Wolbachia is a natural bacterium present in up to 60% of all the different species of insects around us including some mosquitoes that bite people but not the major mosquito species involved in the transmission of diseases such as dengue and malaria.

• Wolbachia is a bacterium that lives only within insect cells and is passed from one generation to the next through the insect’s eggs.
• For many years now scientists have been studying Wolbachia looking for ways to utilise the bacterium to potentially control the mosquitoes that spread human diseases.
• Wolbachia pipiens was first observed in the ovaries and testes of the mosquito, Culex pipiens in the 1920’s.
• Early studies showed that it was not a pathogen of mammals but instead a naturally occurring and harmless symbiotic bacterium of insects.
• Our research has shown that when introduced into the dengue carrying mosquito Aedes aegypti Wolbachia acts like a ‘vaccine’ for the mosquito by blocking dengue virus transmission.
• Wolbachia is safe for humans, animals and the environment.

Different strains of Wolbachia

The Eliminate Dengue research program is currently field-testing two Wolbachia strains - wMel and wMelPop - with other Wolbachia strains in different stages of development.

• Each strain has a slightly different effect on the mosquito’s fitness and consequently how easily it will establish in the wild mosquito population once it is released.
• Wolbachia strains also differ in terms of their ability to block dengue virus inside the mosquito.
• Over time we hope to select strains that have a strong blocking effect on dengue virus in the mosquito and therefore prevent dengue transmission, yet are easily introduced into mosquitoes in the field and thereby provide a low-cost, long-term solution to dengue control.

How Wolbachia spreads in insect populations

The diagram below explains Cytoplasmic Incompatibility (CI) and how Wolbachia spreads in insect populations. It is our hope that by releasing a limited number of mosquitoes with Wolbachia to breed with wild type mosquitoes, over a small number of generations, will result in all the mosquitoes having Wolbachia.

a. When male insects with Wolbachia mate with female wild insects that don’t have Wolbachia, those females will have eggs but they won’t hatch.

b. When male insects with Wolbachia mate with females that are already carrying Wolbachia, the mating will be normal and the offspring will all have Wolbachia.

c. When female insects with Wolbachia mate with males without Wolbachia, all her offspring will have Wolbachia.
Frequently asked questions

1. **What is Wolbachia?**

   *Wolbachia* are bacteria that only live inside insect cells. This bacterium occurs naturally in up to 60% of all insect species, including butterflies, dragonflies and moths. Despite the broad range of insects carrying *Wolbachia*, it is not infectious and cannot be transmitted to any warm blooded animals, including humans.

2. **What effect will Wolbachia have on mosquitoes carrying dengue?**

   *Wolbachia* will reduce the ability of insects to become infected with viruses, including the dengue virus. If mosquitoes cannot become infected with dengue, they cannot transmit the virus between people.

3. **How will Wolbachia spread through the mosquito population?**

   *Wolbachia* can only be transmitted from parent to offspring inside the female’s egg. It spreads into insect populations by altering the reproductive success of the insect that carries it - see over the page for diagram.

4. **How safe is Wolbachia?**

   The Eliminate Dengue program has demonstrated that *Wolbachia* is safe by allowing the mosquitoes to feed directly from researchers on a routine basis. *Wolbachia* cannot be passed to humans as it is too big to travel down the salivary gland ducts of a mosquito.

5. **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 containing *Wolbachia* will not notice any difference or be harmed in any way.

6. **Is Wolbachia harmful to the environment?**

   No, *Wolbachia* is a naturally occurring bacterium that is already found in the environment in up to 60% of all insect species, including many mosquitoes that bite people.

7. **Why is this approach better than insecticides?**

   The *Wolbachia* control strategy is a form of biological control and should be self-sustaining due to *Wolbachia*’s unique ability to spread into mosquito populations. Once *Wolbachia* has been released into a mosquito population we believe it will be maintained and won’t need to be reapplied. The cost of the program is essentially front loaded during the establishment phase. In contrast insecticide based programs have to be continually administered at considerable expense.

8. **Will Wolbachia be effective in the long-term?**

   This is very difficult to predict. Many control measures weaken over time. For example many bacteria and parasites have increasingly become resistant to antibiotics and insects have become increasingly resistant to chemical insecticides. We could imagine that over time the *Wolbachia* method might become less effective however if we could only obtain effective control for a number of decades then that would be a large benefit in the global picture of dengue control.

Contact us for more information: contact@eliminatedengue.com