

Wolbachia



Wolbachia are natural bacteria present in up to 60% of insect species, including some mosquitoes.

Wolbachia is not usually found in the *Aedes aegypti* mosquito, the primary species responsible for transmitting human viruses such as Zika, dengue, chikungunya and yellow fever. Research conducted by the World Mosquito Program (WMP) shows that when introduced into *Aedes aegypti* mosquitoes, *Wolbachia* can help to reduce the transmission of the viruses they carry.

The WMP introduces *Wolbachia* into *Aedes aegypti* mosquitoes in the laboratory and releases them into the wild. These mosquitoes then breed with the wild mosquito population. Over time, the percentage of mosquitoes carrying *Wolbachia* grows until it remains high without the need for further releases.

Wolbachia is safe for humans, animals and the environment. Two independent risk assessments have been conducted, both of which gave an overall risk rating of 'negligible' - the lowest possible rating - for the release of mosquitoes with *Wolbachia*.

The WMP's *Wolbachia* method has some unique advantages. It is safe, natural and deployed without posing risk to natural ecosystems or involving genetic modification (GM). Unlike most other initiatives, the WMP's *Wolbachia* method is self-sustaining and does not suppress mosquito populations.

How does *Wolbachia* increase throughout the mosquito population?

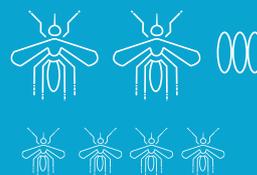
The diagram (right) explains a process called Cytoplasmic Incompatibility which allows *Wolbachia* to increase in the mosquito population. It shows that *Wolbachia* can only be transmitted from parent to offspring inside the female's egg. While this limits the initial amplification of *Wolbachia* in mosquito populations, over successive generations the numbers of male and female mosquitoes with *Wolbachia* steadily increase.

Long-term monitoring by the WMP's researchers show that *Wolbachia* is self-sustaining at high levels in the majority of our international project sites up to seven years after release. In these areas, there have not been any dengue outbreaks.

Cytoplasmic Incompatibility



When male mosquitoes with *Wolbachia* mate with wild female mosquitoes without *Wolbachia*, those females will lay eggs but they won't hatch.



When male mosquitoes with *Wolbachia* mate with females with *Wolbachia*, all of their offspring will carry *Wolbachia*.



When female mosquitoes with *Wolbachia* mate with males without *Wolbachia*, all of their offspring will carry *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*.

Is *Wolbachia* harmful to the environment?

The WMP's *Wolbachia* method is an environmentally friendly intervention that uses naturally occurring bacteria already found in many insect species. The WMP's laboratory research found that *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 without backbones. Up to 60% of insect species naturally carry *Wolbachia*, including butterflies, dragonflies, moths and some mosquito species. *Wolbachia* is not found in 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.

Our research shows that when introduced into the *Aedes aegypti* mosquito, *Wolbachia* is capable of blocking the transmission of Zika, dengue and chikungunya.

Wolbachia is transferred from the fruit fly to *Aedes aegypti* mosquitoes by microinjection.

Wolbachia is:

- **Naturally occurring bacteria**
- **Found in 60% of all insect species**
- **Safe for humans, animals and the environment**

About us

The World Mosquito Program is an international, not-for-profit initiative that works to protect the global community from mosquito-borne diseases including dengue, Zika, chikungunya and yellow fever.

Our Public Acceptance Model guides engagement, communication and issues management. No mosquitoes are released until endorsement by the Community Reference Group. Currently the World Mosquito Program works in 12 countries in Asia, the Pacific and the Americas.

Our ambition is to protect 100 million people at US\$1 per person by 2023. In addition to the Oceania Office in Melbourne, Australia, the World Mosquito Program has a regional Asian Hub in Ho Chi Minh City, Vietnam and plans for an Americas Hub in Panama.

Our approach has widespread support from communities, governments, research institutes and philanthropic partners around the world.

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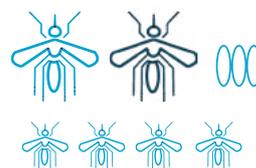
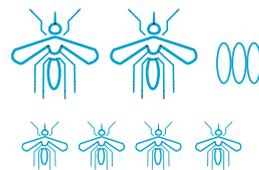
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The World Mosquito Program (WMP) is an international, not-for-profit initiative that works to protect the global community from mosquito-borne diseases including Zika, dengue and chikungunya.

The WMP is working with communities in 12 countries across Asia, Latin America and the Western Pacific, as well as our pioneer program in Australia. The WMP has two regional hubs – our Asia hub in Ho Chi Minh City, Vietnam, and Oceania hub, based at Monash University in Melbourne, Australia.

Our approach has widespread support from communities, governments, research institutes and philanthropic partners around the world, including:

- The Bill & Melinda Gates Foundation
- Yayasan Tahija, Indonesia
- The Wellcome Trust
- United States Agency for International Development
- The Australian and Queensland Governments
- Australian Government's Department of Foreign Affairs and Trade (innovationXchange)
- New Zealand Aid Programme
- The Brazilian Government
- The UK Government
- Candeo Fund – International Community Foundation
- The Gillespie Family Foundation
- Rotary Foundation and local clubs
- Foundation for the National Institutes of Health
- KPMG
- New England Biolabs

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