EXOTIC
Nipah and other exotic henipaviruses
Fact Sheet
April 2024

Key points

- Henipaviruses are important because of their wide host range, and some henipaviruses cause serious disease and death in humans and domestic animals.
- Several henipaviruses are zoonotic, and **Nipah virus** (NiV) and **Hendra virus** (HeV) are considered highly virulent. Some henipaviruses have not been linked to disease in any species.
- **Hendra virus** and **Cedar virus** occur in Australia; other henipaviruses occur in parts of Asia and Africa.
- Two henipaviruses in China have been linked to serious disease and death in humans.
- Flying-foxes, shrews, rodents and insectivorous bats are the natural hosts for these viruses.
- Both Nipah virus and Hendra virus are nationally notifiable diseases. You must notify animal health authorities if you suspect an animal has either of these diseases.

This Fact Sheet focuses on henipaviruses **exotic** to Australia. See the WHA Fact Sheet Hendra virus and Australia wildlife for more information on Hendra virus.

One Health implications

Wildlife and the environment: there is no evidence of disease in wildlife caused by henipaviruses. Infection in wildlife and spillover into domestic animals and humans is driven in part by human-induced habitat-loss, changing climate and change in land use [1, 2]. Flying-foxes and other wildlife play important ecological roles, but conflict and persecution can arise when people perceive these animals as a disease threat.

Domestic animals: NiV is highly fatal in pigs and HeV infection is highly fatal in domestic horses.

Humans: both NiV and HeV infection cause serious neurological disease in humans and have a high fatality rate. Other henipaviruses have been linked to disease in humans, however there is limited information available.

Aetiology

Henipavirus is a genus of negative-strand, enveloped RNA viruses in the family Paramyxoviridae, order Mononegavirales. There are at least nine described species and other potential species are under study. Some henipaviruses are capable of infecting a wide host range.

Nipah virus (and **Hendra virus**) are very serious zoonoses with a very high fatality rate in humans. They can cause serious disease and death in pigs and horses, respectively.

Moijang virus (MojV) has been implicated in disease and death in a small number of people in China. There is no evidence of other animals developing disease associated with MojV [3].

Langya virus (LaV) is considered the cause of moderately severe disease in dozens of people in China. There is no evidence of other animals developing disease associated with LaV [4-7].

Other identified henipaviruses have not been linked to disease in humans, domestic or wild animals [8-11]. More details on One Health implications for henipaviruses are provided in Table 1.

Table 1: One Health implications and other relevant information for identified henipaviruses.

Virus	Natural hosts	World distribution (year emerged)	Present in Australia?	Zoonotic?	Disease in animals, wild or domestic	Human-to-human spread?
Nipah virus	Flying-fox (*Pteropus* spp.)	Malaysia, Singapore, Bangladesh, India, other areas of SE Asia (1998)	No	Yes, severe disease, death	Pigs, severe disease and death. Occasionally horses, cats, dogs.	Yes
Hendra virus	Flying-fox	Australia (1994)	Yes	Yes, severe disease, death	Horses, severe disease and death	No
Moijang virus	*Rattus flavipectus* (buff-chested rat)	China (2012)	No	Yes, severe pneumonia, three deaths reported.	No evidence	No evidence
Langya virus	Shrews	China (2018)	No	Yes, mild to moderate systemic disease. No deaths reported.		No evidence
Ghanian bat henipavirus	Flying-fox	Africa (2008)	No	No	No evidence	N/A
Angavokely virus	Flying-fox	Madagascar (2022)	No	No	No evidence	N/A
Gamak & Daeryong viruses	Shrews	South Korea (2021)	No	No	No evidence	No
Cedar virus	Flying-fox	Australia (2012)	Yes	No	No evidence	No

Epidemiology

Henipaviruses can affect a wide range of mammalian hosts.

Nipah virus

Nipah virus spreads through close contact with virus-laden body secretions, particularly blood, urine and saliva. Incubation period is 4-14 days. Nipah is spread to humans from flying-foxes either from

an infected domestic animal (usually pigs, sometimes horses) or through ingestion of contaminated food stuff (date palm syrup in India and Bangladesh).

Nipah virus emerged in 1998 in Malaysia and Singapore [12], with a large outbreak of disease in domestic animals and humans. Many thousands of pigs and smaller numbers of other domestic animals died. Workers on pig farms and in abattoirs became infected with 105 deaths (40%) in 265 confirmed cases. The outbreak devastated the Malaysian pig farming industry.

In Bangladesh, Nipah virus outbreaks in humans began in 2001. Multiple smaller outbreaks in humans have occurred near-annually in Bangladesh and nearby southern India since 2001. Infection originates from flying-foxes and spillover may be to pigs or directly to humans. Contamination of raw date palm juice by bat saliva, urine or faeces is an important mode of directly infecting humans [13]. Some outbreaks show human-to-human spread, usually in carers and hospital workers [14]. Nipah virus emerged in the Philippines in 2014 and was associated with human consumption of horse meat [15].

There is widespread serological antibody evidence of Henipaviruses in flying-foxes wherever they occur: south-east Asia, the Indian subcontinent, some Pacific islands, the east coast of Africa, and Australia [16-18].

For both NiV and HeV, virus is shed in flying-fox urine at higher rates during the nutrient-poor dry seasons and these seasonal viral shedding pulses have been linked to zoonotic spillover [2, 19].

Nipah virus has never been isolated in Australia and a risk assessment of incursion of the virus into Australia found the risk to be very low to low, with a high level of uncertainty. Susceptibility of Australian wildlife to Nipah virus is unknown, but Australian feral pigs, cats and horses are assumed to be susceptible [20].

Other exotic henipaviruses

Moijang virus (MojV) was first identified following a human outbreak of severe pneumonia in China in June 2012. Three people who had been working in an abandoned mine died from severe pneumonia. The source of the novel henipavirus was traced to *Rattus flavipectus* (buff-chested rat), which are considered the natural reservoir of MojV [3]. However there has been some speculation that MojV was not the true cause of pneumonia in these cases [21].

Angavokely virus [AngV] was identified in urine samples collected from the Madagascar fruit bat (*Eidolon dupreanum*). This virus is part of an ancestral group of henipaviruses, more recently diverged than the rodent- and shrew-borne henipaviruses and might be pathogenic if spillover to humans occurred [8].

Gamak virus (GAKV) and **Daeryong virus** (DARV) (novel henipaviruses) were isolated from two species of shrew, *Crocidura* spp. in South Korea [10]. These viruses and rodent-borne henipavirus (MojV) appear to be distinct from previously identified bat-borne henipaviruses.

Clinical signs

Nipah virus: severe respiratory and neurological disease and death in humans. In pigs, clinical signs vary between age groups. Young pigs show sudden death or severe respiratory and nervous signs

with high mortality rates. Older pigs show lower mortality rates. Not all infected pigs develop disease.

Hendra virus: severe respiratory and neurological disease and death in humans and horses.

Moijang virus: severe pneumonia and death in humans [3].

Langya virus: no signs of disease have been detected in the natural host species.

There are no reports of disease associated with other henipaviruses.

Diagnosis

Tests for henipaviruses include PCR from throat and nasal swabs, urine and blood. Serum neutralisation, ELISA and IFAT can be used to test for antibodies to henipavirus. Henipavirus grows readily in tissue culture. Nipah and Hendra viruses are zoonotic biosafety level 4 pathogens and extreme care must be taken in handling infected animals and collecting and testing samples.

Pathology

Grossly, in diseased animals there may be blood-stained exudates from the mouth or nostrils and lungs may be oedematous.

Histopathology shows non-suppurative pneumonia, encephalitis and vasculitis with endothelial syncytia [22].

Laboratory diagnostic specimens and procedures

Samples for testing include clotted blood, whole blood in EDTA, fixed and fresh lung, brain and other major organs and tissues. Operators **must** seek professional advice on appropriate use of personal protection and inactivation of the virus in the environment and in specimens **before** collecting samples.

Differential diagnoses

For both humans and domestic animals, a wide range of infectious diseases and toxins are capable of causing respiratory and neurological signs or sudden death, and should be considered in a differential diagnosis list. For example, the Malaysian Nipah virus outbreak was first thought to be due to Japanese encephalitis virus [23].

Treatment

Treatment of wild animals infected with henipaviruses is not considered practical or warranted. There are no specific treatments for most domestic animals infected with henipaviruses.

A range of treatments have been attempted in humans infected with henipaviruses. Monoclonal antibodies have been used for treatment of NiV infections [24]. Other drugs such as antiviral medications, have been used both experimentally and in clinical treatment.

Prevention and control

A vaccine to prevent NiV infection in humans is under trial [24, 25]. A vaccine for HeV in horses is available.

Prevention includes practices to reduce exposure of domestic animals to flying-fox urine. In Malaysia this has included no longer farming pigs in fruit orchards, which attract flying-foxes. Reducing exposure through food contamination has focused on safer practices for collection of date palm syrup.

Successful eradication of NiV outbreaks in Malaysia was achieved by animal quarantine, test and slaughter [23]. Environmental and personal hygiene measures will help to control spread, as close contact is required for transmission. Henipaviruses are readily inactivated by a range of disinfectants, detergents, soaps and sodium hypochlorite (bleach) [26]. Routine physical cleaning with the use of a commercial disinfectant or bleach will control the virus in the environment.

Research

Much remains to be learnt about henipaviruses, although HeV has been studied in detail in Australia. The host range of exotic henipaviruses (including susceptibility of Australian wildlife species) is a key research question. Newly described exotic henipaviruses require more research in many areas, and for all Henipah viruses, research is needed to better understand the drivers of host excretion and virus spillover. The Australian Centre for Disease Preparedness has an ongoing research program on henipaviruses, including development of therapeutic and control agents.

Surveillance and management

Hendra virus and Nipah virus are nationally notifiable diseases (see www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/notifiable). By law you must notify animal health authorities in your jurisdiction if you know or suspect that an animal has a notifiable pest or disease. Refer to advice in your jurisdiction (www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/state-notifiable) and on outbreak.gov.au on how to report.

Wildlife Health Australia administers Australia's general wildlife health surveillance system, in partnership with government and non-government agencies. Wildlife health data is collected into a national database, the electronic Wildlife Health Information System (eWHIS). Information is reported by a variety of sources including government agencies, zoo based wildlife hospitals, sentinel veterinary clinics, universities, wildlife rehabilitators, and a range of other organisations and individuals. Targeted surveillance data is also collected by WHA. See the WHA website for more information https://wildlifehealthaustralia.com.au/Our-Work/Surveillance and https://wildlifehealthaustralia.com.au/Our-Work/Surveillance/eWHIS-Wildlife-Health-Information-System.

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Wildlife Health Australia recognises the Traditional Custodians of Country throughout Australia. We respectfully acknowledge Aboriginal and Torres Strait Islander peoples' continuing connection to land, sea, wildlife and community. We pay our respects to them and their cultures, and to their Elders past and present.

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Find out more at **wildlifehealthaustralia.com.au**

Email: **admin@wildlifehealthaustralia.com.au**

Or call +61 2 9960 6333