

## 2. EPIDEMIOLOGY

CHIKV is an RNA virus that belongs to the *Alphavirus* genus in the family *Togaviridae*. The name 'chikungunya' derives from a word in Makonde roughly meaning "that which bends up"; it describes the stooped appearance of patients suffering with the characteristic painful arthralgia.

Epidemics of fever, rash and arthritis resembling CHIK were reported as early as the 1770's. However, the virus was not isolated from human serum and mosquitoes until an epidemic in Tanzania in 1952-53<sup>1</sup>. More outbreaks have subsequently occurred in both Africa and Asia. Many of these outbreaks were in small or rural communities. However, in Asia, CHIKV strains were isolated during large urban outbreaks in Bangkok, Thailand in the 1960s and from Calcutta and Vellore, India during the 1960's and 1970's<sup>2,3</sup>.

### ***Recent outbreaks***

After the initial identification of CHIKV, outbreaks occurred sporadically but little activity was reported after the mid-1980's. However in 2004, an outbreak originating on the coast of Kenya, subsequently spread to Comoros, La Réunion, and several other islands of the Indian Ocean during the following two years. From spring of 2004 to summer of 2006, an estimated 500,000 cases occurred.

The epidemic spread from the Indian Ocean islands to India where large outbreaks emerged in 2006. Once introduced, CHIKV spread to 17 of the 28 states in India and infected more than 1.39 million people before the end of the

year. The outbreak in India has continued into 2010 with new cases appearing in areas not involved in the early phase of the epidemic. Outbreaks have also spread from India to the Andaman and Nicobar Islands, Sri Lanka, the Maldives, Singapore, Malaysia, Indonesia, and numerous other countries via viremic travelers. Concern over the spread of CHIKV reached a peak in 2007 when the virus was found to be spreading autochthonously (human-to-mosquito-to-human) in northern Italy after being introduced by a viremic traveler returning from India<sup>4</sup>. The attack rates in communities that have been affected in the recent epidemics ranged from 38-63% and in many of these countries cases continue to be reported, albeit at reduced levels. In 2010, the virus has continued to cause illness in India, Indonesia, Myanmar, Thailand, the Maldives, and has resurged in La Réunion. Imported cases have also been identified in 2010 in Taiwan, France, and the U.S. from travelers infected in Indonesia, La Réunion, and India, respectively.

During the recent outbreaks, individuals viremic with CHIKV were found in the Caribbean (Martinique), the United States, and French Guiana<sup>5</sup>. All of these individuals were returning from areas with endemic or epidemic CHIKV transmission and thus were not due to autochthonous transmission. However, all of these areas have competent mosquito vectors and naïve hosts and thus could have been the origin of endemic transmission of CHIKV in the Americas. Given these factors, CHIKV has the capacity to emerge, re-emerge and spread quickly in novel areas making heightened surveillance and preparedness a priority.

## ***Transmission Dynamics***

### *Vectors*

There are two main vectors of CHIKV, *Ae. aegypti* and *Ae. albopictus*. Both mosquitoes are widely distributed throughout the tropics with *Ae. albopictus* also being present at more temperate latitudes. Given the vectors' distribution throughout the Americas, the entire region susceptible to invasion and spread of the virus.

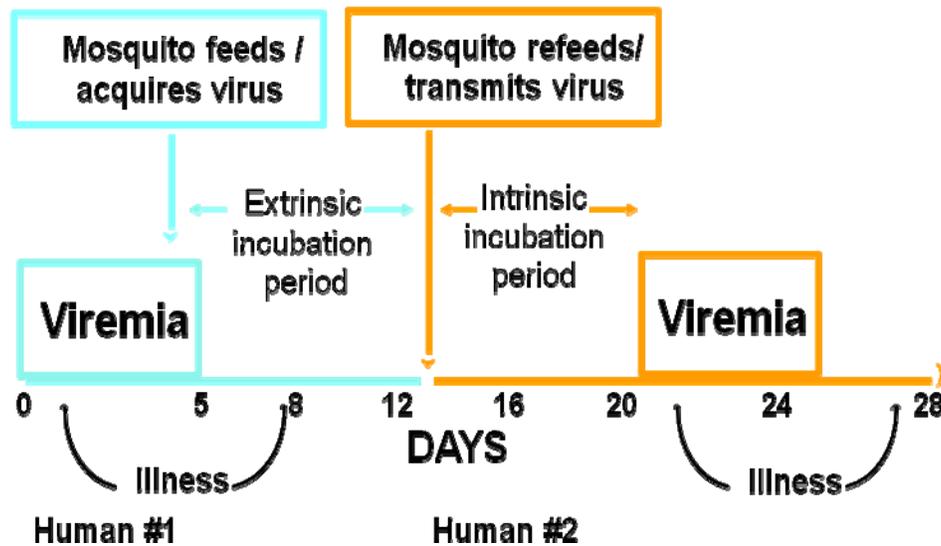
### *Reservoirs*

Humans serve as the primary CHIKV reservoir during epidemic periods. During inter-epidemic periods, a number of vertebrates have been implicated as potential reservoirs, including non-human primates, rodents, birds and other small mammals.

### *Incubation periods*

Mosquitoes acquire the virus from a viremic host. Following an average extrinsic incubation of 10 days, the mosquito is able to transmit the virus to a naïve host, such as a human. In humans bitten by an infected mosquito, disease symptoms typically occur after an average intrinsic incubation period of 3-7 days (range: 1-12 days) (Figure 1).

Figure 1: Extrinsic and intrinsic incubation periods for Chikungunya virus



### *Susceptibility and Immunity*

All individuals not previously exposed to CHIKV (naïve individuals) are at risk of acquiring infection and developing disease. It is believed that once exposed to CHIKV, individuals will develop long lasting immunity that protects against reinfection.

### ***Summary of Epidemiology Section***

- CHIKV is an RNA virus that belongs to the *Alphavirus* genus in the family *Togaviridae*
- The attack rates in communities that have been affected in the recent epidemics ranged from 38-63%
- The two major vectors of CHIKV are *Ae. aegypti* and *Ae. albopictus*; both mosquitoes are widely distributed throughout the tropics and *Ae. albopictus* is present at more temperate latitudes
- CHIK is not known to be circulating in the Americas; however, the risk of introduction is high due to travel importation, competent vectors (same vectors as dengue) and population susceptibility.