

Nipah

Importance

Nipah virus infection is an emerging new disease, first described during a 1998-1999 epidemic in Malaysia. Although mortality appears to be low in pigs, the virus can spread readily from pigs to humans and other animals, with serious consequences. Infected humans may develop serious and often fatal encephalitis. Epidemics of Nipah can also result in serious economic losses to pig farmers; the outbreak in Malaysia was only controlled after more than 1 million pigs were culled. Although the current outbreak seems to be at an end, a reservoir of virus appears to exist in asymptomatic fruit bats.

Etiology

Nipah virus is a previously unknown virus. It has been placed in a new genus (proposed name *Megamyxovirus*) in the family *Paramyxoviridae*. Antibodies to the Nipah virus cross-react with the Hendra virus.

Species affected

Nipah virus infections have been seen in pigs, humans, dogs, and goats. Antibodies to the virus have been reported in dogs, cats, horses, and goats, and virus antigens were found in one case of meningitis in a horse. Sheep may also be affected. Fruit bats (flying foxes) are thought to be natural hosts for this virus.

Geographic distribution

Nipah virus infections have been reported only in Malaysia and in pigs exported from that country. Several human cases occurred in Singapore, among abattoir workers in contact with imported pigs. On the basis of known infections, this virus should be considered to be endemic in Southeast Asia. The probable reservoir host, the fruit bat of the genus *Pteropus* (also known as the 'flying fox'), is found in Malaysia, Australia, Indonesia, the Philippines, and some of the Pacific Islands.

Transmission

Most infections are thought to occur after close direct contact with the excretions or secretions from an infected pig. Infections spread readily from infected pigs to other species. Nipah virus does not appear to be spread from human to human, and transmissions from horses to humans seem to be rare.

Nipah virus or its antigens have been found in the lungs, upper and lower airways, central nervous system, and kidneys. Virus excretion through oral-nasal routes has been proven. Experimentally, pigs can be infected by oral or parental inoculation. Aerosol spread does not appear to be a major route, although respiratory infection may occur. Transmission may also be possible in the semen and by fomites such as contaminated needles or equipment. Animals are infectious during the incubation period.

Fruit bats are thought to be the reservoir host; infections in this species are common and appear to be asymptomatic.

Incubation period

The incubation period in pigs is estimated to be 7 to 14 days, but may be as short as 4 days.

Clinical signs

In pigs, asymptomatic infections appear to be common. Symptomatic infections are usually acute febrile illnesses, but fulminating infections and sudden death have also been seen. In general, mortality is low except in young piglets.

In pigs from 4 weeks to 6 months old, respiratory symptoms appear to be more common than neurologic signs. In this age group, common symptoms include fever, open mouth breathing, rapid and labored respiration, and a loud barking cough. Neurologic signs are sometimes seen and can include trembling, twitches, muscle spasms, myoclonus, weakness in the hind legs, spastic paresis, lameness, an uncoordinated gait when driven or hurried, and generalized pain that is particularly evident in the hind quarters.

Similar symptoms are seen in sows and boars, but neurologic disease appears to be more common. The neurological signs may include agitation, head pressing, nystagmus, chomping of the mouth, tetanus-like spasms, seizures, and apparent pharyngeal muscle paralysis. Increased salivation and nasal discharge, and possible first trimester abortion have also been reported.

In piglets, common clinical signs include open mouth breathing, leg weakness with muscle tremors, and twitching.

An unproductive cough, poor growth, severe respiratory signs, and death have been seen in goats. The symptoms in dogs are similar to those seen in pigs.

Post mortem lesions

Mild to severe lung lesions can be found in most symptomatic pigs. These lesions may include varying degrees of consolidation, petechial or ecchymotic hemorrhages, and emphysema. On cut surface, the interlobular septa may be distended. The bronchi and trachea may contain frothy, sometimes bloodstained, fluid. In the brain, generalized congestion and edema has been seen. Petechial hemorrhages were noted in one case. The kidneys may be congested, but are often normal. No lesions have been seen in other internal organs.

In dogs, the lesions may include hemorrhages and congestion in the kidneys and exudates in the bronchi and trachea.

Morbidity and Mortality

In Malaysia, Nipah virus appeared to be present mainly in pigs. Prior to depopulation, antibodies to the virus were found in approximately 5.6% of all pig farms. In contrast, only five horses out of more than 3200 were positive by serology. No signs of current

infection were seen in two necropsied horses; however, virus antigens were found in a horse that had died with symptoms of meningitis in 1998.

In pigs older than 4 weeks, morbidity appears to be high but mortality low. In the Malaysian outbreak, morbidity in pigs from 4 weeks to 6 months old approached 100% but mortality ranged from less than 1% to 5%. The mortality rate was approximately 40% in piglets; however, neglect by ill sows may have contributed to the high death rate.

Diagnosis

Clinical

The symptoms of Nipah virus infections are not dramatically different from other respiratory and neurologic illnesses of pigs. The unusual loud, barking cough or the presence of human cases of encephalitis may raise the index of suspicion.

Differential diagnosis

Nipah virus infections must be differentiated from Japanese encephalitis. Other respiratory or neurologic syndromes of pigs must also be ruled out.

Laboratory tests

Infections can be diagnosed by a serum neutralization test, a polymerase chain reaction (PCR) assay, and virus isolation. Nipah virus can be isolated in several cell lines including African green monkey kidney (Vero), baby hamster kidney (BHK), and porcine spleen (PS) cells. An enzyme linked immunosorbent assay (ELISA) is available for serologic testing in Malaysia.

All procedures should be carried out in a biosafety level 4 (BSL-4) laboratory

Samples to collect

Before collecting or sending any samples from animals with a suspected foreign animal disease, contact the AVIC. These samples should only be sent under secure conditions, by authorized personnel, and to authorized laboratories to prevent the spread of disease. Nipah is a zoonotic disease; samples should be collected and handled with all appropriate precautions.

Nipah virus or its antigens have been found in the lungs, upper and lower airways, central nervous system, and kidneys. In the Malaysian outbreak, samples of the lungs, kidneys, spleen, liver, heart, and brain were collected. Serum should also be collected for serology.

Recommended actions if Nipah virus infection is suspected

Notification of authorities

Nipah virus infections must be reported to state or federal authorities immediately upon diagnosis or suspicion of the disease. Federal: Area Veterinarians in Charge (AVICS)

http://www.aphis.usda.gov/vs/area_offices.htm

State vets: <http://www.aphis.usda.gov/vs/sregs/official.html>

Quarantine and Disinfection

Nipah virus is contagious and appears to be easily spread by contact from pigs. Infections may also be spread between farms by fomites and possibly infected dogs or cats. The epidemic in Malaysia was controlled by mass culling of seropositive animals. This virus has been classified as a Hazard Group 4 pathogen; infected animals and blood and tissue samples must be handled with appropriate biosecurity precautions.

Nipah virus is readily inactivated by detergents; routine cleaning and disinfection with sodium hypochlorite, Betadine®, Vircon®, or Lysol® is expected to be effective. Sodium hypochlorite has been recommended for disinfection of pig farms in Malaysia. For spills, disinfection with 10,000 ppm chlorine is recommended.

Public health

Human infections range from asymptomatic to fatal infections. Reported symptoms are flu-like and may include fever, severe headaches, myalgia, a sore throat, disorientation, dizziness, drowsiness, or other signs of encephalitis or meningitis. During the 1998-1999 epidemic in Malaysia, 265 cases of suspected Nipah virus infection were seen in humans; 105 cases were fatal. Most cases occurred in pig farmers or others who had contact with swine.

Humans in contact with animals from endemic areas should wear protective clothing, including gloves, disposable gowns, and a face visor. Nipah virus is classified as a hazard group 4 pathogen.

For More Information

World Organization for Animal Health (OIE)
<http://www.oie.int>

OIE International Animal Health Code
http://www.oie.int/eng/normes/mcode/A_summry.htm

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Center for Emerging Issues, Centers for Epidemiology and Animal Health, and Animal and Plant Health Inspection Service, USDA
<http://www.aphis.usda.gov:80/vs/ceah/cei/nipah.htm>

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Department of Health Social Services, and Public Safety U.K.
http://www.doh.gov.uk/hendra_nipah

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