



WHAT ARE DENGUE & CHIKUNGUNYA ?

Dengue and chikungunya are mosquito-borne virus infections commonly transmitted by the female mosquitoes of two particular species: *Aedes aegypti* and *Aedes albopictus*. Dengue is found predominantly in tropical and sub-tropical areas of Asia and Latin America, with chikungunya occurring across Africa, Asia, the Americas, and the Indian subcontinent. Both mosquitoes are a major risk in urban and peri-urban regions where *Ae. aegypti* or *Ae. albopictus* are endemic and where mosquito breeding sites exist in close proximity to human dwellings.

The number of dengue infections has risen dramatically over the last few decades and in some Asian and Latin American countries severe dengue ('dengue hemorrhagic fever') is one of the leading causes of infant illness and mortality¹. In Latin America alone, over 300 million cases of dengue have been reported since the virus reappeared in the mid-1980's, and across the whole of the Americas about 1 million cases of dengue fever and a further 25,000+ cases of severe dengue are reported each year, spread across 10-11 countries. In Brazil, nearly 3 million cases and 800 deaths were reported between 2009-2014 and, most recently, 745,957 cases and 229 deaths have been attributed to dengue since the start of 2015. As of April 10, 2015, one-in-ten Brazilian cities have declared epidemic-level rates of dengue fever. The Brazilian government currently spends US\$1.2 billion on vector control each year and information from the Centers for Disease Control & Prevention (CDC) indicate that dengue fever has also cost the Puerto Rico economy over US\$250 million in the last 10 years².

In 2013, chikungunya was discovered for the first time in the Americas with cases of local transmission of the virus occurring in the Caribbean. Since then, a further 1.2 million suspected cases of locally acquired chikungunya have been reported from an additional 44 countries³.

WHAT ARE THE SYMPTOMS ?

Dengue and chikungunya are extremely difficult to differentiate based on symptoms alone and serology tests for virus antibodies are required to confirm an infection as misdiagnosis can occur in regions where both viruses are present⁴. People infected with either virus will typically experience fever, headaches and lethargy, and potentially muscle pain, mild to severe joint pain, nausea and a rash. The onset of debilitating bilateral polyarthralgia (crippling joint pain) or arthritis may indicate for the presence of chikungunya instead of dengue⁴. Onset of Symptoms typically occurs after a 4-10 day incubation period and may last for 2-7 days. There is no cure for dengue fever or chikungunya but treatment may involve monitoring of fluids and/or pain relief.

Dengue can be caused by any one of four distinct serotypes of the virus (DEN-1, DEN-2, DEN-3 & DEN-4) and recovery after infection confers immunity to that serotype. No lasting cross-immunity is conferred to the other remaining serotypes and repeated infection with any other serotype dramatically increases the chances of developing potentially deadly severe dengue. The symptoms of severe dengue are initially the same as for dengue fever, except that over the course of several days the infected person will become increasingly agitated and sweaty and complications may arise due to fluid retention, plasma leaking, severe bleeding, respiratory distress, and organ impairment¹. Hemorrhagic patches of blood then begin to develop underneath the skin and minor injuries can cause severe bleeding, shock, or death. However, if the infected person survives this critical 24-48 hour phase, recovery usually commences. The WHO recommends that proper medical care is required in instances of severe dengue¹



HOW IS IT TRANSMITTED ?

Aedes aegypti is the primary vector of both dengue and chikungunya, although *Aedes albopictus* may also transmit the viruses. The transmission of each virus is fundamentally simple, as it is transmitted to human-to-human in the saliva of an infected *Aedes* female. Conversely, if a mosquito feeds on an infected host, the virus will incubate in the mosquito for between 4-10 days before then making the mosquito infective for the rest of its life. People who are infected with dengue fever or chikungunya can transmit the infection to mosquitoes for up to 12 days (typically 4-5 days) after the onset of the first symptoms.

Aedes aegypti is a particularly hazardous host of the virus as it is a day-biting mosquito that also lives in urban and peri-urban habitats and which readily breeds in man-made containers. Female *Ae. aegypti* may enter into buildings to feed and will also bite several people in one feeding period, heightening the risk of virus transmission in endemic regions. *Aedes albopictus*, which may also transmit both viruses, has recently spread to new regions of the world, most often through trade routes and small deposits of water in shipping containers and items such as used tires. *Ae. albopictus* is of particular concern to much of Europe and cooler regions as it possesses greater cold tolerance and can survive below freezing temperatures.



HOW IS IT CONTROLLED ?

Currently there are no direct methods to control outbreaks of dengue fever and chikungunya beyond attempts at reduction of the vector mosquitoes. This typically involves intensive efforts at breeding-source eradication or treatment and reduction of adults and larvae. Breeding holes and water sources may be successfully treated chemically by commercial, government or non-governmental organizations, or by engagement with the local community to physically fill or modify drainage to limit larval survival. Widespread application (e.g. aerial spraying, ground fogging) of insecticides is rarely successful in rural areas although it may have limited success in urban and peri-urban areas if appropriately planned and monitored. Large-scale efforts at the release of 'sterile-male' or 'Wolbachia-infected' mosquitoes are still developing control strategies.

Prevention is best achieved through community-wide education about breeding site identification and eradication, and the use of personal protective clothing, barriers, and repellents. Targeted insecticide application around interiors and the use of mosquito bed nets will limit the risk of being bitten during the night, although as noted above both *Ae. aegypti* and *Ae. albopictus* are active day biters as well, making the use of personal repellents highly recommended.

REFERENCES AND FURTHER INFORMATION

- 1) <http://www.who.int/mediacentre/factsheets/fs117/en/>
- 2) <http://www.cdc.gov/dengue/>
- 3) <http://www.cdc.gov/chikungunya/>
- 4) <http://www.medscape.com/viewarticle/831523>
- 5) <https://www.nlm.nih.gov/medlineplus/ency/article/001373.htm>

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