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Zika virus: A review

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Abstract

The virus was first isolated in April 1947 from a rhesus macaque monkey placed in a cage in the Ziika Forest of Uganda, near Lake Victoria, by the scientists of the Yellow Fever Research Institute. A second isolation from the mosquito *A. africanus* followed at the same site in January 1948. When the monkey developed a fever, researchers isolated from its serum a "filterable transmissible agent" which was named Zika in 1948.

The first human cases of Zika were detected and since then, outbreaks of Zika have been reported in tropical Africa, Southeast Asia, and the Pacific Islands. Zika outbreaks have probably occurred in many locations. Between August and November 2016, 455 cases of *Zika virus* infection were confirmed in Singapore. In 2017, Angola reported two cases of Zika fever. In April 2007, the first outbreak outside of Africa and Asia occurred on the island of Yap in the Federated States of Micronesia, characterized by rash, conjunctivitis, and arthralgia, which was initially thought to be dengue, chikungunya, or Ross River disease. Serum samples from patients in the acute phase of illness contained RNA of Zika. There were 49 confirmed cases, 59 unconfirmed cases, no hospitalizations, and no deaths.

Majority of cases are found in tropical regions, wet lowlands, regions with warmer temperatures and higher levels of poverty. Countries with past or recent Zika virus infection include parts of Africa, Asia, the Americas and the Pacific Islands.

Though India offers a fertile environment to the virus, so far no case relating to it has been reported in the country. The best prevention is to control the spread of *Aedes* mosquito that breeds in standing water.

Keywords: Zika virus, microcephaly, *Aedes albopictus*, Asian tiger mosquito

Introduction

Zika virus infection & Microcephaly- a growing Concern: This becomes a matter of concern as there is a possible link between maternal Zika virus infection and Infant Microcephaly, as first case in United States was reported recently in Hawaii.

Zika virus crossed placenta in two cases of microcephaly in Brazil. The child's mother was probably infected when she lived in Brazil in May 2015, early in her pregnancy. Zika virus, confirmed to be present in two Amniotic fluid samples of microcephalic babies. In Brazil, since October 2015 the rate of infants born with Microcephaly, are reported to be 10 times higher than those in previous years.

CDC has confirmed that Zika virus causes microcephaly and other birth defects, Microcephaly is a neurological condition. Infant's head circumference is significantly smaller than the average size for infants of the same age. It leads to developmental delays in movement and speech among other complications.

Zika virus

Zika Virus is Single stranded RNA virus of flaviviridae family. Is similar to the viruses that cause dengue, yellow fever, West Nile fever, and chikungunya disease.

Zika virus replicates in the mosquito's midgut epithelial cells and then its salivary gland cells. After 5–10 days, the virus can be found in the mosquito's saliva. If the mosquito's saliva is inoculated into human skin, the virus can infect epidermal keratinocytes, skin fibroblasts in the skin and the Langerhans cells. The pathogenesis of the virus is hypothesized to continue with a spread to lymph nodes and the bloodstream. Flaviviruses replicate in the cytoplasm, but Zika antigens have been found in infected cell nuclei.

The viral protein numbered NS4A can lead to small head size (microcephaly) because it disrupts brain growth by hijacking a pathway which regulates growth of new neurons.

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In fruit flies, both NS4A and the neighboring NS4B repress eye growth.

Sign and symptoms of zika virus infection, are vague & last for up to a week. It includes

1. Fever
2. Rash
3. Headache
4. Joint pain
5. Muscle pain
6. Conjunctivitis (red eyes)
7. Vomiting

Zika Transmission

1. Through mosquito bites

Zika virus is transmitted to people primarily through the bite of an infected *Aedes* species mosquito (*Aedes aegypti* and *Aedes albopictus* known as the “Asian Tiger mosquito”).

- These are the same mosquitoes that spread dengue and chikungunya viruses.
- These mosquitoes typically lay eggs in or near standing water in things like buckets, bowls, animal dishes, flower pots, and vases. Mosquitoes that spread chikungunya, dengue and Zika, live indoors and outdoors near people and bite during the day and night.
- The mosquito gets infected with the zika virus when it bites an infected person during the period when the virus is found in the person’s blood, typically only through the first week of infection.
- Infected mosquitoes can then spread the virus to other people through bites.

2. From mother to child

- A pregnant woman infected with Zika virus can pass the virus to her fetus during the pregnancy or around the time of birth.
- Zika is a cause of microcephaly and other severe fetal brain defects.
- It has been found in breast milk. Possible Zika virus infections have been identified in breastfeeding babies. Additionally, we do not yet know the long-term effects of Zika virus on young infants infected after birth. Because current evidence suggests that the benefits of breastfeeding outweigh the risk of Zika virus spreading through breast milk.
- CDC continues to encourage mothers to breastfeed, even if they were infected or lived in or traveled to an area with risk of Zika.

3. Through sex

- Zika can be passed through sex from a person who has Zika to his or her partners. Zika can be passed through sex, even if the infected person does not have symptoms at the time.
- Studies are underway to find out how long Zika stays in the semen and vaginal fluids of people who have Zika, and how long it can be passed to sex partners. Zika can remain in semen longer than in other body fluids, including vaginal fluids, urine, and blood.

4. Through blood transfusion

- Till date, there have not been any confirmed blood transfusion transmission cases in the United State. There have been multiple reports of possible blood

transfusion transmission cases in Brazil.

- During the French Polynesian outbreak, 2.8% of blood donors tested positive for Zika and in previous outbreaks, the virus has been found in blood donors.
- On 22 March 2016, Reuters reported that Zika was isolated from a 2014 blood sample of an elderly man in Chittagong in Bangladesh as part of a retrospective study.

Prevention of Zika transmission

1. Protect from Mosquito bites

- Everyone, including pregnant and breastfeeding women, should take steps to prevent mosquito bites.
- You, your neighbors, and the community can also take steps to reduce mosquitoes in and around house and in neighborhood.
- Dress children in clothing that covers arms and legs.
- Cover strollers and baby carriers with mosquito netting.
- When using insect repellent on your child:
 - Always follow label instructions.
 - Do not use products containing oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD) on children under 3 years old.
 - Do not apply insect repellent to a child’s hands, eyes, mouth, cuts, or irritated skin.
 - Adults spray insect repellent onto your hands and then apply to a child’s face.
 - Do not spray repellent on the skin under clothing.
 - If you are also using sunscreen, apply sunscreen first and insect repellent second.
 - When used as directed, EPA-registered insect repellents are proven safe and effective, even for pregnant and breastfeeding women:- DEET, Picaridin (known as KBR 3023 and icaridin outside the US), IR3535, Oil of lemon eucalyptus (OLE), Para-menthane-diol (PMD), 2-undecanone
- Professionals from local government departments or mosquito control districts develop mosquito control plans, perform tasks to control larvae and adult mosquitoes, and evaluate the effectiveness of actions taken.

2. Prevent zika transmission during Sex

- Condoms (male and female condoms) can reduce the chance of getting Zika from sex. Condoms should be used from start to finish, every time during vaginal, anal, and oral sex and the sharing of sex toys should be avoided.
- Decisions about having sex and using condoms depend on each person’s understanding of the risks and benefits, including-
 1. The mild nature of the illness for many people
 2. Their possible exposure to mosquitoes while in an area with risk of Zika
 3. Their plans for pregnancy (if appropriate) and access to birth control
 4. Their access to condoms
 5. Their desire for intimacy, including willingness and ability to use condoms or not have sex
 6. If either partner develops symptoms of Zika or has concerns, they should talk to a healthcare provider.
- Pregnant couples should use condoms from start to

finish every time they have sex, or they should not have sex for the entire pregnancy.

- Dental dams may also be used for certain types of oral sex (mouth to vagina or mouth to anus).

3. Pregnant women

Pregnant women should NOT travel to areas with current or past spread of Zika outbreaks (as indicated by red areas on Zika map). They should discuss their travel plans with a doctor, deciding whether to travel, reasons for traveling, and ability to prevent mosquito bites.

- Monitoring for infant microcephaly
- Pregnant women, diagnosed with Zika, Should monitor fetal growth and anatomy every 3-4 weeks.
- Refer to a health care professional specialized in pregnancy management and either infectious disease or maternal-fetal medicine.
- Pregnant women traveling to countries with Zika virus should avoid mosquito bites. It is better to consider postponing travel to any of these areas.

4. Avoid donating blood: People who have traveled to a region with active Zika virus transmission

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