

Hendra Virus in Public Health Perspective

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ABSTRACT

Hendra Virus is a lethal zoonotic virus initially identified in horses in Australia in 1994. This virus is highly contagious and can cause severe respiratory and neurological conditions in both horses and humans. Thought to have a natural reservoir in flying foxes, the virus can also infect other mammals, including horses, cats, dogs, and humans. By coming into contact with infected individuals or their bodily fluids, humans are susceptible to the Hendra virus through zoonotic transmission. Human Hendra virus infections can cause mild to severe symptoms with no known cure at this time. Supportive care can be offered and experimental treatments such as convalescent plasma and monoclonal antibodies have been tried with varying levels of efficacy. The risk of zoonotic transmission to humans can be decreased by immunizing horses against the Hendra virus. There is no licensed vaccine for human use yet, research is ongoing to develop one. Since the Hendra virus poses a serious threat to public health through zoonotic transmission, it is crucial to comprehend the mechanisms and risk factors for transmission in order to prevent and control epidemics.

Introduction

Zoonotic illnesses are contagious conditions that can be passed from animals to people. (Middleton 2014). One such ailment that has drawn attention recently is the Hendra virus. The lethal zoonotic virus known as the Hendra virus was originally identified in horses of Australia in 1994 (Middleton 2014). Since then, there have been other Hendra virus outbreaks, mostly in Australia, which have caused human illnesses and fatalities. Understanding the processes and risk factors for transmission is essential for avoiding and controlling epidemics since the zoonotic transmission of the Hendra virus poses a serious threat to public health (Tulsiani et al. 2011).

This article provides an overview of the Hendra virus, its hosts, reservoirs, and the clinical features of infection. It also explores the modes of zoonotic transmission, prevention strategies, treatment, and vaccination.

Etiology:

Hendra virus belongs to the Paramyxoviridae family and the genus Henipavirus [1]. It was initially discovered in horses in the Australian suburb of Hendra in 1994 [2]. According to Geisbert et al. [3], the highly pathogenic Hendra virus can cause serious respiratory and neurological conditions in both horses and people. The first known epidemic of the virus in horses occurred in the area that the virus is named after [4].

Hendra virus is an enveloped, single-stranded RNA virus that is highly contagious and can be spread by contact with infected animals or their

bodily fluids [4]. Flying foxes (fruit bats) are thought to be the virus's natural reservoir, but these can also infect other mammals, such as horses, cats, dogs, and humans [5].

Transmission:

Humans can acquire the Hendra virus through zoonotic transmission when they come into touch with infected patients or their body fluids [6]. Direct contact with infected animals, coming into contact with contaminated objects, or inhaling aerosolized virus particles are just a couple of the ways the virus can spread [7].

The danger of zoonotic transmission is greatest for those who come into touch with diseased horses regularly, such as stable workers, veterinarians, and horse trainers. Also, there is a higher risk of infection for people who handle or come into contact with flying foxes, which are the Hendra virus's natural reservoirs [8].

Clinical Features:

There are no pathognomic signs present. Human Hendra virus infections can have a wide variety of clinical symptoms, from moderate to severe. Hendra Virus incubation time in horses is 3-16 days following exposure. Clinical symptoms are divided into three categories: neurological, respiratory, and miscellaneous symptoms. Tachypnea and frothy nasal discharge are respiratory symptoms. Ataxia, convulsions, altered mental status, recumbency, head tilt, urine incontinence, and circling are a few examples of neurologic symptoms. Fever, tachycardia, sadness, colic, and restlessness are other symptoms. Because of the high fatality rate of the Hendra virus, patients are treated on a priority basis [9]

Initial flu-like signs of a human Hendra virus infection can include fever, headache, muscular aches, and general malaise. Respiratory distress, which includes coughing, wheezing, and chest pain, might come after these symptoms. Furthermore possible are gastrointestinal problems such as nausea, vomiting, and diarrhoea. Severe neurological symptoms, such as confusion, disorientation, seizures, and coma, may emerge as the illness worsens. In extreme circumstances, multi-organ failure can happen and result in death [10].

Human infection with the Hendra virus has a significant mortality rate; between 50% and 100% of recorded cases result in fatalities [10]. The amount of virus to which the individual was exposed, together with their age and general health, all appear to have an impact on the disease's severity.

Treatment:

Human Hendra virus infection is currently untreatable with antiviral medications [11]. The mainstay of treatment is supportive care, which may include mechanical breathing, oxygen therapy, and the control of side effects such as secondary bacterial infections [12]

In a small number of patients, experimental therapies such as monoclonal antibodies and convalescent plasma have been employed

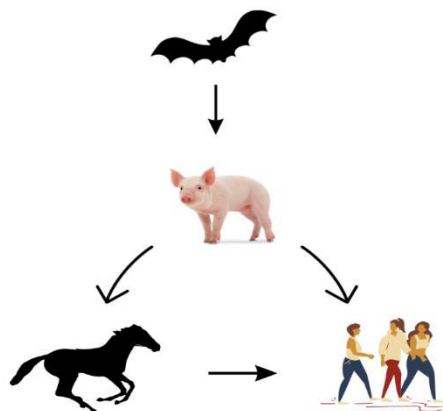


Fig. 1 Transmission of Hendra Virus

with varying degrees of success [13]. These therapies aren't generally accessible and are still regarded as experimental.

Vaccination:

The danger of zoonotic transmission to humans can be decreased by immunizing horses against the Hendra virus [14]. In places where Hendra virus outbreaks take place, the vaccine is now widely accessible after receiving initial approval for use in Australia in 2012. The glycoprotein G portion of the Hendra virus is used in the recombinant vaccine. Two initial doses of the vaccine are given, followed by booster shots every six months. It has been demonstrated that the vaccination is both secure and efficient in shielding horses from Hendra virus infection. Horse vaccination lowers the danger of human infection while also protecting the animals from the Hendra virus [15].

Although there isn't a vaccine that has been licensed for human use just yet, research is still being done to create a vaccine that might shield people from the Hendra virus [15]. An extra layer of defence against the virus may be offered by the creation of a human vaccine, especially for those who are more likely to be exposed [16]. Research is still being done to create vaccinations for both humans and animals as well as efficient antiviral treatments for the Hendra virus [13].

Prevention:

The Hendra virus must be controlled to lower the possibility of zoonotic transmission to people. Among the most crucial preventative techniques are:

- 1) Put in place strict biosecurity measures to avoid getting into touch with diseased animals or their bodily fluids [17]. As part of this, sick animals must be kept apart, handlers must put on personal protective equipment when working with possibly infectious animals, and contaminated objects must be disposed of correctly.
- 2) Immunizing horses against the Hendra virus lowers the chance of human infection [18]
- 3) Maintaining excellent hygiene, which includes regularly washing your hands and staying away from your face, particularly after coming into contact with animals or polluted items.
- 4) Staying away from flying foxes, which serve as the Hendra virus's natural reservoirs [18].
- 5) Early identification and isolation of affected people to stop further spread.
- 6) Improving methods for monitoring and tracking prospective epidemics.
- 7) Effective communication and teamwork between experts in animal and human health to control epidemics and stop human transmission.

Conclusion:

The Hendra Virus, which is currently poorly understood, is one of the zoonotic diseases that are now emerging. Due to the infection's various symptoms, diagnosis is particularly challenging. A reminder of the value of One Health, which acknowledges the interdependence of human, animal, and environmental health, is provided by epidemics of the Hendra virus. We can protect animal and human health and stop the development of zoonotic illnesses by cooperating to stop and control the Hendra virus.

References

- [1] Field HE. Hendra virus ecology and transmission. *Current opinion in virology*. 2016 Feb 1; 16:120-5.
- [2] Escaffre O, Borisevich V, Rockx B. Pathogenesis of Hendra and Nipah virus infection in humans. *Journal of infection in developing countries*. 2013 Apr 1;7(4):308-11.
- [3] Yuen KY, Fraser NS, Henning J, Halpin K, Gibson JS, Betzien L, Stewart AJ. Hendra virus: Epidemiology dynamics in relation to climate change, diagnostic tests and control measures. *One Health*. 2021 Jun 1; 12:100207.
- [4] Middleton D. Hendra virus. *Veterinary Clinics: Equine Practice*. 2014 Dec 1;30(3):579-89.
- [5] Yuen KY, Fraser NS, Henning J, Halpin K, Gibson JS, Betzien L, Stewart AJ. Hendra virus: Epidemiology dynamics in relation to climate change, diagnostic tests and control measures. *One Health*. 2021 Jun 1;12:100207.
- [6] Broder CC, Xu K, Nikolov DB, Zhu Z, Dimitrov DS, Middleton D, Pallister J, Geisbert TW, Bossart KN, Wang LF. A treatment for and vaccine against the deadly Hendra and Nipah viruses. *Antiviral research*. 2013 Oct 1;100(1):8-13.
- [7] Rockx B, Bossart KN, Feldmann F, Geisbert JB, Hickey AC, Brining D, Callison J, Safronetz D, Marzi A, Kercher L, Long D. A novel model of lethal Hendra virus infection in African green monkeys and the effectiveness of ribavirin treatment. *Journal of virology*. 2010 Oct 1;84(19):9831-9.
- [8] Gazal S, Sharma N, Gazal S, Tikoo M, Shikha D, Badroo GA, Rashid M, Lee SJ. Nipah and Hendra Viruses: Deadly Zoonotic Paramyxoviruses with the Potential to Cause the Next Pandemic. *Pathogens*. 2022 Dec;11(12):1419.
- [9] Geisbert TW, Daddario-DiCaprio KM, Hickey AC, Smith MA, Chan YP, Wang LF, Mattapallil JJ, Geisbert JB, Bossart KN, Broder CC. Development of an acute and highly pathogenic nonhuman primate model of Nipah virus infection. *PloS one*. 2010 May 18;5(5):e10690.
- [10] Field HE, Breed AC, Sheild J, Hedlefs RM, Pittard K, Pott B, Summers PM. Epidemiological perspectives on Hendra virus infection in horses and flying foxes. *Australian Veterinary Journal*. 2007;85:268-70.
- [11] Eaton BT, Broder CC, Middleton D, Wang LF. Hendra and Nipah viruses: different and dangerous. *Nature Reviews Microbiology*. 2006 Jan 1;4(1):23-35.
- [12] Marsh GA, Wang LF. Hendra and Nipah viruses: why are they so deadly?. *Current opinion in virology*. 2012 Jun 1;2(3):242-7.
- [13] Broder CC, Weir DL, Reid PA. Hendra virus and Nipah virus animal vaccines. *Vaccine*. 2016 Jun 24;34(30):3525-34.

- [14] Ang BS, Lim TC, Wang L. Nipah virus infection. *Journal of clinical microbiology*. 2018 Jun;56(6):e01875-17.
- [15] Prabakaran P, Zhu Z, Xiao X, Biragyn A, Dimitrov AS, Broder CC, Dimitrov DS. Potent human monoclonal antibodies against SARS CoV, Nipah and Hendra viruses. *Expert opinion on biological therapy*. 2009 Mar 1;9(3):355-68.
- [16] Edson D, Peel AJ, Huth L, Mayer DG, Vidgen ME, McMichael L, Broos A, Melville D, Kristoffersen J, de Jong C, McLaughlin A. Time of year, age class and body condition predict Hendra virus infection in Australian black flying foxes (*Pteropus alecto*). *Epidemiology & Infection*. 2019;147.
- [17] Annand EJ, Horsburgh BA, Xu K, Reid PA, Poole B, de Kantzow MC, Brown N, Tweedie A, Michie M, Grewar JD, Jackson AE. Novel Hendra virus variant detected by sentinel surveillance of horses in Australia. *Emerging infectious diseases*. 2022 Mar;28(3):693.
- [18] Ochani RK, Batra S, Shaikh A, Asad A. Nipah virus-the rising epidemic: a review. *Infez Med*. 2019 Jun 1;27(2):117-27.