

An overview on Nipah Virus

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Abstract: NIPAH is a viral zoonotic disease caused by virus named NIPAH of genus henipavirus and of family paramyxoviridae . This disease caused a havoc damage to both animal and human kind. The major outbreak of this disease is by the pteropus species. The disease in humans caused a damage to respiratory and neurological systems in body. The present day advances in technology leads us to easy identification and diagnosis of the deadly disease. The scripps research institute (TSIR) have resolved the structure of key protein in NIPAH virus which could pave a way for development of antibodies against the NiV. The vaccine named “HENDRA-SG” was developed which could medicate the virus .The novel way of delivery of therapy is by “stealth liposomes” which helps in reaching the site of action .The movie named “CONTAGION” is based on global NIPAH outbreak. The drugs such as chloroquine and ribavirin treatment which are popularly known today to treat NIPAH are found worthless in hamster model. The FIVIPRAVIR (T-705) the potent antiviral drug was efficient in dealing with the disease by inhibiting replication and transcription at micro molecular levels in NIPAH virus. Although many vaccines and drugs are available to NIPAH there is no currently approved vaccines that prevent NIPAH, so I suggest everyone to be attentive in their part as prevention is better than cure.

Keywords: Nipah Virus, henipavirus and of family paramyxoviridae

1. INTRODUCTION

The recent outbreak of NIPAH was the present topic of this paper, NIPAH is a Viral Zoonotic disease caused by virus named NIPAH of genus henipavirus and of family paramyxoviridae. Urbanization, high population, deforestation and other human deeds leads to lack of resources for pteropus species thus leading the bats into human habitats causing Human -animal interaction leading to the disease in the modern world¹⁻³. NiV is an enveloped RNA virus and along with Hendra virus make up the Henipaviruses ^{4,5}.The natural host of the virus are fruit bats of the Pteropodidae family, Pteropus genus. According to the World Health Organization (WHO), there is no apparent disease in fruit bats^{6,7}.The Nipah outbreak in Malaysia alerted the global

public health community to the severe pathogenic potential and widespread distribution of these unique paramyxoviruses⁸.

1.1 Discovery

The virus Nipah Virus or the Disease was first discovered by a Professor Dr. Kaw Bing Chua of Malaysia who first examined the virus in his lab and found the virus under the microscope as similar to that of bright green lantern. But nobody believed him. He called his department head to his home to show his results .the head of the department suggested him to throw away the experiments and not to waste his time. But he didn't throw away the virus. Instead he packed it up and brought the samples to the U.S for further identification.

1.2 History

The NIPAH dates us back to the year 1998-99. This is a drastic outbreak with 263 cases reported of while 196 were died. The disease was named after **kampung Sungai NIPAH (NIPAH river village)**. Thus disease not only infects human but also animal kind. This virus invaded into pigs causing sporadic disease in them. The first and the second out break in India was reported in the years 2001 and 2007 respectively in West Bengal. It was fascinatingly found that around 50 deaths are recorded in both the outbreaks⁹. The recent out break of NIPAH was a few months back causing much introspection over the virus.The morbidity and mortality data of human NiV infection in India from 2001 and 2007 are presented in the table below. So far, NiV has infected 263 people and resulting in 196 deaths since 2001.

Morbidity and mortality due to Nipahin india between 2001-2007 is as follows:

| Year/Mon th | Location | No. cases | No. deaths | Case Fatality Rate |
|--------------|------------------|-----------|------------|--------------------|
| Jan-Feb 2001 | Siliguri (India) | 66 | 45 | 68% |
| Apr 2007 | Nadia (India) | 5 | 5 | 100% |

1.3 Structure

- The present day research had advanced in such a good extent that it is easy to diagnose study and research on any pathogen. The structure of NIPAH

can be easily elucidated with some diffraction studies.

- Nipah virus (NiV) is a RNA virus belongs to **family** Paramyxoviradae and **genus** *Henipavirus*.
- **Size:** 40-600nm
- **Shape:** pleuromorphic
- **Envelope:** present

The structure was so fascinatingly found similarly to that of Measles and Mumps virus (5 to 26% identical). If two proteins have high sequence identity than you would expect they would have 3D structure but to see such similarities in proteins with low identity was alarming. The researches found two proteins on the surface of the viruses that are used to communicate in a sequence as that of burglars with one casing the human cell while the other waits for the signal to launch the break in. The scripps research institute (TSRI) has resolved the structure of key protein in NIPAH which could pave a way for the development of much needed antiviral drugs. The structure shows how key pieces of virus machinery are oriented and tethered together. The NIH and centres for disease control and prevention classified NIPAH virus as bio threatening agent. The researchers are still working on understanding the virus and why it is so deadly.

1.4 Mode of transmission of Nipah virus

- **Direct contact:** Human get infection by direct contact with infected animals (pigs and fruit bats) or human
- **Droplet infection:** respiratory droplets, nasal or throat secretion of infected animals
- Eating contaminated fruits and juices with body secretion of infected animals and
- Human to human transmission with direct contact with infected person may lead to disease.

1.5 Basic Symptoms

The basic symptoms of the disease are headache, body aches, fever, nausea, vomiting, respiratory disorders and disorientation of body.

Some patients may develop Atypical pneumonia, and some Neurological cases may results in encephalitis and seizures.

2. NIPAH IN HUMANS

The virus caused a havoc damage majorly to two systems in body, they are respiratory & neurological system. The majority of patients are encountered with disorders of CNS, Respiratory disorders with a high mortality rate. The incubation period in humans is around 2 to 4 months from the exposure of pathogens. The respiratory illness include

prolonged cough and difficulty in breathing(pneumonia). The CNS disorders include encephalitis(major), trembling, spasms, leisures, weakness and fatigue

2.1 Hosts & Research On Bats

The genus pteropus are predominantly found as disease causing organism in the human kind. The research on Bats were seropositive to NIPAH antigens from the countries of Combodia, Thailand, Indonesia, Bangladesh and India. In this around 32 species of bats were investigated in Bangladesh and only one species of **pteropus giganteus** was found positive towards NiV. The NIPAH RNA was detected in **liver** homogenate of pteropus giganteus. This virus further entered into pig population and caused sporadic disease in them, due to transportation of pigs as meat in many modern nations causing animal - human interaction leading to the disease in human. The other way of transmission may be from the fruits bitten by the pteropus species. Some cases are recorded such that the people would drank the sap of palm bitten by these bats caused a havoc outbreak of the disease in the past. The direct contact with pigs, bats, there excretions and secretions such as urine and saliva are playing a key role in amplifying the disease.

2.2 Diagnostic Tests And Facilities

- Basically infections such as NiV in humans and animals are confirmed by viral isolation, nucleic acid amplification test and serological tests.
- Effective diagnosis should be of relatively low cost and with great out put results.
- **Samples usually taken are from:** nasal secretion, blood, contaminated fruits or infected animals.
- In such a case ELISA (Enzyme Linked Immuno Sorbant Assay) is an efficient test.
- The confirmation can be done by some serological tests such as ELISA.
- The molecular diagnostic tests like RT-PCR, real RT-PCR (Taqman & Duplex nested) can be used to confirm the sequence of viral RNA.

3.RESEARCH AND DEVELOPMENTS

The advancement in science and technology has found some vaccines and therapies that could prevent and cure the disease. The recent research on mokeys is by immunizing them with basic Hendra virus attached with G glyco protein, this combination afforded complete protection against NIPAH virus infection with no evidence of disease. This vaccine is a soluble portion of G Glyco Protein of Hendra Virus known as "Hendra – SG" which medicates viral infection produced in the laboratory using molecular techniques. Since the vaccine is only a piece of virus by the re-combinant technology, it is extremely safe to use. Some animal trials with this vaccine are found positive with few species of animals.

The Australian research team in collaboration with CSIRO is developing a new therapy that attacks the virus by turning off the “viral gene”. The novel way of delivering the therapy is by “Stealth Liposomes”. These liposomes helps us to reach the site of action efficiently. The human monoclonal antibody is the 1st effective antiviral drug against NIPAH Virus. An anti-body therapy can also be subjected to a person who is severely suffering from a viral infection.

3.1 Facts

There are no currently approved vaccines that prevent or cure the NIPAH virus.

It is an astonishing fact that all the bats do not cause the disease ,only certain species of bats cause the disease.

It is also found that African bats of straw coloured (Fruit bats) on Islands of west coast of central Africa when captured and examined their blood samples were found with anti-bodies that can neutralize the deadly virus.

NIPAH virus is so menacing that the nations top infectious disease experts served as consultants in the film making of the medical thriller “CONTAGION” (2011) which is based on global NIPAH outbreak.

The death rate of nipah was alarmingly found to be 40 – 75% of the infected persons.

To continue the research in the virology a BSL 4 LAB at national institute of virology (ICMR) Pune was established.

DRUGS

The combined **Choloroquine** and **Ribavirin** treatment which is popular known now a days is worthless according to hamster model of NIPAH Virus.

4. PREVENTION AND CONTROL OF NIPAH VIRUS INFECTION

If an outbreak is suspected, the animal premises should be quarantined immediately. Culling of infected animals – with close supervision of burial or incineration of carcasses – may be necessary to reduce the risk of transmission to people. Restricting or banning the movement of animals from infected farms to other areas can reduce the spread of the disease.

- In health care settings, staff should consistently implement standard infection revention and control measures when caring for patients to prevent nosocomial infections.
- Health care workers caring for a patient suspected to have NiV fever should immediately contact local and national experts for guidance and to arrange for laboratory testing

- Be Aware and educate people to take preventive measure to reduce contact with virus
- Apply preventive measure to sap collection such that bats cannot contaminate the collected sap.
- Boil the collected sap before consumption.
- Apply preventive measure while handling domesticated animals especially sick animals.
- Avoid direct or unprotected contact with infected person.
- Wear NH95-grade and higher masks
- Follow standard infection control procedure during handling patients and samples

5. CONCLUSION

The knowledge of drugs and technology paves a great way in the field of medicine. The techniques such as recombinant technology along with antigen-antibody responses helps in understanding modern diseases. Although favipiravir and other vaccines such as HENDRA-SG are available there are no curently approved vaccines to prevent or treat the NIPAH. So, I suggest everyone to be attentive in their part as “prevention is better than cure”.

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