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Zika Virus: Why Should We Care? What Do We Do About It?

Commentary

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INTRODUCTION

The recent outbreak of Zika Virus Disease in South America and the association of Zika virus with microcephaly [1] and Guillain-Barre' syndrome [2] has attracted worldwide attention and concern. The World Health Organization has declared Zika virus and its suspected link to birth defects as a 'health emergency of international concern' [3]. Zika virus is an arbovirus transmitted primarily by the giant Asian mosquito, *Aedes albopictus* [4] but human epidemics have often been associated with *Aedes aegypti* transmission [5-6].

WHY SHOULD WE CARE?

The current outbreak of Zika virus in Brazil and the rise in the number of cases of microcephaly, a rare neurological condition in which an infant's head is much smaller than the heads of other children of the same age and sex due to abnormally slower brain development, has raised so much media attention and worry even here in Zambia. In January 2016, a child born with microcephaly in Hawaii, United States tested positive for Zika virus. The mother of the child had previously travelled to Brazil where she possibly got infected and the virus was transmitted to the foetus congenitally as reported by BBC and CBC on 6th February 2016. Even though Zambia has not recently reported a single case of Zika virus infection, *Aedes aegypti* the competent vector of Zika virus,

which is widely distributed in the tropics, is present in Zambia and the Western and North-Western Provinces have previously reported seropositivity for Zika virus IgG [7]. Therefore, care, surveillance and mosquito control programmes, especially against *Aedes aegypti*, should be intensified. Because the symptoms of Zika virus disease are similar to Dengue and Chikungunya virus disease, countries where these diseases are endemic need to conduct surveillance for Zika virus [8].

Zika virus is a flavivirus belonging to the virus family flaviviridae, which includes mosquito-borne viruses that cause yellow fever, Dengue fever and Dengue haemorrhagic fever, West Nile fever, and Japanese encephalitis. The first human outbreak of Zika virus was reported in the Zika forest of Uganda in 1947 [9] and the virus was later isolated in Asia [10-12]. The most recent outbreaks of Zika virus occurred in Yap Island in 2007 followed by Tahiti in 2013, and New Caledonia and the Cook Islands in 2014. Early in 2015, Brazil reported Zika virus infections with cases presenting with symptoms of mild fever, rash, conjunctivitis and arthralgia [13]. The patients came from Dengue and Chikungunya virus endemic regions but molecular diagnosis confirmed Zika virus nucleic acid [13]. In December 2015, the Territory of Puerto Rico was the first to report autochthonous transmission of Zika virus in the United States [14]. Infections with Zika virus are often subclinical, but 20% of cases develop a self-limiting mild febrile illness with joint pains [15] which are very similar to malaria and other arboviral infections hence the disease is mostly misdiagnosed. Zika virus is primarily transmitted by

mosquitoes but recently both in utero [1] and sexual transmission [16-18] have been documented. Zika virus RNA has been demonstrated in blood, semen, urine, cerebrospinal fluid, breast milk and amnion fluid but only mosquito bite [6], sexual [17], blood transfusion [19] and perinatal [20] evidence for transmission have been established. There is no known reservoir for Zika virus infection.

The causality of microcephaly by Zika virus is yet to be definitively established but the United States Centers for Disease Control confirmed Zika virus RNA in newborns with microcephaly that died and in the placentas of two women who miscarried foetuses that had microcephaly. This association provided direct evidence to support causation and was confirmed when the child born in Hawaii tested positive for Zika virus but there are still other suggestions of other possible etiologies. The evidence for the link between Zika virus and microcephaly is overwhelming [1,21-30]. However, there are unpublished reports and suspicions of pyriproxyfen, a malformation producing larvicide that targets *Aedes aegypti*, to be linked to microcephaly. The Argentinean group of physicians published a report that Pyriproxyfen was being applied to drinking water 18 months prior to the Zika virus disease outbreak. Therefore, there is urgent need to establish explicitly the etiology and pathophysiology of microcephaly and this will facilitate the development of novel therapeutic and vaccine targets.

The pathophysiology of Zika virus disease and its link to microcephaly is thus poorly understood. Being a blood-borne pathogen the virus is injected into the skin by blood-feeding *Aedes* mosquitoes. The first cells infected include fibroblasts, keratinocytes and immature dendritic cells which produce interferons that are part of antiviral innate immune responses [31]. The main receptors for Zika virus entry into cells include adhesion factors, including DC-SIGN, AXL, Tyro3, and, TIM-1 [31]. The early antiviral responses after Zika virus infection may be responsible for the larger number of asymptomatic infections and mild illness Zika virus disease. However, the pathogenesis leading to severe disease and other complications ranging from rash, fever, eye inflammation, body and joint pain, Guillain-Barre' syndrome and microcephaly is unknown. There are no treatment options available except for supportive care and there is no licensed vaccine against Zika virus. The illness is often mild and infected individuals usually do not require treatment. However, the implicated complications from Zika virus infection including microcephaly, Guillain-Barre' syndrome and eye diseases warrant research and development of effective treatment and vaccine strategies against Zika.

The rapid spread of Zika virus from Africa to the Pacific and then to the Americas means that the virus may spread to Europe [32] and then may potentially cause a pandemic. In the February, the United Kingdom reported four cases of Zika virus disease and these are being classified as 'travel related' as all cases had recent travel to South America [33] and one case has been reported in South Africa. The spread of Zika virus also poses further challenges for public health preparedness for mass gatherings including the 2016 Olympic

Games that are scheduled to be held in Brazil [34].

The widespread distribution of *Aedes* mosquito species will fuel the spread of the Zika virus. *Aedes aegypti* is widely distributed in the tropics and another species *Aedes albopictus* which is present in North America has been linked to several arboviral disease outbreaks in North America. The emergence of Zika virus from the Pacific to the Americas and now to the United Kingdom is a source of concern to Africa particularly sub-Saharan Africa with one case being reported where *Aedes* species are widespread. Further, Zika disease symptoms are similar to malaria which is still endemic to this region. Other arboviral diseases like Dengue fever, Chikungunya and West Nile are often mistaken for malaria implying that the emergence of Zika virus disease may be more difficult to detect.

WHAT DO WE DO ABOUT IT?

There is an urgent need to strengthen molecular surveillance of arboviruses in sub-Saharan Africa. Currently, there is awareness in Zambia about the current Zika virus outbreak in the Americas but more efforts need to be applied to educational awareness, surveillance, and monitoring and evaluation of prevention programme strategies. Vector control strategies including destroying mosquito breeding sites indoor residual spraying should be prioritised. The use of long clothing when outdoors especially in the evenings, using mosquito repellents, sleeping under insecticide-treated nets and barriers such as window screens and closing doors should be encouraged.

The rapid spread of Zika virus is yet another reminder that in the era of globalisation and modern transportation, diseases that were normally confined to the tropics have the potential to pose global threats. Biological factors like genetic mutations may exacerbate fitness adaptations for emerging and re-emerging infectious diseases to cause epidemics. The recent Ebola outbreak and the current Zika virus disease serve as a warning and call for global efforts in responding to tropical infectious diseases.

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References

1. Oliveira Melo AS, Malinger G, Ximenes R, Szejnfeld PO, Alves Sampaio S, Bispo de Filippis AM. Zika virus intrauterine infection causes fetal brain abnormality and microcephaly: tip of the iceberg? *Ultrasound Obstet*

- Gynecol.* 2016 Jan;47(1):6-7.
2. Oehler E, Watrin L, Larre P, Leparc-Goffart I, Lastere S, Valour F, et al. Zika virus infection complicated by Guillain-Barre syndrome--case report, French Polynesia, December 2013. *Euro Surveill.* 2014;19(9).
 3. Gulland A. Zika virus is a global public health emergency, declares WHO. *BMJ.* 2016;352:i657.
 4. Grard G, Caron M, Mombo IM, Nkoghe D, Mbouï Ondo S, Jiolle D, et al. Zika virus in Gabon (Central Africa)--2007: a new threat from *Aedes albopictus*? *PLoS Negl Trop Dis.* 2014 Feb;8(2):e2681.
 5. Li MI, Wong PS, Ng LC, Tan CH. Oral susceptibility of Singapore *Aedes* (*Stegomyia*) *aegypti* (Linnaeus) to Zika virus. *PLoS Negl Trop Dis.* 2012;6(8):e1792.
 6. Marchette NJ, Garcia R, Rudnick A. Isolation of Zika virus from *Aedes egypti* mosquitoes in Malaysia. *Am J Trop Med Hyg.* 1969 May;18(3):411-5.
 7. Babaniyi OA MP, Songolo P, Mazaba-Liwewe ML, Mweene-Ndumba I, Masaninga F, Rudatsikira and Seter Siziya E. Seroprevalence of Zika virus infection specific IgG in Western and North-Western Provinces of Zambia. *Int J Public Health. Epidemiol* 2015.
 8. Gulland A. WHO urges countries in dengue belt to look out for Zika. *BMJ.* 2016;352:i595.
 9. Dick GW, Kitchen SF, Haddow AJ. Zika virus. I. Isolations and serological specificity. *Trans R Soc Trop Med Hyg.* 1952 Sep;46(5):509-20.
 10. Haddow AJ, Williams MC, Woodall JP, Simpson DI, Goma LK. Twelve Isolations of Zika Virus from *Aedes* (*Stegomyia*) *Africanus* (Theobald) Taken in and above a Uganda Forest. *Bull World Health Organ.* 1964;31:57-69.
 11. Haddow AD, Schuh AJ, Yasuda CY, Kasper MR, Heang V, Huy R, et al. Genetic characterization of Zika virus strains: geographic expansion of the Asian lineage. *PLoS Negl Trop Dis.* 2012;6(2):e1477.
 12. Heang V, Yasuda CY, Sovann L, Haddow AD, Travassos da Rosa AP, Tesh RB, et al. Zika virus infection, Cambodia, 2010. *Emerg Infect Dis.* 2012 Feb;18(2):349-51.
 13. Zanluca C, de Melo VC, Mosimann AL, Dos Santos GI, Dos Santos CN, Luz K. First report of autochthonous transmission of Zika virus in Brazil. *Mem Inst Oswaldo Cruz.* 2015 Jun;110(4):569-72.
 14. Thomas DL ST, Torres J, et al. . Local Transmission of Zika Virus — Puerto Rico, November 23, 2015. *MMWR Morb Mortal Wkly Rep* 2016;65:154-158 DOI: <http://dx.doi.org/10.15585/mmwrmm6506e2>. 2016.
 15. Duffy MR, Chen TH, Hancock WT, Powers AM, Kool JL, Lanciotti RS, et al. Zika virus outbreak on Yap Island, Federated States of Micronesia. *N Engl J Med.* 2009 Jun 11;360(24):2536-43.
 16. Foy BD, Kobylinski KC, Chilson Foy JL, Blitvich BJ, Travassos da Rosa A, Haddow AD, et al. Probable non-vector-borne transmission of Zika virus, Colorado, USA. *Emerg Infect Dis.* 2011 May;17(5):880-2.
 17. Musso D, Roche C, Robin E, Nhan T, Teissier A, Cao-Lormeau VM. Potential sexual transmission of Zika virus. *Emerg Infect Dis.* 2015 Feb;21(2):359-61.
 18. Oduyebo T, Petersen EE, Rasmussen SA, Mead PS, Meaney-Delman D, Renquist CM, et al. Update: Interim Guidelines for Health Care Providers Caring for Pregnant Women and Women of Reproductive Age with Possible Zika Virus Exposure - United States, 2016. *MMWR Morb Mortal Wkly Rep.* 2016;65(5):122-7.
 19. Musso D, Nhan T, Robin E, Roche C, Bierlaire D, Zisou K, et al. Potential for Zika virus transmission through blood transfusion demonstrated during an outbreak in French Polynesia, November 2013 to February 2014. *Euro Surveill.* 2014;19(14).
 20. Besnard M, Lastere S, Teissier A, Cao-Lormeau V, Musso D. Evidence of perinatal transmission of Zika virus, French Polynesia, December 2013 and February 2014. *Euro Surveill.* 2014;19(13).
 21. Rodriguez-Morales AJ. Zika and microcephaly in Latin America: An emerging threat for pregnant travelers? *Travel Med Infect Dis.* 2016 Feb 3.
 22. Heymann DL, Hodgson A, Sall AA, Freedman DO, Staples JE, Althabe F, et al. Zika virus and microcephaly: why is this situation a PHEIC? *Lancet.* 2016 Feb 11.
 23. de Paula Freitas B, de Oliveira Dias JR, Prazeres J, Sacramento GA, Ko AI, Maia M, et al. Ocular Findings in Infants With Microcephaly Associated With Presumed Zika Virus Congenital Infection in Salvador, Brazil. *JAMA Ophthalmol.* 2016 Feb 9.
 24. McCarthy M. Severe eye damage in infants with microcephaly is presumed to be due to Zika virus. *BMJ.* 2016;352:i855.
 25. Mlakar J, Korva M, Tul N, Popovic M, Poljsak-Prijatelj M, Mraz J, et al. Zika Virus Associated with Microcephaly. *N Engl J Med.* 2016 Feb 10.
 26. Rubin EJ, Greene MF, Baden LR. Zika Virus and Microcephaly. *N Engl J Med.* 2016 Feb 10.
 27. Ventura CV, Maia M, Ventura BV, Linden VV, Araujo EB, Ramos RC, et al. Ophthalmological findings in infants with microcephaly and presumable intra-uterus Zika virus infection. *Arq Bras Oftalmol.* 2016 Feb;79(1):1-3.
 28. Schuler-Faccini L, Ribeiro EM, Feitosa IM, Horovitz DD, Cavalcanti DP, Pessoa A, et al. Possible Association Between Zika Virus Infection and Microcephaly - Brazil, 2015. *MMWR Morb Mortal Wkly Rep.* 2016;65(3):59-62.
 29. Ventura CV, Maia M, Bravo-Filho V, Gois AL, Belfort R, Jr. Zika virus in Brazil and macular atrophy in a child with microcephaly. *Lancet.* 2016 Jan 16;387(10015):228.
 30. Tetro JA. Zika and microcephaly: causation, correlation, or coincidence? *Microbes Infect.* 2016 Jan 14.
 31. Hamel R, Dejarnac O, Wichit S, Ekcharyawat P, Neyret A, Luplertlop N, et al. Biology of Zika Virus Infection in Human Skin Cells. *J Virol.* 2015 Sep;89(17):8880-96.
 32. Gulland A. WHO warns European countries to be on alert for Zika. *BMJ.* 2016;352:i753.
 33. O'Dowd A. UK is safe from Zika virus and is helping towards a vaccine, MPs hear. *BMJ.* 2016;352:i692.
 34. Petersen E, Wilson ME, Touch S, McCloskey B, Mwaba P, Bates M, et al. Rapid Spread of Zika Virus in The Americas - Implications for Public Health Preparedness for Mass Gatherings at the 2016 Brazil Olympic Games. *Int J Infect Dis.* 2016 Feb 4;44:11-5.