



Bangladesh..  
..a new face of Nipah virus

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Photo: Jon Epstein, 2006

# Nipah virus in Malaysia

## Background..

- first described in 1999 in Malaysia.
- one million+ pigs culled.
- 800 pig farms demolished.
- 36,000 jobs lost.
- \$120+ million exports lost.
- 250+ human cases (106 fatal)
  - pig farmers
  - Singapore abattoir workers



Nipah outbreak Malaysia, 1999

# Nipah virus in Malaysia

## Natural reservoir..

- flying foxes the reservoir host.
- wide geographic distribution.
- high antibody prevalence (20-40%).



Island flying fox (*P. hypomelanus*)

# Nipah virus in Malaysia

## Stages of emergence..

- spillover from flying foxes to pigs near Ipoh.
- farming practices and high pig densities facilitated dissemination in the Ipoh area.
- transportation of pigs for commerce led to the southern spread.
- the amplifying pig host facilitated transmission of the virus to humans.



# Nipah virus in Bangladesh..

- five outbreaks between April 2001 and February 2005.
- total of 122 cases, 64% of which were fatal.



Photo: Jon Epstein, 2006



# Nipah virus in Bangladesh..

- shared characteristics with Malaysia
  - delayed recognition.
  - primary presentation with fever and central nervous system signs.
  - high case fatality.

# Nipah virus in Bangladesh..

- contrasting characteristics
  - infection in humans is not associated with disease in pigs.
  - evidence of horizontal human transmission.

# Nipah virus in Bangladesh

## First outbreak..

- April - May, 2001 (Meherpur).
- 13 identified cases, 9 fatal.
- index case (33-year-old farmer) died after a 6 day clinical course.
- four others in the household became ill 10-18 days after the index case.
- a further four cases were relatives of the index case.

# Nipah virus in Bangladesh

## Second outbreak..

- January 2003 (Naogaon).
- 12 identified cases, 8 fatal.
- index case a 12-year-old boy.
- cases in 8 households.
- in one household, the man became ill and later died.
- two weeks later his wife and three eldest daughters became ill (wife and one daughter died).

# Nipah virus in Bangladesh

## Risk factors..

- handling or exposure to patient secretions was a risk factor for illness

(Hsu et al., 2004).

# Nipah virus in Bangladesh

## Third outbreak..

- January and February 2004 (Golanda).
- 29 identified cases, 22 fatal.
- predominance of young boys, suggesting that a specific activity may have led to exposure.

(Anon, 2004).

# Nipah virus in Bangladesh

## Fourth outbreak..

- April 2004 (Faridpur).
- 36 identified cases, 27 fatal.
- six patients developed an acute respiratory distress syndrome.
- clear evidence that person-to-person spread (likely large droplet transmission) was the primary mode of transmission.

# Nipah virus in Bangladesh

## Fifth outbreak..

- January 2005 (Tangail).
- 12 identified cases, 11 fatal.
- predominantly fever and neurological symptoms.
- drinking raw date palm juice significantly associated with illness.
- bats reportedly frequently drink from the juice pots.

(Anon, 2005).



Photo: Jon Epstein, 2006



Photo: Jon Epstein, 2006

# Nipah virus in Bangladesh

## Animal surveillance..

- serological evidence of infection only in flying foxes (*Pteropus giganteus*).

(Anon, 2004; Hsu et al., 2004).

Photo: Jon Epstein, 2006

# Nipah virus in Bangladesh

## Animal surveillance..

- concurrent surveillance of *P. giganteus* in India in 2003 found that 54% had neutralizing antibodies to Nipah virus.

(Epstein et al., 2005)



Photo: Jon Epstein, 2006



Photo: Jon Epstein, 2006



Photo: Jon Epstein, 2006



Photo: Jon Epstein, 2006



- Evidence for Henipavirus infection in bats\*
- ▲ Confirmed human Henipavirus infection

# Nipah virus in Bangladesh

## Where to from here..

- a comprehensive investigation of the ecology of NiV in *P. giganteus* to underpin risk management strategies in Bangladesh.
- research priorities include
  - population dynamics
  - virus infection dynamics
  - modes of transmission to humans
  - identification of factors precipitating emergence.

# The team..



- Peter Daszak, Jon Epstein: Consortium for Conservation Medicine.
- Steve Luby: International Center for Diarrhoeal Research, Bangladesh.
- Craig Smith: DPI&F Queensland

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