Editorial

iMedPub Journals
http://www.imedpub.com/

Insights in Biomedicine

2016
Vol.1 No.1:3

Local Transmission of Zika Infection is Feasible in Non-endemic Developed Countries but has Limited Potential to Reach Epidemic Proportions

Andrew W Taylor-Robinson

Infectious Diseases Research Group, School of Medical & Applied Sciences, Central Queensland University, Rockhampton, QLD, Australia

Corresponding author: Andrew W Taylor-Robinson, Infectious Diseases Research Group, School of Medical and Applied Sciences, Central Queensland University, Rockhampton, QLD, Australia, Tel: +61 7 4923 2008; E-mail: a.taylor-robinson@cqu.edu.au

Received: February 23, 2016; **Accepted:** February 26, 2016; **Published:** February 29, 2016

Abstract

In the opening months of 2016 Zika infection is drawing considerable global media attention and the spread of misinformation has perhaps understandably caused public alarm. At a time shortly before the eyes of the world will turn to the Olympic Games in Rio de Janeiro, the Zika virus has a strongly suspected causal link to more than 4,000 recent cases of microcephaly among newborn infants in Brazil. Moreover, Zika has spread rapidly through over 25 Latin American nations and, with increased globalization and in an era of mass international travel, it is uncertain where it may establish next. It is quite possible that this epidemic may extend as far as North America, Europe and Australia, continents that are at present unaffected except for an occasional clinical case of a traveler returning from an endemic area. However, in these more developed countries local transmission of infection should be containable through adherence to existing robust measures to suppress mosquitoes, which include the Aedes spp. vector of transmission. Thus, there is limited potential for Zika to reach epidemic proportions in currently unaffected industrialized nations.

Keywords: Zika; Aedes; Transmission; Diagnosis; Vector control; Flavivirus; Mosquito; Treatment; Epidemic

Editorial

Originally identified in 1947 and named for the remote rainforest in Uganda where it was first isolated from rhesus monkeys [1], the mosquito-borne viral disease of humans Zika has occurred at a low prevalence for decades. All that changed in late 2015 and early 2016, which heralded an unexpected and eruptive Zika outbreak in many Latin American and Caribbean countries, with an estimated 1,300,000 clinical cases in Brazil alone [2]. Furthermore, the World Health Organization now predicts 3-4 million people could be infected with Zika virus in the Americas this year [3]. This has led to growing media hysteria over the possibility of a worldwide spread of Zika, and the public health impact this may have in those regions that are presently unaffected [4]. While the reasons for this apparent epidemic in South America are multiple [5], deficient vector control of a sudden population explosion of mosquitoes is a suspected causal factor. Right now, Zika may be considered as a re-emerging infectious disease; an old disease revealed in a new context, in a similar way to the recent surge of Ebola cases in West Africa [6].

Zika is a positive sense, single-stranded RNA virus which belongs to the Flavivirus genus [7]. It is thus a close relative of dengue, yellow fever and Japanese encephalitis viruses, as well as to etiological agents of other more obscure but still debilitating mosquito-borne diseases, including Murray Valley encephalitis, Kokobera encephalitis and Ross River fever, which notably occur along the north east seaboard of Australia [8]. Alternative modes of Zika transmission (vertical, sexual and blood-borne) have been speculated [9,10], which, if confirmed, may play an ancillary role to facilitate persistence of the virus in mosquito non-endemic regions.

In comparison to dengue, yellow fever and Japanese encephalitis, which can be significantly incapacitating for people of any age who contract infection, it is estimated that four of every five adults who are infected with Zika do not exhibit any clinical manifestations [11]. Hence, they may be entirely unaware of their contact with this virus and act as asymptomatic carriers of infection for several days after being bitten by an infectious mosquito. If a person is ill, the principal symptoms are similar but less severe than other related febrile illnesses – a mild fever, conjunctivitis, maculopapular rash, myalgia and arthralgia that may last up to one week [12]. In rare cases, Zika is associated with Guillain-Baré syndrome, a neural demyelination syndrome often identified as being an autoimmune sequela of infectious disease [13].

The major clinical complication that is associated with Zika is via congenital transmission from a pregnant woman to her unborn child or newborn infant [12,14], the effects of which can be severe. In Brazil alone, the virus has been linked to more than 4,000 cases of microcephaly [15], a rare condition that is associated with incomplete neurological development and which causes babies to be born with unusually small heads and, in the majority of cases, brain damage. In the short term caution is strongly advised to pregnant women before travelling to Brazil and neighboring countries [16]. Currently, there is neither a preventive vaccine nor a commercially available medicine. Since effective vaccines are available against yellow fever and Japanese encephalitis viruses, it is anticipated that a similar preventative can be prepared for Zika [17]. However, in spite of the expeditious release of ring-

© Copyright iMedPub

fenced funding to support research into developing a vaccine [18], this may take years rather than months to design, trial and gain regulatory approval for public administration [19].

At present, recommended ways to prevent disease, especially microcephaly, include suspending travel by pregnant females to Zika-endemic territories, and practicing safe sex in those nations. Importantly, caution is advised in planning to conceive a baby in countries where Zika is reported as endemic until such time as the apparent association between infection with the virus and microcephaly is either established or dismissed [20,21]. This begs the question what guidance is relevant to provide in more economically developed countries remote from the current epidemic and where there are no reported cases of Zika.

The delivery of different interventions, singularly or in combination, should be informed by, and thereby tailored to, local settings. Since anti-viral therapies are not available, alternative devices should be engaged to combat Zika. These include low technology measures such as protection from mosquito bites. Aedes mosquitoes are active and readily bite during the day [22], so topical application of an effective repellent is highly recommended. Common sense steps that households can take to contribute to control of the vector within a local community include the installation of door and window screens, use of air-conditioning, and removal or sealing of garden debris and vessels (e.g. disposed tyres, buckets, bowls and flower pots) in which water may collect.

Conspicuously among industrialized nations there is a real and present risk of an outbreak of Zika in north east Australia where Aedes aegypti, which is the main vector of its transmission in Latin America, is also resident [23]. Typically, this species of mosquito inhabits the tropical north of the state of Queensland although its geographical range is creeping gradually southward, principally as a consequence of climate change [24], but possibly accelerated by inadvertent human-assisted translocation.

At the present time it is highly likely that any outbreak – initiated by the return of an individual infected abroad – would be contained locally, in a manner similar to sporadic clusters of dengue cases that occur in and around the cities of Cairns and Townsville [25]. As *A. aegypti* has a very restricted spatial dispersal [26], sustained foci of infection and significant epidemiological advance require a high population density of both mosquitoes and humans. It should be noted, however, that this is a manifestly anthropophilic mosquito that thrives in urban environments [26]. This should be a consideration for future control strategies in Queensland, both for Zika itself but also in unison with the continuing public health threat posed by dengue.

Among the residents of Queensland there is a demonstrably high level of understanding of good practice in avoiding mosquito bites and preventing mosquito breeding, especially in those areas most affected by dengue [27]. This provides encouragement that current strategies to combat dengue should be sufficient to similarly limit any local transmission of Zika that may possibly arise in Australia. Geographically much closer to the present outbreak in Latin America, the same holds true in the southern USA where local authority-implemented mosquito control measures, including insecticide spraying of residential areas, are stringently observed [28]. In addition to the aforementioned cost-effective methods that individuals can take, these management programs have helped to suppress the *A. aegypti* population in urban areas of states such as Florida [29], thereby limiting cases of dengue and yellow fever. Thus, it may be concluded that integrated vector management, advocated by the World Health Organization as a means to combat Aedes transmission of dengue [30], would also constitute a valid strategy for control of Zika in developed countries where the required cooperation, infrastructure and budget are all available.

References

1. Dick GW, Kitchen SF, Haddow AJ (1952) Zika virus (I) Isolations and serological specificity. Trans R Soc Trop Med Hyg 46: 509-520.
2. Pan American Health Organization. Zika virus infection. Washington DC.
3. BBC News (2016) Zika virus: pp to four million Zika cases predicted.
4. BBC News (2016) Zika virus: rumours and theories fuel 'information war'.
5. Vogel G, Cohen J, Enserink M (2016) Zika virus: your questions answered.
6. Carroll MW, Matthews DA, Hiscox JA, Elmore MJ, Pollakis G, et al (2015) Temporal and spatial analysis of the 2014-2015 Ebola virus outbreak in West Africa. Nature 524: 97-101.
7. Kuno G, Chang G-J (2007) Full-length sequencing and genomic characterization of Bagaza, Kedougou, and Zika viruses. Arch Virol 152: 687-696.
8. van den Hurk AF, Craig SB, Tulsiani SM, Jansen CC (2010) Emerging tropical diseases in Australia. Part 4. Mosquito borne diseases. Ann Trop Med Parasitol 104: 623-640.
9. Foy BD, Kobylinski KC, Chilson Foy JL, Blitvich BJ, Travassos da Rosa A, et al. (2011) Probable non-vector-borne transmission of Zika virus, Colorado, USA. Emerg Infect Dis 17: 880-882.
10. Musso D, Roche C, Robin E, Nhan T, Teissier A, et al. (2015) Potential sexual transmission of Zika virus. Emerg Infect Dis 21: 359.
11. Ginier M, Neumayr A, Günther S, Schmidt-Chanasit J, Blum J (2016) Zika without symptoms in returning travellers: what are the implications?. Travel Med Infect Dis 14: 16-20.
12. Centers for Disease Control and Prevention (2016) Zika virus – symptoms, diagnosis & treatment.
13. Cao-Lormeau VM, Roche C, Teissier A, Robin E, Berry AL, et al. (2014) Zika virus, French Polynesia, South Pacific, 2013. Emerg Infect Dis 20: 1085-1086.
14. Meaney-Delman D, Rasmussen SA, Staples JE, Oduyebo T, Ellington SR, et al. (2016) Zika virus and pregnancy: what obstetric health care providers need to know. Obstet Gynecol. [Epub ahead of print].
15. Fauci AS, Morens DM (2016) Zika virus in the Americas – yet another arbovirus threat. N Engl J Med. 374: 601-604.

16. U.S. National Library of Medicine (2016) CDC broadens Zika virus travel alert for pregnant women.

17. Ishikawa T, Yamanaka A, Konishi E (2014) A review of successful flavivirus vaccines and the problems with those flaviviruses for which vaccines are not yet available. Vaccine 32: 1326-1337.

18. Holpuch A (2016) Obama to seek $1.8bn from Congress to combat Zika virus.

19. Mahalingam S, Rolph M (2016) Here's why we don't have a vaccine for Zika (and other mosquito-borne viruses). The Conversation.

20. Schuler-Faccini L, Ribeiro EM, Feitosa IM, Horovitz DD, Cavalcanti DP, et al. (2016) Possible association between Zika virus infection and microcephaly - Brazil, 2015. MMWR Morbidity and Mortality Weekly Report 65: 59-62.

21. Calvet G, Aguiar RS, Melo AS, Sampaio SA, de Filippis I, et al. (2016) Detection and sequencing of Zika virus from amniotic fluid of fetuses with microcephaly in Brazil: a case study. Lancet Infect Dis. [Epub ahead of print].

22. Yasuno M, Tonn RJ (1970) A study of biting habits of Aedes aegypti in Bangkok, Thailand. Bull World Health Organ 43: 319-325.

23. Hanna JN, Ritchie SA, Hills SL, Pyke AT, Montgomery BL, et al. (2003) Dengue in north Queensland, 2002. Communicable Diseases Intelligence Quarterly Report 27: 384-389.

24. Russell RC, Currie BJ, Lindsay MD, Mackenzie JS, Ritchie SA, et al. (2009) Dengue and climate change in Australia: predictions for the future should incorporate knowledge from the past. Med J Aust 190: 265-268.

25. Viennet E, Ritchie SA, Faddy HM, Williams CR, Harley D (2014) Epidemiology of dengue in a high-income country: a case study in Queensland, Australia. Parasit Vectors 7: 379.

26. Muir LE, Kay BH (1998) Aedes aegypti survival and dispersal estimated by mark-release-recapture in northern Australia. Am J Trop Med Hyg 58: 277-282.

27. Gyawali N, Bradbury RS, Taylor-Robinson AW (2016) Knowledge, attitude and recommendations for practice regarding dengue among the resident population of Queensland, Australia. Asian Pac J Trop Biomed In press.

28. American Mosquito Control Association (2014) Why we need mosquito control.

29. Florida Medical Entomology Laboratory (2007) Mosquito management. Mosquito Information.

30. World Health Organization (2012) Handbook for Integrated Vector Management. Geneva: WHO.

© Copyright iMedPub