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REVIEW

Overview of Zika infection, epidemiology, transmission and control measures

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Abstract The current Zika virus outbreak in the Americas and the proposed link to increases in microcephaly and neurological disorders have prompted the World Health Organization to declare a Public Health Emergency of International Concern on February 1, 2016. The virus is transmitted by *Aedes* mosquitoes and potentially by transfusion, perinatal and sexual transmission. The potential for spread into countries where *Aedes* mosquitoes are endemic is high. Previously, cases tended to be sporadic and associated with mild, non-specific symptoms. Prior outbreaks occurred in Yap Island in Micronesia in 2007, the first time Zika arose outside of Africa and Asia, and in French Polynesia in 2013. A birth data review has confirmed that the latter outbreak was followed by an increase in microcephaly cases. A coordinated international response is needed to address mosquito control; expedite development of diagnostic tests, vaccines and specific treatments for Zika; and address the proposed link to microcephaly and neurological diseases.

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Contents

Introduction

International interest in the Zika virus (ZIKV) has been sparked by the current outbreak in Brazil and other countries in the Americas, which led the Pan American Health Organization to issue an alert for northeast Brazil on 7 May 2015. The worldwide interest is largely due to a possible link to an increased incidence of microcephaly and neurological disorders, including Guillain-Barré syndrome (GBS), in the affected areas. No causative link has yet been scientifically established; however, the World Health Organization (WHO) strongly suspects that the concomitance of a sharp increase of microcephaly and/or GBS incidence in seven countries in the Americas and the ZIKV outbreak indicates a relationship. This possibility has led them to declare a Public Health Emergency of International Concern on February 1, 2016 [1].

ZIKV is a mosquito-borne virus, but other forms of transmission, including by blood transfusion and probable sexual and perinatal transmission, have also been confirmed [1—5]. Concern has been heightened further in the face of upcoming mass gatherings in regions where the virus is currently endemic, such as the Summer Olympics in Brazil [6]. The Umrah and Haji pilgrimages in Saudi Arabia, where local mosquito populations represent the potential for new outbreaks, are also major concerns [7]. The current lack of specific treatments or vaccines and complications in diagnosis of ZIKV further underscore the urgency of developing a global approach to researching this virus [8—11]. The objective of this paper is to give an overview of the history of the ZIKV and of current understanding of the virology, symptoms, transmission, diagnosis and treatment of this virus, along with consideration of future perspectives.

History of Zika epidemiology

The ZIKV is a mosquito-borne *Flavivirus*, of the family *Flaviviridae*. It was first isolated from a febrile sentinel monkey in the Zika forest in Uganda in 1947 and subsequently from *Aedes africanus* mosquitoes in the same forest [12,13]. Isolation of ZIKV from *Ae. africanus* mosquitoes and other *Aedes* species including *Ae. aegypti* in Africa and Malaysia over the subsequent decades followed [2]. Many other *Aedes* species, including *Ae. luteocephalus*, *Ae. albopictus*, *Ae. furcifer*, *Ae. vittatus*, *Ae. taylori*, *Ae. dalzieli*, *Ae. hirsutus*, *Ae. metallicus*, *Ae. hensilii* and *Ae. unilineatus* have also been implicated as vectors, as have mosquitoes from other genera, including *Mansonia uniformis*, *Culex perfuscus* and *Anopheles coustani* [14,15]. Cases of ZIKV infection of humans arose throughout the 1960s and 1970s in several countries in Africa and Asia [2]. Although the cases were sporadic, they were widespread. The true incidence and prevalence of ZIKV, however, remains difficult to definitively establish because of the lack of simple, reliable laboratory diagnostic tests and the similarity of symptoms caused by ZIKV to those of other arbovirus infections [16].

The first example of human infection by ZIKV outside of Africa and Asia arose in 2007, when there was an outbreak in Yap Island in the Federated States of Micronesia in Oceania. [2]. Yap Island has a population of approximately 7391 people; 49 positive cases and 59 probable cases of ZIKV infection were identified using ELISA to detect IgM antibody against ZIKV or by identification of ZIKV RNA [8]. A household survey suggested prevalence of 75% of the population over the age of three [1,8,17]. *Ae. hensilli*, the predominant *Aedes* species on Yap Island, has been identified in laboratory studies as a likely culprit for the ZIKV vector during that outbreak [14].