VECTOR-BORNE AND ZOONOTIC DISEASES
Volume 15, Number 4, 2015

DOI: 10.1089/vbz.2015.9001.int

Chikungunya: International Focus Issue

Pierre Roques,[1] Lisa F.P. Ng,[2] I-Ching Sam,[3] and Stephen Higgs[4,5]

In October 2013, the first international meeting on chikungunya took place in Langkawi, Malaysia. The Integrated Chikungunya Research consortium (ICRES, www.icres.eu), coordinated by Professor John Fazakerley and funded by the European Union Seventh Framework Programme (EU FP7), brought together the main European laboratories working on chikungunya with groups in Southeast Asia and Australia. The meeting was attended by 127 participants from more than 20 countries. This chikungunya special focus issue of *Vector-Borne and Zoonotic Diseases (VBZD)*, provides an update of the major topics discussed at the meeting written by selected experts in the field:

- Epidemiology, clinical and diagnostic virology, that is extensively reviewed by Sam and colleagues who are directly involved in the evaluation of differential diagnosis and tests used in Malaysia and Europe;
- Molecular virology, evolution, and mosquito transmission is resumed in this issue by Higgs and Vanlandingham, the pioneers in the evaluation of mosquitoes specificity of alphaviruses;
- Mammalian cell response, immunity, and pathogenesis advances obtained during the current period were presented by Gasque and colleagues;
- Antivirals and vaccines that are probably the fastest moving fields during the last 10 years were extensively presented by Ahola and colleagues with a special emphasis on the vaccine pipeline.

As a background for *VBZD* readers who do not work on mosquito-borne viruses, chikungunya virus (CHIKV) is an alphavirus transmitted by mosquitoes, mainly *Aedes* species. It causes outbreaks of fever, rash, and joint pain which may be debilitating. Although generally an acute self-limiting disease, it can lead to chronic joint pain and inflammation and considerable long-term morbidity. Severe neurological manifestations and multi-organ failure may occur; the fatality rate is mostly unknown, but is estimated to be in the region of 1:1,000. After its description in the 1950's in Tanzania, chikungunya fever was involved in sporadic epidemic outbreaks in the 1960's and 1970's in Asia and Africa. Its apparent disappearance and the lack of subsequent epidemics during the following 30 years resulted in a lack of interest in this pathogen/disease that was limited to tropical areas. Another arbovirus, dengue virus, causing dengue fever that is a differential diagnosis of chikungunya fever, attracted more attention as it spread all around the world during the same period.

Chikungunya fever reemerged into prominence in 2005 when it arose in East Africa and spread across the Indian Ocean into India and Southeast Asia, affecting millions of people until 2010. The explosive nature of this viral disease is illustrated by the outbreak on La Reunion Island, an island off the East African coast in the Indian Ocean, which affected 37% of the 750,000 population over five months and overwhelmed the healthcare system. In addition, travelers and tourists imported the disease to temperate countries, specifically in Europe, where small autochthonous outbreaks occurred in 2007 and 2010. At this time, no specific treatment and vaccine are available, and few options have been explored since the 1970's. Interestingly, early *in vitro* studies with CHIKV, demonstrated induction of type 1 interferon (IFN) and suggested IFV inactivation of the virus (Gifford and Heller, 1963).

A key event which occurred during the early stages of the recent outbreaks was a mutation in the virus that shifted the arthropod vector from *Aedes aegypti* to *Ae. albopictus* (Tsetsarkin et al. 2007). The distribution and potential for continued geographic spread of the Asian tiger mosquito was highlighted in *VBZD* in 2007 (Benedict et al.) and is still of considerable concern (Campbell et al. 2015, Ogden et al. 2014). The risk of chikungunya fever is therefore now present globally (Campion et al. 2015, Higgs and Vanlandingham, 2015).

The surge and impact of the disease in temperate countries was evidenced by increases in the number of scientific papers on chikungunya as well as the numerous groups that have moved into this field.

Experts at the meeting discussed how the disease that had historically affected Asia and Africa was now threatening

[1]CEA, Division of Immuno-Virology, iMETI, Fontenay-aux-Roses, France and University Paris-Sud XI, Orsay, France.
[2]Singapore Immunology Network (SIgN), Singapore.
[3]Department of Medical Microbiology, Faculty of Medicine, Universiti Malaya, Kuala Lumpur, Malaysia.
[4]Editor-in-Chief, *Vector-Borne and Zoonotic Diseases.*
[5]Biosecurity Research Institute (BRI), Kansas State University, Manhattan, Kansas.

Australasia and the Pacific. The risk to the Americas, where an epidemic occurred in 1827 (Halstead, 2015) was a topic of much discussion. Little did we realize how timely this discussion was, for within a month of the meeting, cases of chikungunya in the New World were reported from the island of Saint Martin in the Caribbean (Leparc-Goffart et al. 2014). In December 2013, autochthonous cases were described from French Guyana on the South American mainland. As described in this issue, this ongoing epidemic in the Americas has resulted in over 1 million cases. A major epidemic is also currently sweeping through islands of the South Pacific (Nhan 2015). As described by Magurano et al. in this issue, because of some similarities between chikungunya and dengue fevers, accurate differential diagnosis is critical.

This recent upsurge in interest in this disease makes it an appropriate time to review the new knowledge on chikungunya. My co-authors and I hope that this special focus issue of *VBZD* will convey the current dynamism and enthusiasm of the field to its readers.

References

Benedict MQ, Levine RS, Hawley WA, Lounibos LP. Spread of the tiger: Global risk of invasion by the mosquito *Aedes albopictus.* Vector Borne Zoonotic Dis 2007;7:76–85.

Campbell LP, Luther C, Moo-Llanes D, Ramsey JM, et al. Climate change influences on global distributions of dengue and chikungunya virus vectors. Philos Trans R Soc Lond B Biol Sci 2015;370: 20140135. DOI: 10.1098/rstb.2014.0135.

Campion EW, Weaver SC, Lecuit M. Chikungunya virus and the global spread of a mosquito-borne disease. N Engl J Med 2015;372:1231–1239.

Gifford GE, Heller E. Effect of Actinomycin D on interferon production by 'active' and 'inactive' chikungunya virus in Chick cells. Nature 1963;200:50–51.

Halstead SB. Reappearance of Chikungunya, formerly called Dengue, in the Americas. Emerg Infect Dis 2015;21:557–561. DOI: 10.3201/eid2104.141723.

Higgs S, Vanlandingham DL. Chikungunya: here today, where tomorrow? Int. Health 2015;7:1–3.

Leparc-Goffart I, Nougairède A, Cassadou S, Prat C, et al. Chikungunya in the Americas. Lancet 2014;383:514.

Ogden NH, Milka R, Caminade C, Gachon P. Recent and projected future climatic suitability of North America for the Asian tiger mosquito *Aedes albopictus*. Parasit Vectors 2014;7:532.

Nhan T-X. The burden of Chikungunya in the Pacific. Clin Microbiol Infect 2015; DOI: 10.1016/j.cmi.2015.02.018.

Tsetsarkin KA, Vanlandingham DL, McGee CE, Higgs S. A single mutation in Chikungunya virus affects vector specificity and epidemic potential. PLoS Pathog 2007; 3: e201. DOI: 10.1371/journal.ppat.0030201 2007.