



Chikungunya: first emergent arbovirosis in the XXI century in the Americas*

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In December 2013, the arboviral disease panorama in the Western Hemisphere changed forever with the first reported indigenous circulation of the chikungunya virus in the Region of the Americas, on the island of Saint Martin (1). From that point on, the epidemic spread at an unprecedented pace in the Region. There was unexpected growth in the number of cases, geographical distribution, challenges to health services, case-fatalities, and economic impact. Vector control programs, accustomed to dealing with dengue, had to be retooled to cope with a new threat.

Knowledge of the chikungunya virus (virology, physiopathology, serious clinical manifestations, vertical transmission, chronic manifestations and sequelae, and economic impact) began to develop, based on outbreaks in the French Pacific territories and in India in 2007. However, lack of evidence on the virus' clinical behavior in the Americas prompted the scientific and public health community to work hard to develop and publish their experiences and knowledge.

Molecular analysis of the virus circulating in the Americas shows that it is related phylogenetically to the Asian genotype (2)—one of the three genotypes described, together with the West African (WA) and East-Central-South African (ECSA) ones. The spread of the virus was explosive; in the first year of circulation, more than 1 million suspected and confirmed cases of chikungunya were recorded (3). Epidemiological surveillance systems had to adapt in order to report on the magnitude and dynamics of the spread of chikungunya virus. Some aspects of monitoring, however, still needed to be tackled, such as reporting of atypical and severe cases, and deaths related to the infection. Reported case-fatality from the epidemiological surveillance systems possibly underestimated the virus' effect on the population; this might be clarified through retrospective analysis of the mortality data and verification of whether mortality in older adults (over 65 years of age) increased when the virus spread to the Region.

An unknown arboviral disease in the Americas

Determining which factors led to the swift geographical spread of the chikungunya virus in the Americas is a priority. Such factors may include: the lack of immunity in a population never before exposed to this virus; high and prolonged viremia, which increases the likelihood of transmission; and environmental and social determinants such as high temperature, humidity, vegetation, rainfall, and population density, which favor the proliferation of mosquitoes.

Surveillance and control of arboviral diseases, including dengue, has become significantly more complex since the introduction of the chikungunya virus in 2013 and the Zika virus in 2014–2015. These diseases require an integrated approach, in which clinical care, laboratory work, and vector control are essential elements.

Recognition of the presence of clinical symptoms compatible with chikungunya is essential for early warning of the circulation of the virus, together with differential diagnosis for proper management of diseases that require specific treatment (for example, dengue, leptospirosis, or bacterial sepsis). The challenges of a chikungunya epidemic lie not only in the response to the acute phase, but also to the subacute and chronic forms, which affect people's quality of life and well-being.

Virology laboratories are critical from a public health standpoint for confirming the virus' circulation and chikungunya-related deaths, and from a clinical standpoint for diagnosing atypical and severe forms and mother-to-child transmission. In response, countries rapidly built up their laboratory capacity to detect this new pathogenic virus.

Chikungunya's swift spread was a clear indicator that vector control strategies, as they are applied today, are insufficient to contain arboviral diseases. The extensive

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spread of the vector (*Aedes aegypti* and *Ae. albopictus*) in the Americas—related to different social and economic factors, and to climate change and local and global ecosystems—is the greatest challenge for controlling arboviral diseases in the Region, despite the countries' commitment to phase in integrated vector management (4). Elements of ecological characterization need to be incorporated, along with new technologies with proven results.

The growing complexity of the approach to arboviral diseases from a public health perspective led to the presentation and approval of a regional strategy on arboviral diseases at the 55th Directing Council of the Pan American Health Organization (PAHO) (5). In that strategy, the countries committed to providing an integrated response to the common aspects of clinical care of arboviral diseases, the need for a laboratory network, epidemiological surveillance and vector control.

Toward an integrated management of arboviroses

The ecology in the Americas permits endemic vector-borne diseases, particularly in its large intertropical area. PAHO's origins are, in fact, tied to vector-borne diseases. In 1902, representatives of 11 countries of the Americas met to tackle malaria and yellow fever at the First General International Sanitary Convention of the American Republics—a body that, over time, would become PAHO. One hundred and fifteen years later, PAHO continues to provide technical support to the countries to contend with these and new vector-borne diseases, and the lessons learned from the response to chikungunya proved highly valuable when circulation of the Zika virus in Brazil was confirmed in May 2015. The countries' health services, vector control systems, and laboratory capacity were able to adapt and respond to this new challenge.

Nonetheless, evidence gaps persist with regard to chikungunya, and many pieces of scientific knowledge that have a public health impact have yet to be put in place. Undoubtedly, the virus' behavior in the Americas has to be monitored, not only in human populations, but also in wildlife. The abundance of primate species in many countries, and of mosquitoes that have never been exposed to chikungunya, can create opportunities for the virus to establish sylvatic cycles that to date have not been documented outside of Africa (6). Other pending aspects include: an impact assessment on population mortality in older adults, more precise knowledge of the burden on health systems, an estimate of the disease burden, and calculation of the economic cost to countries.

This special edition of the *Pan American Journal of Public Health* aims to help bridge some of these evidence gaps and provide a platform for disseminating research findings that are relevant from a public health standpoint in the Americas.

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