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Epidemiology and Prevention of Zika Virus: A Review

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Abstract

The Zika virus is a mosquito-borne flavivirus (*Aedes*) first identified in Uganda in 1947. Here we tried to collect scattered data and present a synthesis of the history and the current status of the disease. Its major epidemic in the world was presented and effective prevention techniques were cited. WHO estimated that 3 to 4 million people were expected to be infected with the Zika virus in 2017. Strategies for the prevention and control of Zika virus disease should include the use of insect repellent and mosquito vector eradication since there is currently no vaccine available.

Keywords

Zika Virus; *Aedes*; Epidemiology; Prevention

Zika virus global data

Zika virus is an African flavivirus isolated in 1947 in Uganda from a rhesus monkey [1]. It was first isolated in human's in 1952, in Uganda and in Tanzania [2]. It was transmitted by *Aedes africanus* in the tropical regions of Southeast Asia, Africa and the Pacific [3]. The virus reservoir is not completely identified but some authors suggest there is a primate reservoir. Some authors have reported finding anti-Zika antibodies in various animals such as big mammals (orang-outang, zebras, elephants, etc.) and rodents in Pakistan [4,5]. Recently, the Zika virus infection affected Polynesia and South America. WHO estimated that 3 to 4 million people could be infected with Zika by 2017.

Epidemiology

The first major epidemic occurred in the Pacific on Yap Island (Micronesia) in 2007. The second epidemic affected Polynesia in 2013 with more than 8,000 cases reported [6]. Other countries reported outbreaks in 2013-2014: Cook Islands, Easter Island (Chile), New Caledonia and Vanuatu. The vectors were *Aedes aegypti* and *Aedes polynesiensis*. A third epidemic reached Latin America, first Brazil and other Latin American countries (Colombia, Honduras, Paraguay, Mexico, Guatemala, El Salvador, Suriname). Zika was detected in October 2015 in Africa in Cape Verde [7]. The vector was the tiger mosquito, *Aedes albopictus*. Outbreaks broke out in 2015-2016 in Asia and the Pacific including the New Caledonia. Beginning of 2017, 70 countries had reported cases for the first time and 11 countries in which transmission of the virus had been observed previously reported cases or outbreaks. The Zika virus reached the end of 2015 in the French departments of America: Guyana, Martinique, Guadeloupe [8]. The end of the epidemic was recorded in autumn of 2016, but vigilance remains in place. On average, half of the population has been infected. Imported cases were confirmed in the United States and Europe, including metropolitan France, in 2015-2016 [9]. WHO estimated in 2016 that we were facing a "global public health emergency". WHO estimated that 3 to 4 million people were expected to be infected with the Zika virus in 2017.

This epidemic outbreak was explained by the climatic and socio-demographic conditions favorable to the proliferation of vector mosquitoes and the development of international travel. The growing urbanization and certain climatic phenomena are at the origin of warmer and wetter environments that increase the number of mosquitoes. The transmission was mainly by the bite of the female mosquito of the genus *Aedes*: *Aedes aegypti* and *Aedes albopictus*. Transmission is only possible 14 days after a blood meal containing the Zika virus. Once infected, the mosquito remains infected all its life [7]. This period of 14 days could benefit the vector control, the only effective method currently to circumscribe the Zika epidemic.

Maternal-fetal transmission has been formally demonstrated and is responsible for the complications described in the fetus and newborn. The human-to-human transmission is possible. The Zika virus would persist in the sperm for several months after the disappearance of any symptoms. It is therefore advisable for men who have visited an endemic area to have protected relations, so as not to risk contaminating their partner, especially as the Zika virus infection would be asymptomatic in 3/4 cases. The first French case of sexual transmission, concerning a woman whose husband was returning from a

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trip to Brazil, strengthens its protection measures. Zika virus can be transmitted by blood transfusion. Laboratory contamination has been reported. Other biological fluids have been tested positive for Zika virus, but no transmission has been identified to date (saliva, breast milk, urine).

Prevention

There is currently no vaccine available. Three vaccines are under development: a vaccine containing the inactivated viral strain, a plasmid vaccine and an adenovirus-vectored vaccine for the expression of immunogens of the pre-membrane and the envelope of the Zika virus. The trials in humans have started and their results are expected by the end of 2017. It seems that the inactivated vaccine and adjuvanted is currently preferred by the health authorities. Protection against mosquito bites is an essential measure for prevention including destruction of breeding sites, use of insecticides, prevention of punctures by repellents, clothing advice, and mosquito nets. Sexual transmission requires sexual partners of pregnant women to practice safer sex or to consider abstinence for at least 6 months. Couples planning a pregnancy should wait at least 8 weeks before trying to conceive in the absence of symptoms or 6 months if one or both members of the couple have symptoms.

Conclusion

In conclusion, we should note that this emergent arbovirolosis transmitted by mosquitoes of the *Aedes* genus has a high potential for spreading in countries where the vector is present. This situation requires the highest vigilance, especially since this disease is not well known and that some questions remain on potential reservoirs and transmission modes as well as on clinical presentations and complications.

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