Special Communication

# Zika – A Pandemic in Progress?

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## Abstract

**The emerging threat of Zika virus outbreak with associated neurological abnormalities needs to be assessed in perspective in terms of its ability to cause a pandemic. This article attempts to throw some light on the issue.**

***Keywords:*** *Zika virus, Aedes, arboviruses, countermeasures, pandemic*

The current outbreak of Zika virus (ZIKV) infections in Latin America is a global public health emergency (1) which may signals an emerging pandemic. Prior large outbreaks had occurred in Yap, Micronesia in 2007 (2) and in the French Polynesia, South Pacific in 2013-2014 (3). Serological evidences indicated that ZIKV circulates in human populations in Africa, Southeast Asia, and the Indian Ocean (4,5).

ZIKV shares a similar urban vector, *Aedes (Ae.) aegypti* with other related flaviruses like dengue (DENV) and yellow fever; and also chikungunya virus (CHIKV). *Ae. albopictus* as a new vector for ZIKV was reported in a 2007 outbreaks in Gabon (6). The mosquito is more widely distributed with increasing geographic range (7–9), and increased transmission efficiency (10) that had caused global geographic expansion of CHIKV and DENV (11). ZIKV could mutate to adapt to *Ae. albopictus* (6) when it spreads to new areas where the mosquito is present. The eventual establishment of a sustainable transmission cycle could presage further expansion of the ZIKV (6), even to temperate regions (8,12–14). Non-vector borne transmission of ZIKV (15,16) including sexual transmission (17,18), adds to its pandemic potential.

Increased in microcephaly cases during an outbreak of a newly circulating ZIKV is highly suggestive of a causal relationship; especially with presence of incriminating circumstantial evidences (19,20). However, case-control studies are needed to confirm the association and identifying other possible risk factors (19), including presence of a virulent ZIKV strain since genomic changes in the virus have been reported (21). Case detection would be difficult due to frequent asymptomatic presentations (2); while symptoms are non-specific and similar with other more commonly diagnosed DENV and CHIKV infections (22,23) - thus confounds clinical diagnoses, while specific aetiological diagnoses require high-quality reference laboratories to resolve the cross-reactivity between flavivirus serology results (4,20). Moreover, initial prenatal ultrasounds could be normal, with late confirmed cases (24). Microcephaly could also be occurring in later trimesters (Dr Lacerda Nogueira, Faculdade de Medicina de Sao Jose do Rio Preto - FAMERP, Brazil, ProMED-mail post; archive number: 20160111.3925377), which implies that the risk could be throughout the pregnancy period.

Co-circulation of DENV during ZIKV outbreaks in the French Polynesia (25) and Brazil (26) could have contributed to pathogenesis of Guillian-Barre syndrome (27) and possibly microcephaly (20). CHIKV has also established in areas where ZIKV is reported (6,25,26) and thus is a high likelihood for its co-circulation too. How these arboviruses interplay in a shared ecology still remain uncertain (22).

Border quarantine, by screening of travellers at airports and the border, to prevent importation of infectious diseases is hampered by low detection rate (28,29); more so with ZIKV infections which are mostly asymptomatic. Vaccine development on an accelerated emergency basis could use the existing flavivirus vaccine platforms. However, pre-emptive vaccination would not be cost-effective as arboviral epidemics are unpredictable and sporadic, and sudden explosive outbreaks makes rapid deployment of vaccine stockpiles logistically impossible (30). Moreover, non-availability of incentives for vaccine production makes dependence on large pharmaceutical companies problematic (31). Thus, vector control remains the only choice for current deployment; but might be difficult for *Ae. albopictus* as it often breeds in less accessible areas and produces cold-resistant eggs (12). Moreover, the uncontrollable spread of DENV had exposed weaknesses in vector control due to expense, logistics, public resistance, and problems posed by inner-city crowding and poor sanitation (30).

In conclusion, the potential for rapid spread of ZIKV with severe diseases could not be overlooked. The virus certainly has the prerequisites for the emergence and global spread.

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## References

1. WHO Media Centre. WHO statement on the first meeting of the International Health Regulations (2005) (IHR 2005) Emergency Committee on Zika virus and observed increase in neurological disorders and neonatal malformations [Internet]. Geneva (CH): World Health Organization; 2016 [cited 2016 17 Feb]. Available from: http://www.who.int/mediacentre/news/statements/2016/1st-emergency-committee-zika/en/.

2. Duffy MR, Chen T, 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;**360(24)**:2536–2543. doi: 10.1056/NEJMoa0805715.

3. Cao-Lormeau VM, Roche C, Teissier A, Robin E, Berry ALT, Mallet HP, et al. Zika virus, French Polynesia, South Pacific, 2013. *Emerg Infect Dis*. 2014;**20(6)**:1085–1086. doi: 10.3201/eid2006.140138.

4. Hayes EB. Zika virus outside Africa. *Emerg Infect Dis*. 2009;**15(9)**:1347–1350. doi: 10.3201/eid1509.090442.

5. 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. doi: 10.1371/journal.pntd.0001477.

6. Grard G, Caron M, Mombo IM, Nkoghe D, Ondo SM, Jiolle D, et al. Zika virus in Gabon (Central Africa) – 2007: A new threat from Aedes albopictus? *PLoS Negl Trop Dis*. 2014;**8(2)**:e2681. doi: 10.1371/journal.pntd.0002681.

7. Benedict MQ, Levine RS, Hawkey WA, Lounibos LP. Spread of the tiger: global risk of invasion by the mosquito Aedes albopictus. *Vector Borne Zoonotic Dis*. 2007;**7(1):**76–85. doi: 10.1089/vbz.2006.0562.

8. Medlock JM, Hansford KM, Schaffner F, Versteirt V, Hendrickx G, Zeller H, et al. A review of the invasive mosquitoes in Europe: ecology, public health risks, and control options. *Vector Borne Zoonotic Dis*. 2012;**12(6)**:435–447. doi: 10.1089/vbz.2011.0814.

9. Gratz NG. Critical review of the vector status of Aedes albopictus. *Med Vet Entomol*. 2004;**18(3)**:215–227. doi: 10.1111/j.0269-283X.2004.00513.x.

10. Vega-Rua A, Zouache K, Caro V, Diancourt L, Delaunay P, Grandadam M, et al. High efficiency of temperate Aedes albopictus to transmit chikungunya and dengue viruses in the southeast of France. *PLoS One*. 2013;**8(3)**:e59716. doi: 10.1371/journal.pone.0059716.

11. Kilpatrick AM, Randolph SE. Drivers, dynamics, and control of emerging vector-borne zoonotic diseases. *Lancet*. 2012;**380(9857)**:1946–1955. doi: 10.1016/S0140-6736(12)61151-9.

12. Receveur M, Ezzedine K, Pistone T, Malvy D. Chikungunya infection in a French traveller returning from the Maldives, October, 2009. *Euro Surveill*. 2010;**15(8)**:19494.

13. Buathong R, Hermann L, Thaisomboonsuk B, Rutvisuttinunt W, Klungthong C, Chinnawirotpisan P, et al. Detection of Zika virus infection in Thailand, 2012-2014. *Am J Trop Med Hyg*. 2015;**93(2)**:380–383. doi: 10.4269/ajtmh.15-0022.

14. Tappe D, Nachtigall S, Kapaun A, Schnitzler P, Günther S, Schmidt-Chanasit J. Acute Zika virus infection after travel to Malaysian Borneo, September 2014. *Emerg Infect Dis*. 2015;**21(5)**:911–913. doi: 10.3201/eid2105.141960.

15. Besnard M, Lastère S, Teissier A, Cao-Lormeau VM, Musso D. Evidence of perinatal transmission of Zika virus, French Polynesia, December 2013 and February 2014. *Euro Surveill*. 2014;**19(13)**: pii: 20751.

16. Musso D, Nhan T, Robin E, Roche C, Bierlaire D, Zizou 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)**. pii: 20761.

17. Musso D, Roche C, Robin E, Nhan T, Teissier A, Cao-Lormeau VM. Potential sexual transmission of Zika virus. *Emerg Infect Dis*. 2015;**21(2)**:359–361. doi: 10.3201/eid2102.141363.

18. 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;**17(5)**:880–882. doi: 10.3201/eid1705.101939.

19. 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. doi: 10.15585/mmwr.mm6503e2.

20. Pan American Health Organization (PAHO). Neurological syndrome, congenital malformations, and Zika virus infection. Implications for public health in the Americas—epidemiological alert. [Internet]. Washington DC (USA): World Health Organization, Pan American Health Organization; 2015 [cited 2016 Feb 17]. Available from: http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&Itemid=270&gid=32405&lang=em.

21. Faye O, Freire CC, Iamarino A, Faye O, de Oliveira JV, Diallo M, et al. Molecular evolution of Zika virus during its emergence in the 20(th) century. *PLoS Negl Trop Dis*. 2014;**8(1)**:e2636. doi: 10.1371/journal.pntd.0002636.

22. Ioos S, Mallet HP, Leparc Goffart , Gauthier V, Cardoso T, Herida M. Current Zika virus epidemiology and recent epidemics. *Med Mal Infect*. 2014;**44(7)**:302-307. doi: 10.1016/j.medmal.2014.04.008.

23. Oehler E, Watrin L, Larre P, Leparc-Goffart, 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)**: pii: 20720.

24. den Hollander NS, Wessels MW, Los FJ, Ursem NT, Niermeijer MF, Wladimiroff JW. Congenital microcephaly detected by prenatal ultrasound: genetic aspects and clinical significance. *Ultrasound Obstet Gynecol*. 2000;**15(4)**:282–287. doi: 10.1046/j.1469-0705.2000.00092.x.

25. Roth A, Mercier A, Lepers C, Hoy D, Duituturaga S, Benyon E, et al. Concurrent outbreaks of dengue, chikungunya and Zika virus infections – an unprecedented epidemic wave of mosquito-borne viruses in the Pacific 2012–2014. *Euro Surveill*. 2014;**19(41)**. pii: 20929.

26. Cardoso CW, Paploski IA, Kikuti M, Rodrigues MS, Silva MM, Campos GS, et al. Outbreak of exanthematous illness associated with Zika, chikungunya, and dengue viruses, Salvador, Brazil. *Emerg Infect Dis*. 2015;**21(12)**:2274–2276. doi: 10.3201/eid2112.151167.

27. Musso D, Nilles EJ, Cao-Lormeau VM. Rapid spread of emerging Zika virus in the Pacific area. *Clin Microbiol Infect*. 2014;**20(10)**:0595–0596. doi: 10.1111/1469-0691.12707.

28. Sato H, Nakada H, Yamaguchi R, Imoto S, Miyano S, Kami M. When should we intervene to control the 2009 influenza A(H1N1) pandemic? *Euro Surveill*. 2010;**15(1):** pii: 19455.

29. Scalia Tomba G, Wallinga J. A simple explanation for the low impact of border control as a countermeasure to the spread of an infectious disease. *Math Biosci*. 2008;**214(1-2)**:70–72. doi: 10.1016/j.mbs.2008.02.009.

30. Fauci AS, Morens DM. Zika virus in the Americas — yet another arbovirus threat. *N Engl J Med*. 2016. [Epub ahead of print]. doi: 10.1056/NEJMp1600297.

31. Oyston P, Robinson K. The current challenges for vaccine development. *J Med Microbiol*. 2012;**61(Pt 7)**:889–894. doi: 10.1099/jmm.0.039180-0.