

South American cities release mosquitoes to stem disease

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Credit: Jimmy Chan from Pexels

When Waldeir Barbosa da Silva explained to his family that he was going to release hundreds of thousands of mosquitoes into the open, infected with a bacterium, they were surprised.

In Niterói, southeast Brazil, where da Silva lives, diseases spread by [mosquitoes](#), such as dengue, chikungunya, and Zika, pose a serious public health problem.

However, when mosquitoes carry the bacteria Wolbachia, naturally present in many insects, their ability to transmit these viruses decreases.

"I leave home at 4:30 am," says da Silva, a technician for Brazil's Oswaldo Cruz Foundation (Fiocruz). "At Fiocruz I go straight to where the mosquito tubes are—about 150,000 or 200,000 of them—and withdraw the amount that I have to release. Every day in a different area."

In 2023, global dengue cases hit a historic high of more than 5 million, with 5,000 deaths reported worldwide. And 80% of the cases were in the Americas, according to the latest analysis from the World Health Organization (WHO).

The finding about Wolbachia was made by Scott O'Neill, founder of the World Mosquito Program (WMP), and his colleagues in 2009.

In 2011, Wolbachia-carrying mosquitoes were released for the first time into a community in the Cairns region of Australia. Five weeks later, 100% of mosquitoes at Yorkeys Knob and 90% at Gordonvale were found to carry Wolbachia.

Since then, WMP has devised a strategy to breed large numbers of infected mosquitoes and release them into places with high rates of mosquito-borne diseases.

The first achievement using this technique was the transferral of the wMel Wolbachia strain to the *Aedes aegypti* mosquito, which does not carry it naturally.

"The bacterium was injected into the eggs of mosquitoes," says Sandra Zapata, an environmental technologist who worked with WMP in Barrio Paris, a district of Bogotá, Colombia, during the initiative's most recent intervention.

In that instance, according to a [study](#) published in 2023 in *PLOS Neglected Tropical Diseases*, the release of mosquitoes in the cities of Bello, Medellín and Itagüí reduced the incidence of dengue by more than 94% compared to previous outbreaks.

In [another study](#), published by the same journal in 2021, the incidence of dengue fever decreased by 69%, chikungunya by 59% and Zika by 37% after Wolbachia-infected mosquitoes were released in Niterói.

Introducing the bacteria into mosquito eggs is called embryonic microinjection, a complex technique for mass production.

"Luckily, Wolbachia is transmitted vertically from mother to offspring," says Gabriela de Azambuja García, a veterinarian at a Fiocruz laboratory who was not involved in the research.

After the first group of mosquitoes with Wolbachia is established in the laboratory, all that's needed is to mate females with males collected using traps from the area where they will be released.

Change of strategy

As well as its projects in Colombia and Brazil, the WMP works in Mexico, Honduras and El Salvador and in affected communities in Asia, such as Indonesia, Laos, Sri Lanka and Vietnam.

Before undertaking such an intervention, WMP recognizes the need to explain to people how releasing mosquitoes can help reduce [dengue](#)

[fever](#), when previously the strategy to lower transmission was to prevent them from reproducing.

To that end, its interventions begin with community work.

"Community involvement is the most important thing we do," explains Peter Ryan, an entomologist who leads the research in Colombia. "Many interventions don't succeed because people don't understand or trust."

For children, there's a "Wolbito at school" program. "Wolbito" is the affectionate name in Brazil for mosquitoes with Wolbachia. The program involves taking eggs infected with the bacteria to schools so that pupils can observe their growth.

"This year we did all the development, from observing the larvae, the pupae, the mosquitoes, and the children reported the details through drawings and writing," explains Karine Cardoso Duarte, a primary school teacher in Niterói.

"We made a small book that was made available in the school library," she adds.

To further study the causal relationship between these interventions and dengue reduction, a blinded clinical trial is being conducted in Belo Horizonte, Brazil. Some localities will be treated with infected mosquitoes and others with insects without the bacteria. The whereabouts of the infected mosquitoes will not be revealed until the results are available in 2025.

Rising demand

For now, the main challenge facing the WMP is demand. In addition to the five cities where the project is being run in Brazil, "we have more

than 40 who contacted us and want us to apply their program," explains Moreira.

Vinicius Lima, a cell maintenance technician and community leader in Caramujo, a neighborhood of Niterói, believes the program can save lives.

"The initiative helps control mosquitoes without using chemical spraying," Lima tells SciDev.Net, adding, "I hope it can come to our community."

To meet this demand, Fiocruz and the WFP are planning to build a mosquito factory this year to expand the program. They are also beginning to use mosquito eggs, which are easier to transport than adult insects.

Although he is optimistic about the results from Bello, Medellín and Itagüí, Azambuja Garcia notes that Wolbachia is no panacea.

"In the near future, the ideal scenario would involve the rational use of multiple techniques for mosquito control and working synergistically to combat the spread of vector-borne diseases," he says.

More information: Iván Darío Velez et al, Large-scale releases and establishment of wMel Wolbachia in *Aedes aegypti* mosquitoes throughout the Cities of Bello, Medellín and Itagüí, Colombia, *PLOS Neglected Tropical Diseases* (2023). [DOI: 10.1371/journal.pntd.0011642](https://doi.org/10.1371/journal.pntd.0011642)

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