

# Epidemiology of Nipah virus

Carles Solà Riera

Degree in Microbiology, Universitat Autònoma de Barcelona  
csolariera@gmail.com

## A new tropical menace

Nipah virus (NiV) is an emerging zoonotic virus member of the genus *Henipavirus* within the *Paramyxoviridae* family. It is a new class of viral pathogen. Other zoonotic viruses, such as Hendra and Menangle viruses, are included in this family.

Nipah virus has caused some outbreaks in South Asia, infecting a wide range of animals and causing severe disease and death in people. Research with this pathogen is risky and difficult to perform and it has been considered a Biosafety Level 4 agent by CDC [4].

The case-fatality rate of infection in humans may be as high as 50% according to WHO [5].

The ratio of symptomatic versus asymptomatic is 3:1 [1]. Some of the symptoms are: multi-organ vasculitis, acute encephalitis, seizures, pneumonia and severe respiratory problems progressing to coma [22,23].

**Objective:** The aim of this report is to expose a specific case of a tropical infectious disease in order to aware everyone about the importance of emerging infectious diseases and the need of more research on the field.

Agent	VIRUS - RNA, Paramyxoviridae, Megamycovirus [Henipavirus] - Nipah virus
Reservoir	Pig Bat
Vector	Unknown
Vehicle	Unknown (? urine and secretions) Fruit and sap contaminated by bat feces
Incubation Period	Unknown
Diagnostic Tests	Viral culture (brain tissue, urine, CSF, serum). Serology. Nucleic acid amplification. Biosafety level 4.
Typical Adult Therapy	Supportive. Ribavirin has been reported to be effective in reducing mortality
Typical Pediatric Therapy	As for adult
Clinical Hints	Fever, headache, meningismus, encephalopathy, myoclonus, coma; follows contact with pigs. Case-fatality rate = 32%.
Synonyms	Hendra-like, Nipah, Nipah virus. ICD9: 078.89 ICD10: B33.8

Table 1 Nipah virus profile [2].

## The emergence in Malaysia

The first epidemic occurred from 1998 to 1999 in Malaysia; 5 of the 11 Malaysian states were affected (Figure 1) [1].

265 cases were reported, 111 of them being fatal [2].

Almost 1 million of pigs were slaughtered to control the outbreak and strict quarantine measures were established.

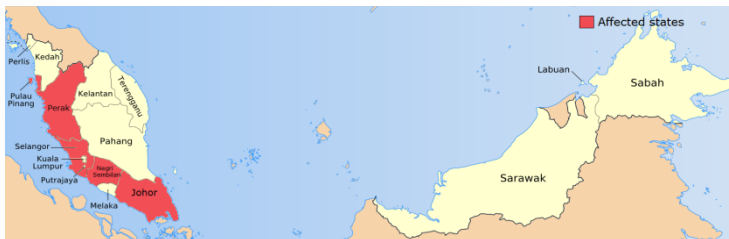


Figure 1 Nipah virus infections were reported in 5 of the 11 Malaysian states.

## Outbreaks

Since the Malaysian case, there have been many epidemics of NiV in South Asia:

Country	Year(s) of Outbreak	Cases	Deaths	Case Fatality Rate (%)	Mode of Acquisition
Malaysia	1998 to 1999	265	111	42	Exposure to sick pigs
Singapore	1999	11	1	9	Exposure to sick pigs
<b>TOTAL</b>		<b>276</b>	<b>112</b>	<b>41</b>	
India	2001	66	45	69	Person-to-person, nosocomial
Bangladesh	2001	28	9	32	Person-to-person, exposure to sick cow
Bangladesh	2003 to 2004	42	17	41	Person-to-person, Climbing trees, person-to-person
Bangladesh	2004	31	23	74	Person-to-person
Bangladesh	2004	36	26	72	Person-to-person
Bangladesh	2004 to 2005	44	12	27	Raw date palm sap exposure
Bangladesh	2007	15	14	93	Person-to-person
India	2007	50	5	10	Person-to-person
Bangladesh	2008	18	9	50	Person-to-person
Bangladesh	2010	3	3	100	Person-to-person
<b>TOTAL</b>		<b>333</b>	<b>163</b>	<b>49</b>	

Table 2 Nipah virus outbreaks (1998 to 2013) [1,2,23,26].

## Differences between outbreaks

Significant differences have been noticed between the outbreaks in Bangladesh and India, and those in Malaysia and Singapore. Phylogenetic analyses supported the idea of different existing NiV subtypes [26].

- Malaysia and Singapore:
  - Mortality rate: 41%
  - Specific symptoms: neurologic disease (encephalitis)
  - Infection from bats to pigs and pigs to human
  - Occasional human-to-human spread
- Bangladesh and India:
  - Mortality rate: very variable; from 27 up to 100%
  - Specific symptoms: acute respiratory distress syndrome
  - Infection from bats to human
  - Important human-to-human spread

As shown in Figure 2, many countries in Asia and East Africa are considered to be areas where future outbreaks may happen. Nipah virus is prevalent among fruit-eating bats and these are widely spread.

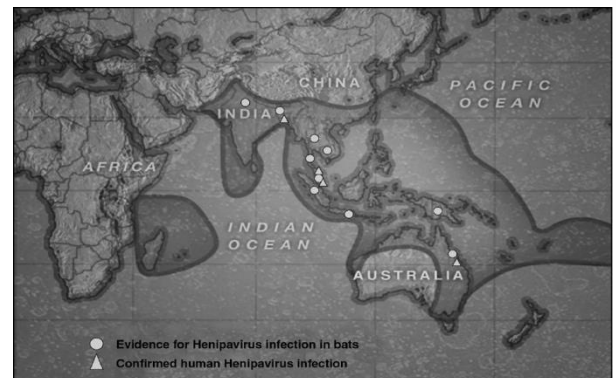


Figure 2 Global distribution of Henipaviruses and *Pteropus* spp. Courtesy: Epstein JH, et al. 2006 [22].

## Reservoirs and intermediate hosts



Figure 3 *Pteropus vampyrus* [3].

Fruit bats of the family *Pteropodidae* – particularly *Pteropus* spp. – are the natural hosts for NiV. Pigs and other domestic animals can be infected due to contact with infected bat secretions [22]. Nipah virus can spread directly from human to human due to close contact with people's secretions and excretions.

Twenty species of bats are considered to be reservoirs for Nipah virus.

Bats are highly mobile, moving beyond state and national borders and making contact with other conspecifics across multiple regions. This results in higher transmission rate of the virus.

## Causes of emergence and risk factors

The causes of emergence were several:

- Use of same non-sterilized needles in cattle
- Insufficient hygienic conditions in farms
- Contact with herds of sick animals
- Climbing trees for fruit gathering and
- Drinking of contaminated raw date palm sap
- Physical contact with infected humans (and any other activity implying contact with infected animal/human secretions and excretions)

## Key facts and conclusions

Nipah virus is an extremely pathogenic virus transmitted from animals to humans (category C biological agent).

Fruit bats (*Pteropodidae* family) are the natural host of NiV.

Potential biological weapon (the virus has been genetically characterized and can be stabilized as an aerosol).

No treatment or vaccine is available but ribavirin seems to reduce a little the mortality rate.

Vaccine development seems to be the most encouraging solution but further research, years of clinical trials and great amounts of money are required.

Surveillance programme and laboratory diagnostic capability must be strengthened in endangered countries.

Public education alerting the citizens will be also helpful.

## References

- [1]. Mandell, Douglas, and Benett's principles and practice of infectious diseases. 7th edition - 2010. Churchill Livingstone Elsevier.
- [2]. Hendra virus and Nipah virus: Global Status. 2011 edition. GIDEON E-books series.
- [22]. Epstein JH, et al. Nipah Virus: Impact, Origins and Causes of Emergence. *Curr Infect Dis Rep* 2006; 8(1):59-65.
- [23]. Goh KJ, Wong KT, Tan CT. Chapter 7: Nipah and Hendra Viruses Encephalitis. *New and Evolving Infections of the 21st Century*, 2007; 279-293.
- [26]. Chang L-Y, Tan C-T. Nipah Virus Infection (Pathology and Pathogenesis of an Emerging Paramyxoviral Zoonosis). *Am J Pathol*. 2013 161(6): 2153-2167.
- [3]. <http://www.arkive.org/>; [4]. <http://www.cdc.gov/>; [5]. <http://www.who.int/en/>