Journal of Advances in Microbiology
1(2): 1-5, 2016; Article no.JAMB.31151

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A Short Review of Zika Virus

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Authors' contributions

This work was carried out in collaboration between both authors. Author FM managed the literature search and writing of the manuscript. Author NAZ helped in the writing of certain part of the manuscript such as transmission and epidemiology of the virus. Both authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAMB/2016/31151
Editor(s):
(1) Atul Sharma, Department of Biomedical Sciences, School of Medicine and Health Sciences, University of North Dakota, Grand Forks, USA.
Reviewers:
(1) Fakruddin, Kumamoto University, Japan.
(2) Natthanej Luplertlop, Mahidol University, Thailand.
(3) Lívia Garcia Bertolacci-Rocha, Universidade Federal de Goiás, Brazil.
Complete Peer review History: http://www.sciencedomain.org/review-history/17693

Review Article

Received 23rd December 2016
Accepted 25th January 2017
Published 2nd February 2017

ABSTRACT

Zika virus (ZIKV) is an arbovirus which is spread mostly by the bite of an infected Aedes species mosquito. In 2015, the outbreak of Zika virus in Brazil cause rapid spread of this virus throughout the Americas. A new report of relation between ZIKV infection and an epidemic of microcephaly among Brazilian neonates attracted universal attention. All the studies reviewed so far, however, suffer from the fact that, there is still no vaccine exist to prevent zika. Hence, important factor on preventing zika is by avoiding mosquitoes bite.

Keywords: Arbovirus; Aedes; mosquito.

1. INTRODUCTION

Zika virus (ZIKV) is an arbovirus which is spread mostly by the bite of an infected Aedes species mosquito [1]. Zika virus was named after the Zika Forest in Uganda. It was first discovered in 1947. The first human cases of Zika were detected in 1952, and since then, outbreaks of Zika have

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been recorded in tropical Africa, Southeast Asia, and the Pacific Islands [2]. Before 2007, at least 14 cases of Zika had been reported, and some cases were not reported [3]. Many cases of Zika virus was not reported because the symptoms of Zika are similar to those of many other diseases, hence it may not have been recognized [4]. Several Aedes species have been reported to be probable vectors of ZIKV including *Aedes hensilli* in Yap, *Ae. Aegypti* and *Aedes polynesiensis* in French Polynesia. Ae. aegypti and *Aedes albopictus* are present in much of the Americas including many parts of the Southeastern and South Central United States as well as Hawaii [5]. In 2015, the outbreak of Zika virus in Brazil cause rapid spread of this virus throughout the Americas. A new report of relation between ZIKV infection and an epidemic of microcephaly among Brazilian neonates attracted universal attention. Zika virus's association with neurologic sequelae, including potential neuropathophysiologic mechanisms, is being actively investigated [6]. Zika virus has the propensity to infect large numbers of persons with severe consequences in some cases. This review aims to collect scattered information on Zika virus to provide beneficial information to public.

2. CASE STUDY

Aedes mosquitoes are widely distributed globally, and native habitats of most species are warm tropical and subtropical regions [7]. It was first detected in Brazil, in the northeast and was continuously identified in other states and several South American countries including Colombia, Ecuador, Suriname, Venezuela, French Guyana and Paraguay. Transmission has been known in Central America (Panama, El Salvador, Honduras and Guatemala), the Caribbean (Martinique, Puerto Rico, Dominican Republic and Haiti) and Mexico. Since January 2016, a sum of 20 countries in the Americas has reported ZIKV infections [8]. As up to date in June 2016, the outbreak of Zika infection into Southeast Asia in, Singapore, Thailand and Vietnam became a major issue [9-10].

3. EPIDEMIOLOGY

Zika virus was first found in a sentinel rhesus monkey from Uganda in 1947 (Dick) and spreading outside of Africa, mainly into Southeast Asia. Previous studies have reported the first human cases in Nigeria in 1954 [11]. In 2007, Yap Island in Micronesia reported an outbreak of Zika virus infection [12]. Later, in 2013 and 2014, epidemics of Zika virus infection occurred in French Polynesia, New Caledonia, Cook Islands, and Easter Islands [13].Similarly, in May 2015, The Brazil Ministry of Health reported the first outbreak of Zika virus infection in the Americas with an estimation of 440,000-1,300,000 suspected cases of Zika virus infection in December 2015 [14].

4. TRANSMISSION

More recent attention has focused on the mode of transmission of Zika virus. Infected female mosquitoes from the genus of Aedes, primarily *Aedes aegypti* and *Aedes albopictus* act as vector for this disease [15]. Incubation period of zika virus is usually up to twelve days before the onset symptom appears [16]. Hence, mosquitoes bite is one of the major routes of transmission of Zika virus [16].

On June 2015, Zika virus has been reported to be transmitted in laboratory and healthcare setting in United States [16]. Besides, factors found to be influencing transmission of Zika virus also including sexual and perinatal transmission. Fortunately, to date, there are no reports of infants getting Zika virus through breastfeeding [17].

One major issue is infected humans are the main carriers of zika virus that enable the replication of the virus. Zika virus will then circulate in the blood of infected humans for several days and serving as a source of the virus for uninfected [18].

Zika virus also has been found in blood transfusion donor during French Polynesian outbreak. Fortunately, current situation, there have not been any confirmed blood transmission cases involving Zika virus [16].

5. PREVENTION

All the studies reviewed so far, however, suffer from the fact that, there is still no vaccine exist to prevent zika [17]. The type of immune response remains as major concerns in developing vaccine. In addition, safety aspect of developed vaccine such as immune compromised individuals also remains unclear for the development of vaccine. However, researchers worldwide are focusing on the development vaccine against this virus, yet this process will be time consuming [19].

Inactivation of flaviviruses will be carried out in temperature above 56℃ for at least 30 min, by using UV light and gamma radiation. The viruses are known to be susceptible to disinfectants such as 1% sodium hypochlorite, 2% glutaraldehyde, 70% ethanol, 3%–6% hydrogen peroxide and 3%–8% formaldehyde. ZIKV is inactivated by potassium permanganate, and ether [19,20].

During emergence of this disease, blood donation should be temporary stopped. In non-endemic places, using predonation questionnaire is helpful to screen donors who recently traveled to affected areas and delay of blood donation from these donors until at least fourteen days after returning from affected places should be done. It is of particular importance for the testing of donated organs of individuals who had history of travel to affected regions for ZIKV [21].

Nevertheless, the key measure on preventing zika has been developed by avoiding mosquitoes bite. In general, mosquitoes that spread Zika virus has the potential to spread dengue and chikugunya virus [17].Hence, avoiding mosquitoes bites relatively have a high impact on preventing the transmission of diseases. Evidence from previous studies suggests that Zika can be passed through sex from an infected person to the sex partners [22]. Thus, wearing condoms could conceivably reduce the chance of getting Zika through sex transmission.

6. SYMPTOMS

Symptoms and signs of infection of zika virus are joint pain, fever, skin rashes, malaise, conjunctivitis, muscle pain, and headache. These symptoms are usually last for about 2-7 days [18].

7. PATHOGENESIS

Few studies on animals with immune deficiencies had discovered the vertical transmission of ZIKV and its effect on fetal neurologic development. When pregnant Swiss Jim Lambert (SJL) mice were infected intravenously with a Brazilian strain of the Zika virus, ZIKV RNA was observed in pup brain tissue compared with that of kidney, liver, or spleen [23]. This suggest that after the replication, ZIKV may distribute from the lymphatics and blood stream to infect other organs of the body such as myocardium, central nervous system, skeletal muscles and to the fetus. The virus replication in infected mice causes neuronal degeneration and cellular infiltration [18].

Zika virus is unique as it can cross blood placental barriers. It was found that all of the known flavivirus structures differ in the amino acids that surround a glycosylation site in the virus shell. The shell is made up of 180 copies of two different proteins.

The glycosylation site where Zika virus differs from other flaviviruses stick out from the surface of the virus. A carbohydrate molecule consisting of various sugars is attached to the viral protein surface at this site. In many other viruses it has been shown that as the virus projects a glycosylation site outward, an attachment receptor molecule on the surface of a human cell recognizes the sugars and binds to them [24].

The glycosylation site and surrounding residues on Zika virus may also be involved in attachment to human cells, and the differences in the amino acids between different flaviviruses could explain the differences types of molecules to which the virus can attach This will reveal the different human cells which zika can infect. If this site of functions involved in attachment to human cells, this could be a novel output in discovery of antiviral compound for the treatment of zika infection [25].

8. SURVIVAL OF ZIKA VIRUS

The virus makes its way into the mosquito's saliva over the course of 8 to 12 days. When the infected mosquito bites another human, the virus goes from the mosquito's saliva into the new person's blood, infecting them. The incubation time in humans is a few days to a week, after which the person can pass the virus to another mosquito. This infectious period lasts up to 7 days and may be accompanied by symptoms of the disease [20].

9. CONCLUSION

More information on zika would help to establish a greater degree of accuracy on the prevention matter of zika. Further research regarding prevention and treatment would be worthwhile.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/17693