond to simple commands
  - Intermittently confused
- Tenth hospital day:
  - Alert and oriented
  - Repeat CSF exam normal

Discharge

- Discharged on 14th hospital day
- Well
- Diagnosis:
  - "Viral encephalitis of unknown etiology"

Patient was called back...

First case of Nipah virus encephalitis in Singapore

CASE REPORT


In March 1999, an outbreak of Nipah virus encephalitis was recognized among slaughterhouse workers in Singapore. One month later, a 24 year-old man, a butcher at a slaughterhouse at Alexandra Hospital, presented to the National University Hospital with a 4-day history of fever and headache. He had a temperature of 39°C, neck stiffness and photophobia. His full blood count and biochemical studies were normal.

Subsequently, two separate serum specimens from the patient obtained during follow-up 6 weeks and 10 weeks after the onset of illness were tested according to the Nicklin et al. (1997) method for Nipah Virus Neutralizing Antibodies and were found to be strongly positive for IgG and IgM antibodies to the Nipah virus by enzyme-linked immunosorbent assay. This was...
Emerging Infectious Disease in Southeast Asia
Prof. Paul Ananth Tambyah, National University of Singapore
Broadcast from the 2010 conference of the Australian Infection Control Association (www.aica.org.au)

MRI reviewed

Nipah Virus Encephalitis: Serial MR Study of an Emerging Disease

Don't mess with Nature

Ending the Outbreak

A Webber Training Teleclass  www.webbertraining.com
What is an Emerging Infectious Disease?

- “new, re-emerging or drug-resistant infections whose incidence in humans has increased within the past two decades or whose incidence threatens to increase in the near future.”
  – Lederberg et al Institute of Medicine 1992

Targetted surveillance?

- Early warning
- Most vulnerable
- Most controlled environment

http://www.apec.org/infectious/NoN/Rodier.pdf

A Webber Training Teleclass  www.webbertraining.com
Emerging Infectious Disease in Southeast Asia
Prof. Paul Ananth Tambyah, National University of Singapore
Broadcast from the 2010 conference of the Australian Infection Control Association (www.aica.org.au)

Watch out for the Canaries.....

High-Throughput Sequencing Method

Propagation of the New Arenavirus in Tissue Culture

A large outbreak of acute encephalitis with high fatality rate in children in Andhra Pradesh, India, in 2003, associated with Chandipura virus

Comprehensive Surveillance

Real-time PCR tests available from CDLS

A Webber Training Teleclass www.webbertraining.com
Could we have prevented the Singapore Nipah outbreak??

Internal Medicine Journal 2007;31:132-133

CASE REPORT

First case of Nipah virus encephalitis in Singapore

P. A. TAMBIYAH, J. H. TAN, R. B. C. ONG, K. H. HOY and K. P. CHAN

Department of Medicine, National University Hospital and Department of Pathology, Singapore General Hospital, Singapore

In March 1999, an outbreak of Nipah virus encephalitis was recognized among pig farmers and vendors in Singapore. One month prior, a 30-year-old pig farmer worker presented to the National University Hospital with a 4-day history of fever and headache. On admission, he was febrile, slightly drowsy and disoriented. His full blood count and subsequent cerebrospinal fluid analysis showed pleocytosis. He was found to have positive Nipah virus complement fixation titer. Subsequently, two separate serum specimens from one patient obtained during follow up visits and 10 weeks after the onset of illness were tested according to a protocol developed by the Centers for Disease Control and were found to be strongly positive for Nipah virus. The patient was admitted to the intensive care unit where he got better for a short time before deteriorating rapidly. This was the first reported case of Nipah virus encephalitis in Singapore.

AI 08:14 AM 22/02/2007, CONTACT_TRACING@nuh.com.sg wrote:

Dear All,

There is a coroners case whose pt. Dx. is viral fever of unknown origin.

Details from HIDS notes:

- 29yr old Chinese lady
- Previously well
- Admitted for:
  1. generally feeling unwell x 3/7
  - with fever, runny nose, dry cough
  - no hemoptysis/headache/abdominal pain/urinary symptoms
  2. transient syncopal episode on day of admission
  - lightheadedness, postural related
- Had seen GP x2 - 1st given Anarex, then amoxycillin
- Had travelled to Hong Kong 1/52 ago - no contact with illness while there. No h/o TCM use
- Admitted through EMD - was hypotensive with BP 71/60 - improved to 85/65 with IV fluids
- Had received 4L of IV fluids by the time she reached inpatient ward. BP was 90/60 at time of admission to ward
- Never tachypneic - pulse 80.
- Patient had mild dizziness on rising to walk but denied other symptoms
  O/E alert, oriented
  Afebrile, BP 90/60, HR 80, RR 16
  S1S2 L clear
  A soft
  NT, BS active neuro grossly normal
  FBC: Tw 7.07 Hb 13.3 Plt 131 RP#1: Na 134 K 3 urea 2.4 Cr 77 Glu 7.4 Lactate 1.7
  CXR - no active lung lesion, heart size normal

Placed on hourly monitoring with further IV fluids given in ward. Started IV ceftriaxone

Bloods repeated in ward ABG: pH 7.35 pCO2 31.1 pO2 895.1 HCO3 16.7 BE -7.6 SaO2 97%

FBC - falling plt count to 98. Thus dengue serology added; pending at patient’s demise

Renal panel remained stable however Mg and Ca low - given IV replacement

However patient collapsed at 0515h - no spontaneous respirations, pulse not palpable; ECG - pulseless electrical activity

Given 2.4mg atropine, 1mg adrenaline. CPR commenced

Intubated and manual ventilation given

Cardiology reg on call - bedside 2D echo showed no pericardial effusion or tamponade

Given 10mg adrenaline - refractory PEA on cardiac monitor

F/b 10ml CaCl2, 250ml HCO3, 1 unit Hartmann’s, 1 unit gelofundin

Rhythm subsequently evolved into asystole

CPR stopped at 0630h. Have updated consultant on call re: above events

To be made coroner’s case.

A Webber Training Teleclass www.webbertraining.com
Emerging Infectious Disease in Southeast Asia
Prof. Paul Ananth Tambyah, National University of Singapore
Broadcast from the 2010 conference of the Australian Infection Control Association (www.aica.org.au)

Denouement

Responding to Emerging Infections: March 14 2003 Straits Times

Very early in the outbreak, the MOH stopped briefing doctors and started using the mass media extensively.
Everyone had to follow the rules

Patients still were sick

Important decisions needed to be made in response to the outbreak:
A major hospital was closed

Most people with SARS in Singapore were infected in hospital

We worked with WHO and CDC to analyse the data quickly

A Webber Training Teleclass  www.webbertraining.com
The newspapers did their own investigations

Healthcare worker protection was a top priority. The CEO visited all infected healthcare workers initially

Barrier Precautions were highly effective in protecting Healthcare Workers

Data courtesy of Dr Lim Suet Wun, Dr Leo YS, TTSH, Singapore

Hand Hygiene: Not a New Concept

Hand antisepsis reduces the frequency of patient infections


Hand Hygiene Audit
February - March & June 2003

Compliance Rate

Courtesy of Deborah & QIU team

Hand hygiene needs a comprehensive approach

Chai et al Clinical Infectious Diseases 2005;40:632-633
Emerging Infectious Disease in Southeast Asia  
Prof. Paul Ananth Tambyah, National University of Singapore  
Broadcast from the 2010 conference of the Australian Infection Control Association  
(www.aica.org.au)

### Guideline for Isolation Precautions:  
**Preventing Transmission of Infectious Agents in Healthcare Settings 2007**

Jane R. Segal, MD; Betty Blankenship, RN, CIC; and Margaret Honkus, RN, CIC  
Linda Cherubino, RN, MS; the Healthcare-Associated Infections Advisory Committee

Acknowledgement: The authors and APIC gratefully acknowledge Dr. Larry Goodbaugh for his many contributions and valuable guidance in the preparation of this guideline.


---

**Isolation ward utilisation**

**Facilities needed to be created**

---

**Efficacy of NUH Isolation Criteria**

<table>
<thead>
<tr>
<th>Time</th>
<th>Value (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensitivity</td>
<td>92.3% (64.3 – 99.6)</td>
</tr>
<tr>
<td>Specificity</td>
<td>93.3% (91.4 – 95.3)</td>
</tr>
<tr>
<td>Positive Predictive Value</td>
<td>15.0%</td>
</tr>
<tr>
<td>Negative Predictive Value</td>
<td>62.3%</td>
</tr>
<tr>
<td>Number Noted in Isolation</td>
<td>37</td>
</tr>
<tr>
<td>Number Noted in General Wards</td>
<td>21.1% (4.3 – 38.1)</td>
</tr>
<tr>
<td>Positive Likelihood Ratio</td>
<td>3.6</td>
</tr>
<tr>
<td>Negative Likelihood Ratio</td>
<td>0.089 (0.24 – 0.32)</td>
</tr>
</tbody>
</table>

---

**A liberal isolation policy:**

<table>
<thead>
<tr>
<th></th>
<th>Confirmed SARS</th>
<th>Non-SARS</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week 1</td>
<td>13</td>
<td>465</td>
<td>478</td>
</tr>
<tr>
<td>Week 2</td>
<td>1</td>
<td>350</td>
<td>351</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>815</td>
<td>829</td>
</tr>
</tbody>
</table>

Chai et al ICEID 2004

---

A Webber Training Teleclass  
[www.webbertraining.com](http://www.webbertraining.com)
A “super spreader”

- 63 year old vegetable seller
- Breathless, afebrile
- Admitted as “heart failure”


Home quarantine for 2,400
Dual measure to stop SARS spreading from wholesale market

NEJM 2003;348:1256-1266

Home quarantine orders
No more leniency: Tough penalties await those who break the rules

ER Transmission of SARS

1.1 m
Emerging Infectious Disease in Southeast Asia
Prof. Paul Ananth Tambyah, National University of Singapore
Broadcast from the 2010 conference of the Australian Infection Control Association (www.aica.org.au)

The last case of smallpox in the world

Air exchanges


Air exchanges & TB transmission


So...is Influenza Airborne?
Results of observational studies

Brankston et al Lancet Infectious Disease 2007;7:257-65

Staff are fully protected

A Webber Training Teleclass  www.webbertraining.com
Emerging Infectious Disease in Southeast Asia
Prof. Paul Ananth Tambyah, National University of Singapore
Broadcast from the 2010 conference of the Australian Infection Control Association (www.aica.org.au)

PAPRs are available

N95 masks: Problems

Headaches and the N95 face-mask amongst healthcare providers

What types of masks are available

N95 masks:

Problems

Headaches and the N95 face-mask amongst healthcare providers

What types of masks are available

There is a variety of masks/ respirators that could be used, depending on the circumstances. These include:

- Surgical masks—reduce contact of droplets, not efficient against viruses which are airborne
- P1 respirator—very good against dust, particulate matter, not against viruses
- N95 respirator—good against both dust and particles, not against viruses. N95 mask can fit snugly around the face to prevent leakage.
- N95+ mask—good against both dust and particles, not against viruses. N95+ mask is ideal for healthcare workers who have to wear it for long hours.
- Surgical respirator—good against dust and particles, not against viruses.
- PAPR—positive air pressure respirator—good against dust and particles, not against viruses. PAPR is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation value is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.
- N95 respirator with exhalation valve—good against dust and particles, not against viruses. N95 respirator with exhalation valve is ideal for healthcare workers who have to wear it for long hours.


Surgical Mask vs N95 Respira for Preventing Influenza Among Health Care Workers

A Randomized Trial


A Webber Training Teleclass  www.webbertraining.com
Emerging Infectious Disease in Southeast Asia
Prof. Paul Ananth Tambyah, National University of Singapore
Broadcast from the 2010 conference of the Australian Infection Control Association  (www.aica.org.au)

Hospitals in Asia are alert against nosocomial influenza

Bottom line: Depends on the virus

Emerging Infectious Diseases: The bottomline…

- Emerging Infectious Diseases will occur
- We can be prepared
- Do good surveillance
- Protect staff
- Have good data
- Have friends – especially internationally!

![Cost-effectiveness Analysis of Hospital Infection Control Plan for Respiratory Virus Threat](cost-effectiveness-analysis.png)

<table>
<thead>
<tr>
<th>Disease</th>
<th>No. Illness</th>
<th>No. Deaths</th>
<th>Cost</th>
<th>Cost/survivor</th>
<th>Cost/death avoided</th>
<th>Cost/survivor avoided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pandemic H1N1 2009</td>
<td>2,960</td>
<td>10</td>
<td>20,650</td>
<td>0.71</td>
<td>2065</td>
<td>0.07</td>
</tr>
<tr>
<td>Spanish influenza</td>
<td>3,270</td>
<td>161</td>
<td>80,930</td>
<td>0.51</td>
<td>513</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Table 1: Results of cost-effectiveness analysis of potential outcomes and responses, Singapore

![Webber Training Teleclass](webber-training-teleclass.png)

13
Emerging Infectious Disease in Southeast Asia
Prof. Paul Ananth Tambyah, National University of Singapore
Broadcast from the 2010 conference of the Australian Infection Control Association (www.aica.org.au)