After all, How is the Zika Virus Transmitted?

Abstract

Zika (ZIKV) has spread rapidly throughout the world, causing serious epidemics. But, before the recent outbreak in Brazil, little was known about the virus or its mode of transmission. After ZIKV and microcephaly were associated in the Brazilian Northeast, virus spread caused international repercussions, generating the need to investigate other possibilities of transmission. Therefore, our objective was to identify the possible ways of ZIKV transmission described in the literature. A review of the published literature was carried out on the following databases: Scielo, Pubmed and Lilacs, related to ZIKV, from 1950 to 2006, and from 2006 to 2017. Only 46 publications were found in the period between 1950 to 2006. However, after the epidemics in the Yap Islands and in French Polynesia, more than 2000 publications were generated. The most common reported mode of transmission was the infected vector, especially those of the genus Aedes - A. aegypti was the most frequently cited. Some other possible vectors were cited as well, such as Culex spp. However, studies suggest that this vector would not have the competence to transmit the ZIKV, which warrants further study. Other forms of documented transmission were through sexual intercourse, saliva, amniotic fluid, urine, semen, breast milk, blood transfusion and laboratory exposure. Given the great transmission potential of the ZIKV, its control has become a major challenge to global health. All these modes of transmission need to be further investigated to determine the relative weight of each one in any given epidemic.

Keywords: Zika virus; Aedes aegypti; Culex; Transmission; Microcephaly

Abbreviations: SZC: Congenital Zika Syndrome; ZIKV: Zika Virus; WHO: Word Health Organization

Introduction

Zika (ZIKV) belongs to the Flavivirus genus of the Flaviviridae family and was isolated in 1947 in a monkey of the genus Rhesus, from Zika Forest, Uganda. In the following year the ZIKV was isolated in a mosquito of the species Aedes africanus [1], and studies have demonstrated the vector competence of Aedes spp. mosquitoes as possible vectors for this virus [2,3]. The first reported human infection occurred in 1954 [4] and only 14 cases of the disease had been reported worldwide by 2006 [5].

Discussion

After almost 60 years since it was first detected, only a handful of studies were directed at Zika fever or factors related to the virus transmission. Only 46 publications were found from 1950 to 2006 [6]. With the Yap Islands and French Polynesia epidemics in 2007 and 2013, respectively, the virus sparked interest once again [5,7,8]. Yet, it was only after an epidemic spread throughout the Brazilian Northeast, with the suspicion of a possible association with microcephaly, that publications rose dramatically [9-13].

After this event, the virus spread to other countries. By February 2016, the disease was declared an International Public Health Emergency by the World Health Organization (WHO) [11,14-17]. By November 2016, ZIKV cases were reported in 48 different countries [17,18], catching the attention of researchers around the world. Until 2015, it was believed that the transmission to humans occurred only through the bite of infected vectors, especially Aedes aegypti mosquitoes [5]. However, due to the large number of people affected by the disease in a short time, questions were raised regarding other possible forms of ZIKV transmission. So, after all, how is the Zika virus transmitted? New research has provided some answers, but has also raised some doubts.

Aedes aegypti always has been associated with Zika, and several studies support its competence under laboratory conditions [1,3,18-23]. Naturally infected Aedes aegypti have been captured in the field [24]. This led to the initial hypothesis of a single transmitting species. There is also evidence of other mosquitoes in the Aedes genus with vectorial competence to transmit ZIKV [5,20,23,25-32]. Due to its great abundance and anthropophilia, Culex spp. was suspected as an alternative ZIKV vector. Culex thrives close to epidemic areas, especially in low-income districts where microcephaly cases were higher [33]. There are records of some naturally infected species [26]. Culex spp. are susceptible to ZIKV infection and able to effectively transmit ZIKV [34,35]. On the other hand, other studies suggest that this vector may not have competence to transmit ZIKV [18,32,33,35-37]. Thus, this subject warrants further analysis, along with field experiments in areas of active ZIKV transmission.

With the rapidly spread of this epidemic throughout the world, other possibilities of transmission have been raised, and there are already important records of possible transmission through sexual intercourse, saliva, amniotic fluid, urine, semen, breast milk, blood transfusion and laboratory exposure [7,10,11,38-47].
Conclusion

With the discovery of the association between microcephaly and ZIKV, and the emergence of a new syndrome (Congenital Zika Syndrome), there has been much interest in this field. In view of the large potential transmission of ZIKV and its clear association with cases of CZS, its control has become a major challenge for global health, even in regions without Aedes mosquitoes. All possibilities of transmission need to be rigorously investigated to determine the relative weight of each in an epidemic process.

It is necessary to understand these different scenarios (with and without the presence of Aedes aegypti) to determine the potential for dissemination of CZS cases worldwide. In addition, it is necessary to understand why the epidemic of CZS did not take on the worldwide proportion that was speculated.

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Conflict of Interest

There are no conflicts of interest on the part of the authors of the article.

References


