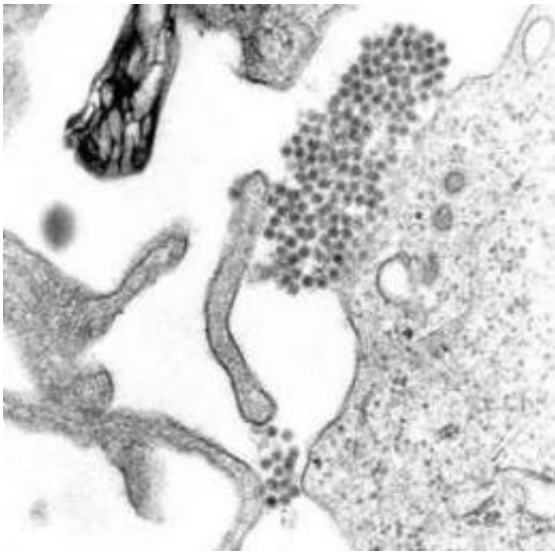


Mosquitoes more likely to transmit dengue virus in hot weather

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A TEM micrograph showing Dengue virus virions (the cluster of dark dots near the center). Image: CDC

Dengue virus grows and spreads in mosquitoes faster at higher temperatures, but slows when temperatures are lower or fluctuate, suggesting that local weather conditions could have a big influence on dengue fever outbreaks. The findings, published today in open-access journal *Frontiers in Microbiology*, could help people prevent outbreaks during warm periods by reducing their exposure to mosquitoes or controlling mosquito numbers.

"Weather reports should be considered for early warning systems," says one of the study's authors, Xiao-Guang Chen from the Southern Medical University in Guangzhou, China. "If the outdoor [temperature](#) is high for a sustained period, dengue prevention strategies should be a priority."

An estimated that 390 million people are infected each year with [dengue virus](#), which can cause serious illnesses such as [dengue hemorrhagic fever](#) and [dengue shock syndrome](#). The [virus](#) is transmitted to humans through mosquito bites. It replicates during an initial incubation period beginning in the mosquito's gut, before spreading to reach its salivary glands. During a bite, the mosquito then transmits the virus in its saliva.

Many different factors can play a role in dengue fever outbreaks, including human population density and the numbers of [mosquitoes](#) in the region. Chen noticed that in China, outbreaks tend to be worse in southern regions, such as Guangdong Province - and that even within the province, some places are more prone to outbreaks than others. In one [outbreak](#) in Guangdong Province in 2014, a massive 96% of cases were concentrated in Guangzhou, for example, whereas Shenzhen, a similar city nearby, suffered very few cases.

During the 2014 outbreak, Guangdong Province was very hot, with a daily average maximum temperature of over 30°C from July to September. Chen and colleagues suspected that this may have played a role in the outbreak, and set out to see if temperature and temperature fluctuations affect the growth of dengue virus in mosquitoes.

The researchers infected mosquitoes with dengue virus, and kept them in the lab in incubators set at 18°C, 23°C, 28°C or 32°C. Another group of mosquitoes experienced temperatures that fluctuated each day (28°C for 14 hours, 23°C for 2 hours and 18°C for 8 hours). The researchers then determined how much the virus had replicated and whether it had spread throughout the mosquitoes' bodies.

The research team found that higher temperatures (23-28°C) resulted in more rapid viral growth and higher levels of virus. The hot conditions also led to a shorter viral [incubation period](#), and the virus spreading throughout the mosquitoes' body to their salivary glands much earlier, meaning more infectious mosquitoes.

Under the coolest conditions, at 18°C, the virus grew very slowly and didn't spread to the salivary glands at all, reducing the chance that the mosquitoes could transmit it to humans. This might explain why cooler regions suffer less from [dengue](#) fever.

Interestingly, under fluctuating temperatures, the mosquitoes also showed lower levels of virus in their salivary glands compared with those kept at a constant 28°C. This suggests that even a temporary drop in temperature might be enough to reduce the chances that mosquitoes are infectious.

This findings may explain the different fates of Guangzhou and Shenzhen during the 2014 outbreak, as Shenzhen may experience greater temperature swings during the day, meaning it had less infectious mosquitoes. The scientists need to carry out further work to see whether this hypothesis is correct, and whether their results are applicable to mosquitoes in the wild.

More information: Zhuanzhuan Liu et al, Temperature Increase Enhances *Aedes albopictus* Competence to Transmit Dengue Virus, *Frontiers in Microbiology* (2017). [DOI: 10.3389/fmicb.2017.02337](https://doi.org/10.3389/fmicb.2017.02337)

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