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Nipah Virus

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Nipah Virus

An Overview

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Dr Agrawal founded PHARMA CONSULTANTS and INVENTOR to fulfill his passion, capabilities and desire to assist pharmaceutical companies around the globe. He has actively worked in pharmaceutical and related industries for more than 28 years and started this firm in 2005. He is **Editor-in-Chief** of renowned IJM Today and honorable member of the editorial board of **The Antiseptic**.

INTRODUCTION:

Nipah Virus is a newly emerging zoonosis that causes a severe disease in both animals and humans. This virus was first identified in Malaysia and Singapore . At that time, it was primarily caused in pigs and through them got transferred to humans.Nipah virus (NiV) is a member of the family Paramyxoviridae, genus Henipavirus. The natural host of the virus is fruit bats of the Pteropodidae Family, Pteropus genus.

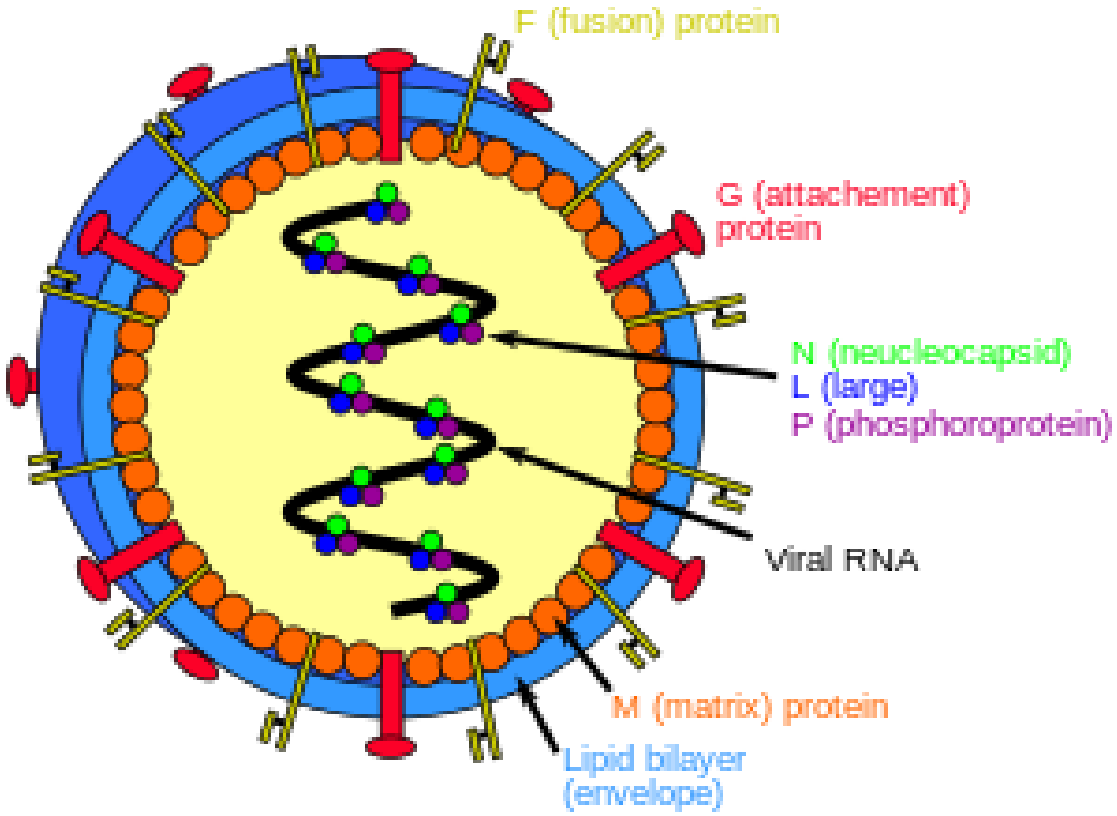
NiV was initially isolated and identified in 1999 during an outbreak of encephalitis and respiratory illness among pig farmers and people with close contact with pigs in Malaysia and Singapore. Its name originated from Sungai Nipah, a village in the Malaysian Peninsula where pig farmers became ill with encephalitis. Given the relatedness of NiV to Hedra Virus, bat species were quickly singled out for investigation and flying foxes of the genus Pteropus *were subsequently identified as the reservoir for NiV*

In the 1999 outbreak, Nipah virus caused a relatively mild disease in pigs, but nearly 300 human cases with over 100 deaths were reported. In 2001, NiV was again identified as the causative agent in an outbreak of human disease occurring in Bangladesh. Genetic sequencing confirmed this virus as Nipah virus, but a strain different from the one identified in 1999.

Structure:

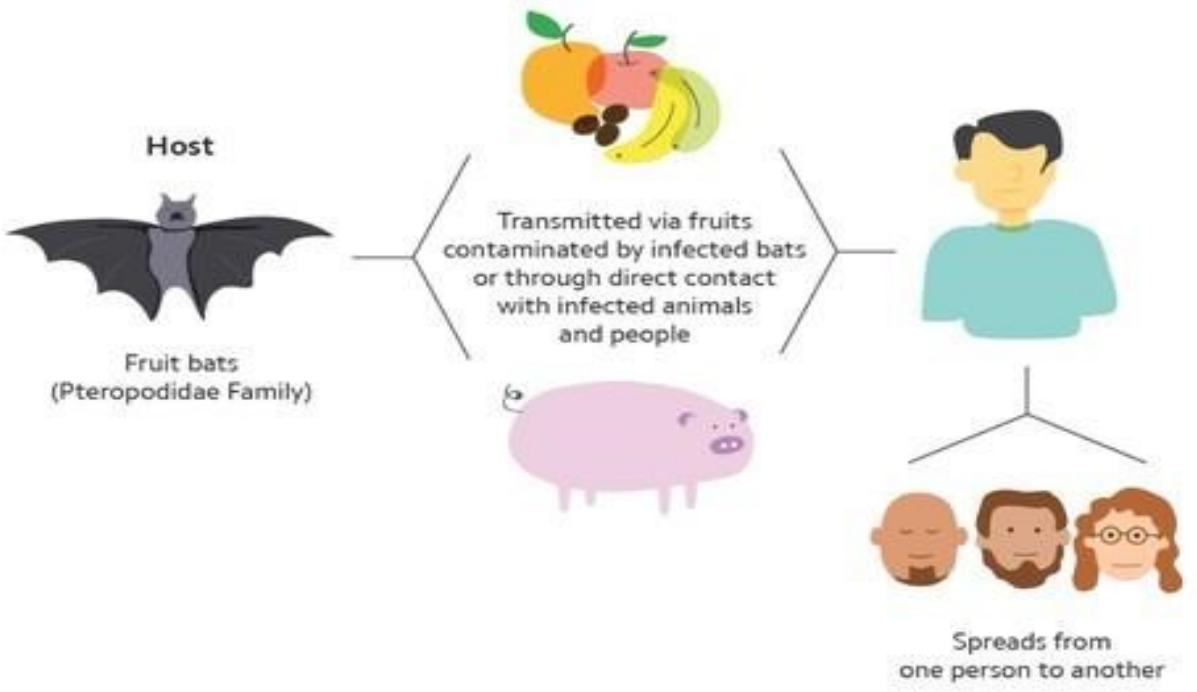
Nipah virus is a newly emergent, bat-borne paramyxovirus found in Southeast Asia that causes encephalitis in humans with 40 to 90% lethality .There are no vaccines or antiviral therapeutics approved for human use .Nipah virus has a single-stranded, negative-sense RNA genome that is encapsidated by the nucleoprotein (N) and transcribed and replicated by the polymerase protein (L). The phosphoprotein (P) plays an essential role as a polymerase cofactor, enhancing polymerase processivity and allowing the encapsidation of the newly synthesized viral genomes and antigenomes. 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, termed N^0, preventing it from nonspecifically binding host RNA.

Nipah is an envelope, single-stranded RNA virus, with a genome sequence size of about 18,000 nucleotides. NiV genome organization comprises six major genes present in all Paramyxovirus: RNA polymerase and nucleocapsid genes envelope membrane protein genes and matrix protein. The attachment glycoprotein which binds the viral receptor, and the fusion glycoprotein which drives virus-host cell membrane fusion, are the two membrane-anchored envelope glycoproteins responsible for host cell infection by NiV. Virions are pleomorphic, ranging in size from 40 to 600 nm in diameter. Fruit bats *(Macrochiroptera) of the family Pteropodidae- particularly species belonging to the Pteropus genus.*



Transmission:

Transmission of Nipah virus to humans may occur after direct contact with infected bats, infected pigs, or from other NiV infected people. Person-to-person transmission of nipah virus in Bangladesh and India is regularly reported. In Malaysia and Singapore, humans were apparently infected with Nipah virus only through close contact with infected pigs. The NiV strain identified in this outbreak appeared to have been transmitted initially from bats to pigs, with subsequent spread within pig populations. Incidental human infections resulted after exposure to infected pigs. The primary pathways of transmission from bats to people in Bangladesh are through contamination of raw date palm sap by bats with subsequent consumption by humans and through infection of domestic animals (cattle, pigs and goats) presumably from consumption of food contaminated with bat saliva or urine with subsequent transmission to people.



Signs and symptoms:

Infection with Nipah virus is associated with encephalitis (inflammation of the brain). After exposure and an incubation period of 5 to 14 days, illness presents with 3-14 days of fever and headache, followed by drowsiness, disorientation and mental confusion. These signs and symptoms can progress to coma within 24-48 hours. Some patients have a respiratory illness during the early part of their infections, and half of the patients showing severe neurological signs showed also pulmonary signs. Most people who survive acute encephalitis make a full recovery, but long term neurologic conditions have been reported in survivors. Approximately 20% of patients are left with residual neurological consequences such as seizure disorder and personality changes. A small number of people who recover subsequently relapse or develop delayed onset encephalitis. The case fatality rate is estimated at 40% to 75%. This rate can vary by outbreak depending on local capabilities for epidemiological surveillance and clinical management.

Diagnosis:

Laboratory diagnosis of a patient with a clinical history of NiV can be made during the acute and convalescent phases of the disease by using a combination of tests. Virus isolation attempts and real time polymerase chain reaction (RT-PCR) from throat and nasal swabs, cerebrospinal fluid, urine, and blood should be performed in the early stages of disease. Antibody detection by ELISA (IgG and IgM) can be used later on. In fatal cases, immunohistochemistry on tissues collected during autopsy may be the only way to confirm a diagnosis.

During the Nipah virus disease outbreak in 1998-99, 265 patients were infected with the virus. About 40% of those patients who entered hospitals with serious nervous disease died from the illness.

Long-term sequelae following Nipah virus infection have been noted, including persistent convulsions and personality changes.

Latent infections with subsequent reactivation of Nipah virus and death have also been reported months and even years after exposure.

Treatment:

Treatment is limited to supportive care. Because Nipah virus encephalitis can be transmitted person-to-person, standard infection control practices and proper barrier nursing techniques are important in preventing hospital-acquired infections (Nosocomial transmission).

The drug ribavirin has been shown to be effective against the viruses in vitro, but human investigations to date have been inconclusive and the clinical usefulness of ribavirin remains uncertain. A human monoclonal antibody that targets the G glycoprotein of NiV has shown benefit in a ferret animal model of this disease but researchers have not studied the effects of the antibody in human.

Prevention:

There are ways to reduce the risk of developing NiV infections. Nipah virus infection can be prevented by avoiding exposure to sick pigs and bats in endemic areas and not drinking raw date palm sap. The WHO (world health organization) suggests that health care professionals wear gloves and other protective clothing during any pig slaughtering and culling procedures .avoid contagion the communication of disease from one person to another by close contact.

Control of Nipah Virus:

This includes prompt and accurate veterinary investigations on suspected clinical cases especially in pigs. Any respiratory or neurological conditions of swine in an area known to have pteropid bats, should consider Nipah as a rule out. Nipah should be suspected if pigs also have an unusual barking cough or if human cases of encephalitis are present. Symptoms in pigs are not dramatically different from other respiratory and neurological illnesses of pigs. Differential diagnosis should be applied in case of deaths of suckling pigs and piglets, sudden death in boars and sows, abortions and other reproductive dysfunction, respiratory diseases with harsh, non-productive coughing, and in cases with encephalitic manifestations of trembling, muscular incoordination and myoclonus leading to lateral recumbency.

All materials and equipment from affected farms should be cleaned and disinfected. Restricting or banning the movement of animals from infected farms to other areas has to be applied to reduce the spread of the disease.

CONCLUSION:

In conclusion, knowledge and awareness on the disease should be improved and disseminated to health services, veterinarians, farmers and consumers. Nipah virus, as other zoonotic agents, might be included in monitoring plans, in particular for wild animals. However, field investigations may demonstrate radical and unexpected epidemiological changes. It is therefore important to enhance our preparedness to counter potential future introduction of exotic pathogens as Henipaviruses *in non endemic areas by conducting active pre-emergence research. Of utmost importance, monitoring the evolving epidemiology of a dangerous pathogen like the Nipah virus is an essential element to be able to promptly adapt control plans in the case that it might become a new public health priority.*

~ Dr Sanjay Agrawal