Wolbachia

Wolbachia is a natural bacterium present in up to 60% of all the different species of insects around us, including some mosquitoes.

However, it is not usually found in the Aedes aegypti mosquito, the primary species responsible for transmitting harmful human viruses such as dengue, chikungunya, and Zika.

Our research has shown that when introduced into the Aedes aegypti mosquito, Wolbachia will reduce the ability of insects to become infected with viruses. This important discovery has the potential to transform the fight against life-threatening viral diseases.

Wolbachia is safe for humans, animals and the environment. Three independent risk assessments have been conducted, all of which gave an overall risk rating of ‘negligible’ (the lowest possible rating) for the release of mosquitoes with Wolbachia.

Wolbachia bacteria can be used in a number of ways, including to suppress mosquito populations. However, the Eliminate Dengue Program’s Wolbachia method is unique because it reduces the ability of mosquitoes to become infected with viruses that can then be passed on to people. This effect is self-sustaining in the mosquito population and does not need to be continually reapplied, making it an affordable, long-term intervention.

How does Wolbachia spread through the mosquito population?

The diagram (right) explains a process called Cytoplasmic Incompatibility (CI) which allows Wolbachia to spread into the mosquito population. We hope that by releasing a limited number of mosquitoes with Wolbachia to breed with wild mosquitoes, over a small number of generations, a high percentage of the mosquitoes in the release area will carry the bacteria. Our field trials using this method have been very encouraging and in areas with high levels of Wolbachia, we have not seen any significant local transmission of dengue.

Image: Wolbachia transferred from the fruit fly to Aedes aegypti mosquitoes by microinjection at Monash University in Australia.

Diagram:

A. When male mosquitoes with Wolbachia mate with female wild mosquitoes that don’t have Wolbachia, those females will have eggs but they won’t hatch.
B. When male mosquitoes with Wolbachia mate with females that are already carrying Wolbachia, the mating will be normal and all the offspring will have Wolbachia.
C. When female mosquitoes with Wolbachia mate with males without Wolbachia, all her offspring will have Wolbachia.
How safe is Wolbachia for people and animals?

Years of laboratory and field-based research have concluded that mosquitoes with Wolbachia are safe for people, animals and the environment. Some mosquitoes (including those that bite people) already naturally carry Wolbachia, but not the Aedes aegypti mosquito.

Is Wolbachia harmful to the environment?

Wolbachia is an environmentally friendly intervention. It is a naturally occurring bacterium already found in many insect species. Our experiments in the laboratory found Wolbachia cannot be passed to humans or other mammals.

Do other animals carry Wolbachia?

Wolbachia is common among arthropods (including insects, spiders and other small animals with no backbone). Up to 60% of insect species naturally carry Wolbachia, including butterflies, dragonflies, moths and some mosquito species. Wolbachia is not found in any larger animals such as mammals, reptiles, birds and fish.

Will the bite of a mosquito infected with Wolbachia hurt more than a normal bite?

No, people who are bitten by an Aedes aegypti mosquito carrying Wolbachia will not notice any difference.

ABOUT US

The Eliminate Dengue Program is an international, non-profit research collaboration led from Monash University, Australia. Today, communities around the world are working with our Eliminate Dengue project teams to implement a unique defence against mosquito-borne viruses including dengue, chikungunya and Zika.

We currently have projects in Australia, Brazil, Colombia, India, Indonesia, and Vietnam with support from governments, research institutes and philanthropic partners around the world. These include:

- The Foundation for the National Institutes of Health through the Grand Challenges in Global Health Initiative of the Bill & Melinda Gates Foundation
- The Wellcome Trust
- The UK government
- The United States Agency for International Development through the Combating Zika and Future Threats Grand Challenge
- The Tahija Foundation, Indonesia
- The Gillespie Family Foundation
- The Australian and Queensland governments
- The Brazilian government
- The Indian Council of Medical Research

Wolbachia (green) seen up close in the cells of an Aedes aegypti mosquito.