A Short Note on Nipah Virus Infection – An Emerging Zoonosis

Maria Anto Dani Nishanth* and Bhargavi Dadimi

MVSc scholar, Division of Veterinary public health and epidemiology, ICAR-IVRI, Izatnagar

Corresponding Author
Maria Anto Dani Nishanth
Email: daninishanth@gmail.com

Keywords
Nipah virus, zoonosis, bats, pigs

How to cite this article:

ABSTRACT
Nipah virus is an emerging zoonotic disease, which was first described in 1999 in Malaysia. It is caused by a virus of the genus Henipa virus belonging to the family paramyxoviridae. The primary reservoir host of this virus is fruit bat which belongs to pteropus genus. The disease spreads from reservoir host to the swine population which acts as source of infection to humans or they can directly contract the disease by coming in close contact with the infected bat secretions. In India first outbreak was reported in 2000 from Siliguri district of west Bengal, and the second outbreak was reported in 2007. The latest outbreak was reported in 2018 in Kozhikode and Malappuram districts of Kerala state. The case fatality in animals is low (1 to 5%) but in piglets it reaches up to 40%. The case fatality rate in humans ranges between 40 and 75%. Preventing infection in pigs can help in reducing risk of infection in humans.

INTRODUCTION
Nipah virus is an emerging zoonotic disease; it had been first described in 1999 and is caused by a virus of the family Paramyxoviridae. It is also called as Barking pig syndrome, Porcine respiratory and encephalitis syndrome and Porcine respiratory and Neurologic syndrome. The disease can spread from its wildlife reservoir to pigs and humans. Nipah virus causes severe, rapidly progressive encephalitis in humans, and severe respiratory disease in pigs. It comes under genus henipa virus of the family paramyxoviridae. It is classified in List D of SPC list diseases, and is a notifiable disease in most countries.

Origin and Outbreak
The first ever identified outbreak of Nipah virus occurred in Malaysia in 1999 which subsequently spread as far as Singapore. In 2001, the OIE officially declared Malaysia free
from Nipah virus infection in its pig population. However the disease could also be present within bat populations. Considering the distribution of fruit bats and their ability to fly over long distances, the disease might be expected to be present among bats in neighboring areas. First outbreak in India occurred between January 31–February 23 in 2001, Siliguri where 66 cases with 74% mortality rate. 2nd outbreak was reported in 2007 February – May, Nadia District, where up to 50 suspected cases with 3–5 fatalities. The outbreak area is on border with the Bangladesh district of Kushtia where eight cases of Nipah virus encephalitis with five fatalities occurred during March and April 2007. This was preceded by an outbreak in Thakurgaon during January and February affecting 7 people with 3 deaths. The 3rd outbreak was reported in Kozikode and Malappuram districts of Kerala in May 2018 with 19 cases and 17 deaths. Person-to-person transmission was evident in all these 3 outbreaks.

Susceptible species

The susceptible species and host range for Nipah virus are not yet fully known, however. Fruit bats of the Pteropus genus has been shown to be the natural hosts in recently conducted researches. As of now four species of fruit bats, including two flying fox species, and one species of insectivorous bat have been found to carry Nipah virus. Humans are susceptible and among domestic animals, pigs are the highly susceptible, whereas dogs, cats, goats and horses have shown evidence of infection without concurrent disease. Rodents and birds haven’t seemed to be susceptible.

Transmission

The primary reservoir for Nipah virus is flying foxes (fruit bats) of the genus Pteropus. Transmission of Nipah virus from fruit bats to pigs is not clear; however, there are various biologically plausible ways for infected secretions of primary hosts to enter swine population including direct contact with infected secretions, contaminated fruits or dead bats.

Nipah virus transmission from bats to people:

Epidemiological investigations have identified three pathways of transmission of nipah virus from bats to people. The most frequently implicated route is ingestion of fresh date palm sap pulp. The second route of transmission for Nipah virus from bats to people is via domestic animals (especially pigs). Fruit bats commonly drop partially eaten fruits which are saliva-laden. Domestic animals forage for such food. Date palm sap that’s contaminated with bat feces is unfit for human consumption is occasionally fed to livestock. The domestic animals (swine) may become infected with Nipah virus, and shed the virus to other animals, including humans. Thirdly, people may come in direct contact with Nipah virus infected bat secretions.

Person-to-person transmission:

Respiratory secretions are found to be particularly important for person-to-person transmission of Nipah Virus.

Disease in animals

Nipah virus in pigs is highly contagious and easily spreads by transport of pigs from farm-to-farm. The incubation period ranges from 7 to 14 days. Many affected swine can be asymptomatic. Those affected develop an acute fever (104ºF), rapid, labored and open-mouth breathing. They also have an unusual loud and explosive barking cough (called as “1-mile cough”). Clinical signs in swine varies according to the age of pigs. In nursery and grower pigs, acute febrile illness with respiratory signs are most ordinarily seen. In severe cases blood-tinged mucous discharge from nostrils may be seen. In less severe cases, open mouth breathing is observed. Neurological signs also possible and include trembling, twitching, muscular spasms, rear leg weakness and possible lameness or spastic
paresis. In boars and sows the affected animals may be found dead overnight or may show acute febrile illness with labored breathing, serous, mucopurulent or even blood tinged nasal discharges and increased salivation. Neurological signs in sows shown to be more common than in younger animals and may include agitation, head pressing and tetanus like spasms, seizures, nystagmus and paralysis of pharyngeal muscles. Morbidity is estimated to be 100% but mortality rate is low (1 to 5%), but in piglets it is 40%. Disease in other species is poorly documented. Clinical signs in dogs are Distemper-like signs, Fever, respiratory distress, Oculonasal discharges, whereas in cats it causes Fever, severe respiratory signs and depression. In horses it causes Encephalitis.

**Disease in humans**

Incubation period ranges from 4 to 20 days and clinical signs include Fever and headache, Encephalitis (Dizziness, drowsiness, vomiting, Seizures, progresses to coma in 24-48 hours) The case fatality rate is estimated to range between 40 and 75%. Respiratory difficulty, Relapsing neurologic symptoms. Complications include Septicemia (24%), GI bleeding (5%), and renal impairment (4%).

**Diagnosis**

Diagnostic methods for detection of Nipah virus include serology, histopathogy, immunohistochemistry, PCR, and virus isolation. Differential diagnostic methods for Nipah virus in swine include: Classical swine fever, Porcine respiratory and reproductive syndrome (PRRS), Aujeszky's disease (pseudo rabies), swine enzootic pneumonia (*Mycoplasma hyopneumoniae*), and porcine pleuropneumonia (*Actinobacillus pleuropneumoniae*).

**Treatment**

Treatment is limited to supportive care. As NiV encephalitis is often transmitted person-to-person, standard infection control protocols and proper barrier nursing techniques are important in preventing nosocomial transmission. The antiviral drug ribavirin has been shown to be effective against the viruses in vitro, but human investigations so far are inconclusive and therefore the clinical usefulness of ribavirin remains uncertain. Passive immunization employing a human monoclonal antibody targeting the Nipah G glycoprotein has been evaluated in the post-exposure therapy in the ferret model and found plays a beneficial role.

**Prevention**

Preventing infections in pigs can help in decreasing the risk of infection for humans. In endemic areas, fruit bats and pigs should be avoided whenever possible. Fruit tree plantations should be removed from areas where pigs are housed. Wire screens can help in preventing contact with bats when pigs are raised in open-sided sheds. Run-off from the roof should be prevented from entering pigpens. Transmission on fomites is also possible; re-used vaccination needles may have contributed to the spread of virus. During an outbreak, equipment and other fomites should be cleaned and disinfected. In addition, cats and dogs should be prevented from coming in contact with infected pigs or roaming between farms. Avoiding unpasteurized juices for drinking; and fruit should be thoroughly washed, peeled, or cooked. Hand washing and good personal hygiene also reduces the risk of infection.

**Vaccine**

A subunit vaccine, with the Hendra G protein, produces cross-protective antibodies against HENV and NIPV has been used recently in Australia to protect horses against Hendra virus. This vaccine has great potential for henipavirus protection in humans as well.

**CONCLUSION**

Nipah virus is a very dangerous pathogen. It is classified as Biosafety level 4 pathogen, if a
potential Nipah virus outbreak is suspected; contact your state veterinarian or your state public health veterinarian immediately. Avoid contact with potentially infected species (pigs, dogs, cats), until the proper authorities are consulted. As Nipah virus can be transmitted from person-to-person, barrier nursing should be used when caring for infected patients. Patients must be isolated, and personal protective equipment, such as protective clothing, gloves and masks should be used.

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