



Singapore is struggling to contain dengue

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# A bug to battle dengue

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SINGAPORE is in the midst of its worst ever outbreak of dengue fever, caused by a virus that attacks around 100 million people globally each year. A new approach to tackling the disease is needed, and that could be to infect the mosquitoes that carry dengue with a bacterium that shortens their lifespan.

Fighting diseases by attacking the insects that spread them is not a new idea. One trick that has worked against the tsetse fly in Zanzibar and the screw-worm fly in North America is to release billions of sterilised males to swamp the wild population. Almost all the wild females mate with the sterilised males and

the population quickly crashes.

But this is only a short-term fix because disease-carrying insects from nearby populations fill the vacant niche. The ideal approach would be to replace the existing population with one that cannot transmit the infection to humans.

This now looks more feasible thanks to research by Stephen Dobson, an entomologist at the University of Kentucky in Lexington, and his colleagues. He created artificial lab populations of *Aedes aegypti* mosquitoes, the main carrier of dengue, to see whether he could infect all of the insects with a bacterium that would prevent them passing on the virus to people.

Dobson and his colleagues injected mosquito eggs with a strain of the *Wolbachia* bacterium that passes only from mother to offspring. It spreads via a devious mechanism called "cytoplasmic incompatibility", in which it modifies the sperm of infected males so that when they fertilise the eggs of uninfected females, these fail to hatch. The eggs of females that carry the bacteria are able to counteract the sperm modification, so matings between infected partners are successful.

"It is like a poison-antidote scenario," explains Dobson. "But here the poison and antidote are the same substance – the bacteria." The upshot is that uninfected females are effectively sterilised. Infected females are at an advantage and so the infection spreads. In the lab, the whole population was infected within seven generations, starting with one-fifth of individuals carrying the virus (*Science*, vol 310, p 326).

Since the insects need to incubate the infection for two weeks before they can pass it on, using a *Wolbachia* strain that restricts the mosquito's lifespan would stop it from infecting humans with the virus. "This is a significant step towards completely replacing a population that can transmit dengue with one that can't," says Steven Sinkins, who studies *Wolbachia* at the University of Oxford.

But Marc Muskavitch, a molecular cell biologist at Boston College, is concerned that you need to infect one-fifth of the mosquito population to establish the bacteria. "This would require a massive rearing of infected insects in practical applications," he says. "It's not impossible, but it would be challenging." ●

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