

The Emergence of Zika Virus (ZiV): A Review

Amaresh Mishra*

Gautam Buddha University, Greater Noida, UP, India

Abstract

Zika virus (ZiV) is a mosquito-borne flavivirus (family Flaviviridae); Vector: aedes (ae. Aegypti, ae. Albopictus) also causes dengue, chikungunya, yellow fever. Bit by female mosquitoes mostly in daylight hour, associated with a neurological birth complication called Microcephaly, is the rapid spread of this virus across the globe. Researchers found that ZiV targets specialized stem cells that give rise to the neurons in the brain's outer layer, the cortex. First identify in rhesus monkey of Zika forest Uganda in April 1947, during the research on the yellow fever, Rockefeller foundation initiative. WHO declared the Zika outbreak to a 'Public health emergency of international concern' on January 2016. There are also high occurrences of outbreaks of Guillain- Barre Syndrome (GBS) associated with ZiV infections. Other neurological cases linked to ZiV infection include meningoencephalitis or acute myelitis. In 2007, first large outbreak of disease caused by Zika infection was reported from the island of YAP (Federated States of Micronesia). In July 2015, Brazil described an association between Zika and Guillain-Barre disorder. In Oct 2015, Brazil described an association between Zika and Microcephaly. Sexual transmission of Zika is also possible, blood transfusion can cause Zika.

Keywords: Zika; Flavivirus; Neurological disorders

Current Scenario of ZiV Outbreaks

It has been spread over more than 25 countries till now. First indigenous case of America was found in February 2015, in Chile. Since April 2015, a large outbreak of ZiV has spread across much of central and south America. Then it began in Brazil, in May 2015, 16 cases investigated with Zika infection [1]. In June 2015, first case of ZiV was presented in Dominican Republic. In Jan 2016, a travel alert was issued by CDC for traveler towards ZiV affected countries. Researchers from Brazil identify a new vector of ZiV is *Culex quinquefasciatus* recently [2,3]. In Sep 2016, about 190 people get affected with ZiV in Singapore, 13 of those were Indians among them.

Recent Work for Tackling of ZiV Outbreaks

- OX513A, is a genetically modified male *Aedes aegypti*, creation of british company Oxitec. OX513A stop the spread of ZiV by passing along gene that makes his offspring die. Each OX513A carries a fluorescent marker so he can be tracked by the scientist. Field trials in Brazil in 2011 were hugely successful. A new release of males in Brazil in 2014 was 92% successful [4].
- Bharat biotech claimed to have attained a breakthrough in developing a ZiV vaccine to fight the dreaded mosquito born disease. Bharat biotech claimed that it had started working on vaccine using live ZiV but nobody knows that from where/when they got this virus because normally nobody could import any exotic virus into the country, it requires government authority by investigate all the aspects.
- Sanofi (French pharma company) geared up to launch a project to develop vaccine at the end of this year.
- Researchers from the University of Canada announce first vaccine ready for human testing and also approved by food and drug administration (FDA) and Health, Canada [5].
- Researchers from the University of Southern California (USC) have recently analyze the key proteins associated with this disease, may help to correct Zika-related malformations.
- Tanaka Kikinzoku Kogyo, Tokyo has developed the world's

first kit able to direct analyze the Zika virus in blood. The kit is capable of rapid ZiV detection in just 10 to 15 min.

- Scientists from the University of Massachusetts Medical School (UMMS) in the US, advised that boosting the activity of the interferon induced protein 3 (IFITM3) may be useful for inhibiting ZiV and other emerging viral infections [6].
- It was also found that of the ten proteins that make up the ZiV, two proteins (NS4A and NS4B) are playing key role in the development of small brains in infected babies, i.e., Microcephaly.
- Researchers from World Federation of Neurology have reported the first confirmed case of a new Zika-associated neurological disorder in adults i.e. polyneuropathy during the active phase of his Zika infection [7].

Structure of Zika Virus

The virion is about to 40 nm in diameter. Nucleocapsid is about to 25-30 nm in diameter surrounded by a host membrane derived lipid bilayer. Enveloped, Spherical Icosahedral symmetry (of surface protein), Contains envelope proteins E and M. Single stranded, positive sense RNA genome contain 10794 nucleotides, Encoding 3419 amino acids [8].

Diagnosis of Zika Virus

About one in five people infected with ZiV become ill (develop Zika). Symptoms could be seen within 2-7 days after the Zika infection,

***Corresponding author:** Amaresh Mishra, Central Food Technological Research Institute (CFTRI), Gautam Buddha University, Biotechnology, Fatehpur, Uttar Pradesh 212601, India, Tel: +91-8800968194; E-mail: amaresh.mishra007@gmail.com

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are same as dengue and chikungunya for example fever, rash, joint pain, conjunctivitis, muscle pain, headache [9,10].

Acute phase (3-5 days)

Detection of viral genome by RT-PCR in maternal serum and amniotic fluid [11].

Ambulatory phase (>5 days)

Serology by testing IgM antibodies in blood through ELISA. Plaque reduction neutralization test (PRNT): it may give cross reactive results in case of secondary flavivirus infection [9] (Figure 1).

Treatment and Control

There is no vaccine available in the world for ZiV so precaution is only way to cure in case of Zika infection.

- Reducing mosquito through source deduction (elimination/ modification of breeding sites).
- Reducing contacts between mosquitoes and peoples.
- Wearing full body cloths, use mosquito net for sleeping.
- Close door and windows, use screen in windows.
- Clean/cover the bucket, flower pots, tyers, etc.
- Use insecticides/insect repellent like DEET, IR3535 or Icaridin, KBR3023 or Picaridin.
- Drink enough fluids, take vitamin C rich fruits.

- Treat pain and fever with common medicine like paracetamol.
- Use integrated vector management (chemical, biological, environmental).

Zika through the Years

1947: Discovered in Zika forest of Uganda.

1950-1980: Human infection across Africa and Asia.

2007: Large outbreak from Island of Yap.

Oct, 2013: Reported in French Polynesia, 66% population gets affected till Apr 14th.

Apr, 2015: Identified in Brazil, 1.5 million people get affected at the end of 2015.

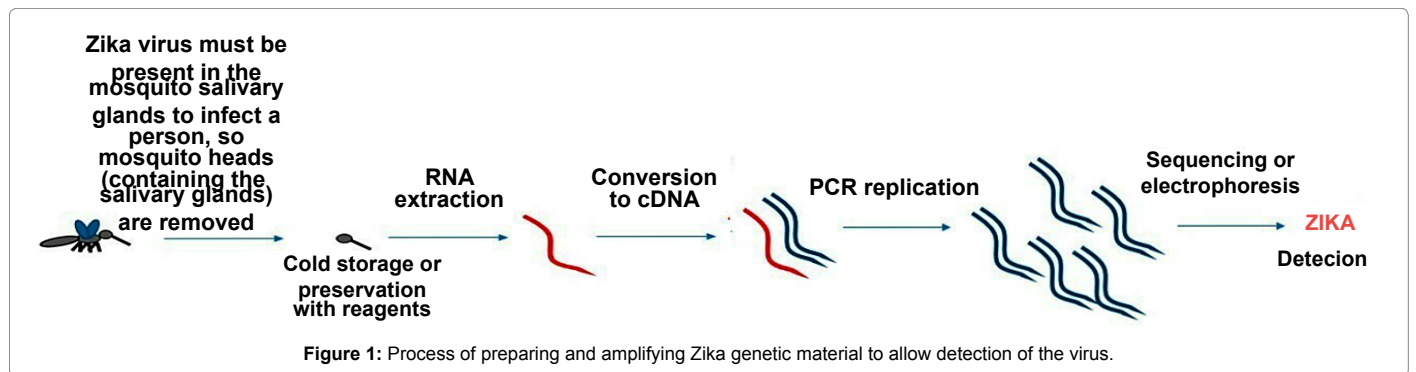
Feb, 2016: WHO declared health emergency for ZiV.

Apr, 2016: CDC confirms the link between ZiV and Microcephaly.

Today: Spread rapidly through more than 25 countries, Americas and 30+ of its territories.

Conclusion

Though the presence of ZiV has not been detected yet in India but the possible association of this virus infection with Microcephaly, Guillain-Barre and other neurological symptoms is exposed. Thus, the preparedness for the ZiV has to be there in our country. This epidemic has been notified recently internationally and requires very strict surveillance programme to spread awareness among the peoples.



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