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Nipah virus: A Major threat to human

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Abstract
The purpose of this study is to highlight the major aspect of NIPAH virus morphology, its internal structure, transmission and preventions in human. It also includes sample collection major consideration measure that should be taken during collection and what form of sample to taken for laboratory investigation of NIPAH virus. NIPAH virus spread from animal the main reservoir are bat it major breakthrough was first in Malaysia in 1999. Currently there is no effective therapy available. It spreads by direct contact with the infected source. However some preventive measure should be taken so that it can be prevented from spreading from human to human and also from animal to human. In this study an attempt has been taken to elaborate the fact of the major site of action of NIPAH virus in the human genome and every major and minor measure that should be taken to minimize it transmission and infection.

Keywords: NIPAH virus, Henipa virus, Immunohistochemistry, myoclonus, immunosuppression

Introduction
The NIPAH virus is a type of RNA virus in the genus Henipa virus. It can both spread between people and other animals. Spread typically requires direct contact with an infected source. Bats are the main reservoir for this virus, which can cause disease in humans and animals. The virus was first identified in Kampung Sungai NIPAH area of Malaysia in 1998 when a brain fever epidemic broke. The disease spreads from fruit bats to humans as well as animals. Most of those infected people were workers at pig breeding centers. NIPAH virus transmitted from animals to humans and can also be transmitted through contaminated food or directly between people and animals. In infected people, it causes a range of illnesses from asymptomatic infection to acute respiratory illness and fatal encephalitis [1].

Morphology of Nipah virus
It is similar to paramyxoviruses, NiV particles are pleomorphic, spherical to filamentous, and range in size from 40 to 1,900 nm. They contain a single layer of surface projections with an average length of 17 ± 1 nm (1). NIPAH virus has a single-stranded, negative-sense RNA genome that is encapsulated by the nucleoprotein (N) and transcribed and replicated by the polymerase protein (L). The phosphoprotein (P) plays an essential role as a polymerase cofactor [2] allowing the encapsulations of the newly synthesized viral genomes and ant genomes. In these roles, P serves as a tether between the polymerase and its template and also serves as a chaperone for nascent, RNA-free N, termd N^0, preventing it from nonspecifically binding host RNA P has an additional role in immunosuppression blocking interferon signaling by binding host STAT-1 [3].

Pathological actions of Nipah virus in human
The Nipah virus genome encodes six structural proteins: the nucleoprotein N, phosphoprotein P, matrixprotein M, fusion protein F, receptor-binding glycoprotein G, and RNA-dependent RNA polymerase L. Within the P gene, an alternative start codon results in the production of the small protein C. The P mRNA change results in the production of proteins V and W through the insertion of one or two non-template G residues [4]. The three nonstructural proteins have been shown to antagonize the host innate immune response in vitro; proteins V and C have been shown to play an important role in Nipah virus pathogenicity in a hamster model [5]. Symptoms include fever, headaches, muscle pain, vomiting and sore throat. This can be followed by dizziness, drowsiness, altered consciousness, and neurological signs that indicate acute encephalitis. Some people can also experience atypical pneumonia and severe respiratory problems, including acute respiratory distress [6]. Encephalitis and seizures occur in severe cases, progressing to coma within 24 to 48 hours.

Clinical manifestation in human
- The incubation period in humans ranged from 4 days to 2 months,
- development of relapse and late-onset encephalitis,
- development of psychiatric features, including depression and personality changes, while others had deficits in attention, verbal, and/or visual memory
- Segmental myoclonus was prominent in the Malaysian cases.

Transmission
Transmission is thought to have occurred via unprotected exposure to secretions from the pigs, or unprotected contact with the tissue of a sick animal. In the Malaysian outbreak, there were reports of person-to-person transmission, especially in families of affected index cases [7]. In

Bangladesh and India several outbreaks have resulted from person-to-person transmission. About half of the cases identified in Bangladesh between 2001 and 2007 involved human-to-human transmission [8]. The clearest illustration of person-to-person transmission occurred during the Faridpur outbreak in 2004, where the chain of transmission eventually involved 5 generations and affected 34 people.

NIPAH virus can spread among humans if they establish close contact with NIPAH-infected people, bats or pigs. 'Bat secretions laden with virus can infect people during fruit tree climbing, eating/handling contaminated fallen fruits or consuming raw date palm sap/juice or toddy', says the National Centre for Disease Control in its guidelines on NIPAH virus. The guidelines outline that besides animal-to-human transmission, NIPAH virus can also transmit between humans. The human-to-human transmission occurs when a healthy person has close contact with an infected person at home or during treatment at hospitals [9].

Fruit bats of the family Pteropodidae -- particularly species belonging to the Pteropus genus -- are the natural hosts for NIPAH virus. Outbreaks of the NIPAH virus in pigs and other domestic animals such as horses, goats, sheep, cats and dogs were first reported during the initial Malaysian outbreak in 1999.

Treatment

There are currently no drugs or vaccines specific for NIPAH virus infection although WHO has identified NIPAH as a priority disease for the WHO Research and Development

Laboratory diagnosis of NIPAH virus infection is made using reverse transcriptase polymerase chain reaction (RT-PCR) from throat swabs, cerebrospinal fluid, and urine and blood analysis during acute and convalescent stages of the disease. IgG and IgM antibody detection can be done after recovery to confirm NIPAH virus infection. Immunohistochemistry on tissues collected during autopsy also confirms the disease. Viral RNA can be isolated from the saliva of infected persons [10].

Currently there is no specific treatment for NIPAH virus infection as of 2019The mainstay of treatment is to supportive care. Standard infection control practices and proper barrier nursing techniques are recommended to avoid the spread of the infection from person to person [11]. All suspected cases of NIPAH virus infection should be isolated, while tentative evidence supports the use of ribavirin, it has not yet been studied in people with the disease.

Sample collection and transport guidelines

Sample collection

- The samples should be collected preferably within 4-5days on onset of illness) with all biosafety precautions and accompanied with detailed history of patients on the Performa which can be obtained from the testing laboratory (Presently NationalInstitute of Virology, Pune in public sector is the testing laboratory which is diagnosing NIPAHVirus infection based on molecular detection of viral RNA and IgM antibody detection by (ELISA test).
- During sample collection wear complete disposable Personal Protective Equipment's (N 95 mask,double surgical gloves, gowns, goggles etc.). Wash hands with soap and water at least for 30seconds and then clean hand using 1-2 ml of alcohol based hand sanitizer before and after collection of samples.

The samples may include

1. Throat swab to be collected in viral transport medium
2. Urine approximately 10 ml in universals sterile container
3. Blood in plain vial (at least 5ml)
4. CSF (at least 1 ml) in a sterile container

Followings consideration should be taken while sample storage and transportation

1. Samples should be safely packed in triple container packing and should be transported under cold chain (2-8°C) to the testing laboratory with prior intimation.
2. Before dispatching the sample, disinfect the outer surface of container using 1:100 dilution of bleach or 5% Lysol solution.
3. Sample containing vials should be kept in good quality plastic bags tied with rubber bands so that inside material if leaks should not come out of bag
4. The plastic bag should be kept in another container which should be sealed with adhesive tape. This carrier should be placed in another plastic bag sealed with rubber bands and placed in the rmocol/vaccine carrier containing ice. The Case sheets with complete information should be placed in plastic bag and should be pasted outside the container.

Samples should be transported at 2-8°C if they arrive at the laboratory with 48 hours; if shipping time is expected more than 48 hours, the samples should be sent using dry ice. Samples should not be held at -20°C for long periods [12]. The sample must be stored at – 70°C if storage is required for longer periods.

Preventions

Can be done by taking care following steps

- Animal premises should be quarantined
- Restricting or banning the movement of animals from infected farms to other areas
- The only way to reduce or prevent infection in people is by raising awareness of the risk factors and educating people about the measures they can take to reduce exposure to the NIPAH virus.
- Physical barriers to prevent bats from accessing and contaminating sap [13].

Conclusion

NIPAH virus is a deadly disease and until now no effective treatments is available however research is in progress for the treatment of this disease. In NIPAH the fatality rate is 100% the person dies within a week. NiV (NIPAH VIRUS) outbreaks in Malaysia, Singapore, Bangladesh, Philippines, and India suggested that a number of factors play a crucial role in NiV transmission to human. Close contact with NIV infected animals, reservoir animals, and consumption of contaminated food is important factors responsible for NiV transmission so the preventive measure should be taken to avoid it infection transmission and spreading.

NiV causes encephalitis and respiratory infections in humans. NiV are spreading in various parts of world, and it has the potential of causing severe outbreaks. There are no specific antiviral or vaccine are available for NiV, and only supportive treatment can be given to patents. The very first

step in controlling of NiV outbreaks and lessen its impact is early detection. Therefore, continuous surveillance of animal reservoirs and community should be done which at high risk of NiV. Better strategies should be developed for effective management of the livestock especially near the habitats of bats.

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