

Dengue infections dive where *Wolbachia* established in mosquitoes in parts of Asia, Australia, and Brazil

November 22 2019

Amid a global surge of infections with dengue and fears climate change will make it worse, an international alliance of researchers presented new evidence today showing reports that the disease fell dramatically in communities in Indonesia, Vietnam, Brazil and Australia. The reduction in dengue cases occurred in communities where they had released lab-grown mosquitoes carrying *Wolbachia*, a naturally occurring bacteria that prevents mosquitoes from transmitting infections when they bite humans.

Presenting today at the Annual Meeting of the American Society of Tropical Medicine and Hygiene (ASTMH), researchers at the World Mosquito Program (WMP) reported a key finding: a 76% reduction in dengue transmission in a community in Indonesia that endures frequent dengue outbreaks and a similar reduction in cases of dengue and chikungunya in an [urban area](#) near Rio de Janeiro, Brazil.

"We are very encouraged by the public health impact we are seeing—it highlights the potential of this approach to fight dengue and related mosquito-borne diseases at a global scale," said Professor Cameron Simmons, Director of Impact Assessment and an expert in the epidemiology of dengue at WMP. "Evidence is rapidly accumulating that areas where *Wolbachia*-infected mosquitoes have been deployed have fewer reports of dengue than untreated areas."

Often called break-bone fever for the searing joint pain it produces, dengue also can lead to fatal complications. There are no drugs to treat the disease. The only licensed dengue vaccine has been saddled with safety issues. The ASTMH Annual Meeting will feature a highly-anticipated update from a late-stage trial with a new dengue vaccine, but experts stress that many tools are needed to control the disease.

The WMP *Wolbachia* trials are ongoing and, given the promising results thus far, are being rapidly expanded to Colombia, Sri Lanka, India and Western Pacific island nations. These trials are driven by a [large body of evidence](#) indicating that establishing *Wolbachia* in local mosquito populations could offer a safe way to reduce dengue infections.

Wolbachia-infected mosquitoes can be created in the laboratory by injecting it into their eggs. *Wolbachia* also has been shown to inhibit chikungunya and Zika.

While presenting at the ASTMH conference today, Katie Anders, Ph.D., an expert in the epidemiology of dengue at WMP, and her colleagues noted that the work in Indonesia involved an experimental release in 2016 of *Wolbachia*-infected mosquitoes in an area of about 65,000 people adjacent to Yogyakarta City, Indonesia. The city on the island of Java is home to about 400,000 people who routinely face risks of dengue infections. The 76% reduction represented notifications of dengue among the targeted population recorded by local health authorities, compared with an untreated control area nearby.

Anders reported results from a smaller field study near Nha Trang, Vietnam where very few cases of dengue were reported during the year following the 2018 release of *Wolbachia*-infected mosquitoes. This low case incidence in the intervention area was documented at a time in which Nha Trang itself was experiencing one of its largest dengue outbreaks ever.

Anders also presented [results](#) published earlier this year showing local dengue transmission ceased in Far North Queensland, Australia. Beginning eight years ago, releases of *Wolbachia*-infected mosquitoes in local communities in this region led to a 96% reduction in cases of [dengue-transmission](#).

The researchers stressed that all of the mosquito releases have been preceded by intensive community outreach and education efforts to inform local communities about the safety of *Wolbachia* bacteria and the potential impact of the releases on the surrounding ecosystem. Advocates of this approach to fighting dengue noted that it has several advantages over other methods. *Wolbachia* has none of the toxicity of conventional insecticides and it does not require genetically modifying the mosquitoes. It is also self-sustaining, which should make it highly cost effective.

Wolbachia is naturally present in the majority of insects. But it's not found in the *Aedes aegypti* mosquitoes that are the main carriers, or vectors, of dengue, chikungunya and Zika—all of which belong to a class of viruses called arboviruses.

"This is exciting work, carried out in the midst of an explosion in dengue infections that health authorities are finding very difficult to control," said ASTMH President Chandy C. John, MD, MS, FASTMH. "The combination of advanced science and committed community engagement is impressive—and essential to its success."

Using *Wolbachia* to Target Both Chikungunya and Dengue in Brazil

Luciano Moreira, Ph.D., WMP's Program Lead in Brazil, reported preliminary results showing cases of dengue and chikungunya fell by more than 70% in 2018—2019 among 100,000 people in two different

areas Niterói, a city near Rio, following the release of *Wolbachia*-infected mosquitoes in their neighborhoods.

Moreira and his team at Fundação Oswaldo Cruz (Oswaldo Cruz Foundation) also noted, however, that because dengue incidence was generally low throughout Rio and Niteroi during the field trials, it was more difficult to show a comparative reduction in *Wolbachia*-treated areas. There was, though, a clear difference compared to untreated areas.

"There has been an epidemic of chikungunya in these areas," Moreira said. "And disease surveillance by the Ministry of Health is showing there was 75% less chikungunya in Niteró where we released the mosquitoes compared with areas where we are not working." Chikungunya is a disease that can lead to chronic, debilitating joint pain and, while native to sub-Saharan Africa, it is becoming a growing problem across Latin America and the Caribbean.

Meanwhile, dengue is once again surging in Brazil, with infections in 2019 up almost 600% and deaths rising by 220%. It's part of a trend in which, last year, dengue infections globally reached near record highs, with especially large outbreaks in Asia and Latin America. Dengue [is common in Puerto Rico, the U.S. Virgin Islands](#) and American Samoa, and local transmission has occurred in Florida, Texas and Hawaii.

Moreira said Brazil's Ministry of Health is keen to expand efforts to test the capacity of *Wolbachia*-infected mosquitoes as a tool for controlling outbreaks of dengue and chikungunya. There is also interest in using [Wolbachia to help protect people from Zika](#) as well. While the intense Zika outbreak of 2016 is over, there are concerns it could return in Brazil and elsewhere. Moreira said plans are now underway to target 1.5 million people with releases of *Wolbachia*-infected mosquitoes in Brazil. Meanwhile, Anders said work is also [underway in Yogyakarta City](#) to conduct a gold-standard trial that involves a population of about

350,000.

Existing evidence of reductions in [dengue](#) linked to the *Wolbachia* [mosquitoes](#) is entirely consistent with [earlier modelling predictions](#) of the likely impact. There have been no safety concerns in any of the communities where *Wolbachia* has been deployed. "We are very excited that this self-sustaining and cost-effective method has been embraced by communities and is delivering the public health benefits we expected it would," said the WMP's Simmons. "Our challenge now is to work with partners and governments to bring the method to 100 million people by 2023."

Provided by American Society of Tropical Medicine and Hygiene

Citation: Dengue infections dive where *Wolbachia* established in mosquitoes in parts of Asia, Australia, and Brazil (2019, November 22) retrieved 3 May 2024 from <https://medicalxpress.com/news/2019-11-dengue-infections-wolbachia-mosquitoes-asia.html>

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