



## Travel Medicine: Zika Virus

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### Abstract

Zika virus belongs to the *Flaviviridae* family and was initially isolated in Uganda from a rhesus monkey in Zika forest in 1947. It was first identified in humans in Nigeria in 1968. It is directly linked to dengue fever, the West Nile virus and Japanese encephalitis. It is transmitted through the *Aedes* species mosquitoes, including the Asian tiger mosquito.

**Keywords:** Zika Virus; Mosquito; *Aedes aegypti*

### Introduction

The disease has been associated with epidemic outbreaks, such as the one in Micronesia in 2007, where approximately 73% of the population was infected by the virus.

In November 2013, there was an outbreak of Zika virus in Polynesia, including the island of Tahiti. It is estimated that approximately 35,000 people were infected by the disease.

Similarly, in February 2014, 49 cases were identified in the same area [2].

In November 2015, the Ministry of Health of Brazil reported a 20% increase in the number of Zika virus cases, with a corresponding increase in microcephaly cases in newborn infants. It is possible that there is a causal association between the virus and microcephaly in infants, as well as intracranial calcifications [3].

### Transmission

Zika virus is transmitted to humans primarily through the bite of an infected *Aedes* species mosquito, mainly *Aedes aegypti*, in tropical regions. This is the same mosquito that transmits dengue, chikungunya and yellow fever. Other *Aedes* species of mosquitoes

(such as the tiger mosquito, *Ae. albopictus*) have also been reported as potential carriers of the virus, even if it has not yet been proven for the European populations of the *Ae. albopictus* mosquito.

The main reservoir of the virus in nature is unidentified. However, humans and other primates are the primary virus receptors. During epidemics, an anthroponotic transmission occurs (from human to mosquito and, then, from the mosquito to another human).

Other rarer modes of transmitting the virus have also been identified: perinatal transmission may occur, most likely via the placenta or during labour, when the mother has been infected. Furthermore, there are reports of sexual transmission of the virus and via blood transfusion. There are case reports describing transmission via sexual intercourse - 3 cases in the literature [3].

### The carrier of the virus

In Greece, the *Aedes aegypti* genus of mosquitoes has not been recorded in the last decades (since the beginning of the 1950s). However, in the last few years, the *Aedes albopictus* (tiger mosquito) genus of mosquitoes has been identified in Greece, which was documented initially in 2003-2004 and has since been recorded throughout the country.

These mosquitoes, marked by white lines on the body and legs, breed (lay their eggs) primarily in urban and suburban environments, even in tiny pockets of stagnant water (e.g. barrels, containers, vases, tree cavities, scrap tires, plant saucers, water tanks). They are more active during the day, especially in the early morning and late afternoon until dusk (although they may bite during the night as well). They bite both indoors and outdoors [4].



Figure 1: *Aedes aegypti* [1].

### Epidemiological data

On 1 February 2015, the World Health Organization (WHO) announced that the recent cluster of neurological disorders and birth defects, reported in the American continent was a Public Health Emergency of International Concern, after the relevant opinion that there was strong suspicion of a causal relationship between this cluster and the Zika virus disease [2].

Zika virus is considered to be an emerging disease with the potential of spreading to new regions where the carrier of the virus, the *Aedes* mosquito, is present. Before 2007, only few data were available about the epidemiology of the disease. That year, the first recorded outbreak of the disease was reported in islands of the Pacific Ocean. A significant virus outbreak was recorded in French Polynesia from 2013-2015. The most well-known are the outbreaks in Brazil and Colombia in 2015, with the issue receiving public attention, especially because of the detection of microcephaly in newborns of infected mothers [3].

### Clinical condition

The incubation period (the time from exposure to symptoms) of the disease is not clear, but it is probably a few days (ranges from 3-12 days after the bite by an infected mosquito).



Figure 2

Around 80% of the infected people are asymptomatic. The symptomatic disease has generally mild symptoms, including acute onset of fever, urticarial rash, arthralgia and conjunctivitis. Symptoms typically last between a few days and a week. Serious illness, requiring hospitalisation, is rare. Guillain-Barré syndrome has been reported in patients [3].



Figure 3: Image of the rash associated with Zika virus [1].

### Complications

Serious illness and death due to the virus are rare. However, during the recent outbreak of the virus (French Polynesia and Brazil, in 2013-2014 and 2015 respectively), a significant increase in patients with autoimmune, neurological and neurodevelopmental disorders, such as Guillain-Barré syndrome and relative microcephaly in fetuses and newborns, was recorded. Indications of the correlation between microcephaly in newborns and Zika virus are growing, however, the causal relationship is being examined, and further analysis is required to properly understand and document this correlation, while other possible causes are being examined [2].

## Disease and pregnancy



**Figure 4:** Image Microcephaly in newborn [1].

In February 2016, a case involving a patient in Slovenia was published. The patient was a mother with a cold and a rash during the first trimester of pregnancy. The ultrasounds performed on the 14<sup>th</sup> and 20<sup>th</sup> week of pregnancy revealed healthy development and anatomy. A new ultrasound was performed on the 32<sup>nd</sup> week that revealed intrauterine growth restriction (3<sup>rd</sup> percentile), microcephaly (2<sup>nd</sup> percentile) and intracranial calcification, also in the placenta. The mother requested termination of pregnancy. An abortion took place and foetal autopsy was performed, where hydrocephalus and multifocal lesions were established, while the anatomic pathology exam confirmed the genome of Zika virus, without any traces of it in any other tissue of its body, verifying the selectivity of the virus for brain tissue [4].

### Diagnosis

Diagnosis is performed through the detection of its viral RNA components with PCR methods, reverse transcription polymerase chain reaction (RT-PCR), and measuring immunoglobulin M, which quadruples. To diagnose the disease in foetuses, amniocentesis may be performed [3].

### Treatment

Symptoms of Zika virus infection are usually mild and no special treatment is required. Supportive care is administered for the relief of the symptoms [2].

### Prevention measures

Currently, there is no vaccine available. Prevention measures are associated with comprehensive carrier screening programs, personal protective measures against mosquitoes, alerted healthcare providers for early diagnosis, treatment and protection against

mosquito bites, and awareness of the public and travellers to endemic countries, so they may adopt suitable, preventive measures.

Due to the great extent of the spread of the virus, mainly to American citizens, the World Health Organization has issued guidelines regarding the protection against mosquito bites, insecticide spraying where they are endemic, as well as raising awareness among expectant mothers on the potential problems arising in infants after the transmission of the disease to them. So, young adult women should use protection or avoid any sexual contacts during their stay in regions where virus receptors are endemic. Psychological support of the young mothers whose children suffer from microcephaly, and provision of clear information on the potential future consequences of the disease are very important.

The actions taken to reduce the breeding sites of mosquitoes in open and closed areas of the community include:

- Removing stagnant water regularly (it gives mosquitoes places to lay their eggs), including small shelters (e.g. vases, plant saucers, bowls, water pipes, scrap tyres, troughs, tree cavities, holes in rocks, by removing stagnant water inside and around the houses on a weekly basis), or applying an approved larvicide, if the removal of stagnant water is not possible.
- Covering (lid) containers with stagnant water when they cannot be cleared out (e.g. tanks, barrels).
- Prevention is also based on personal protection against mosquitoes during the time they are most active. Specifically:
- Installing and using anti-mosquito nets (wire meshes) on all the windows/airways of the buildings.
- Using approved mosquito repellents, not only directly on the skin, but also on the clothes, around the clock, and, specifically, during the time they are most active.
- Wearing appropriate clothing (long sleeves and trousers).
- Using a mosquito sleeping net, even when sleeping during the day (recommended especially for children, the elderly, pregnant women, people with underlying conditions, as well as patients with viraemia).
- Using indoor mosquito repellents (e.g. tablets, liquids or mosquito coils), as well as, when deemed necessary, using approved insecticides for spraying, always adhering to the instructions for use on the bottle or the device. These insecticides should not be applied to the skin.

- Using fans, especially roof fans (the approach of insects is hindered) or air conditioning units (cool air limits mosquito activity).
  - Using yellow light bulbs outdoors.
  - Trimming (pruning) frequently the plants/foilage of the surroundings, so that adult mosquitoes cannot make shelters.
  - Adhering to personal protective measures against mosquitoes (e.g. long sleeves, trousers, insect repellents, mosquito sleeping net, even when sleeping during the day) when travelling to regions with locally transmitted infection, and ensuring that rooms have wire meshes on the windows and doors and are air-conditioned. Travellers showing symptoms within 2-3 weeks of their return should seek medical attention immediately, mentioning their last trip (see instructions for Travel Medicine, National Public Health Organization).
  - When there is suspicion or confirmation of Zika virus, they should avoid mosquito bites (protect themselves from further exposure to mosquitoes) during the first few days of the disease (at least for the first seven days), to prevent infection to other mosquitoes or any further virus transmission. It is recommended to stay in a room with wire meshes on all the windows/doors, use a mosquito sleeping net, use mosquito repellents on the skin and clothes throughout the day, and use approved insecticides. Protective measures against mosquitoes should be taken around the clock, as these mosquitoes are more active during the day [2].
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**Conclusion**

Zika virus disease goes back to less than a decade. During this decade, at least two grave epidemic outbreaks have occurred in the Pacific Ocean. In addition, through human migration, as well as from American and Europeans visiting endemic areas, the risk of spreading the disease to the, so-called, developed countries has greatly increased. Increased vigilance must be exercised by the healthcare regulatory agencies, as well as all healthcare staff, in each country and suspected cases must be recorded immediately [5].

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