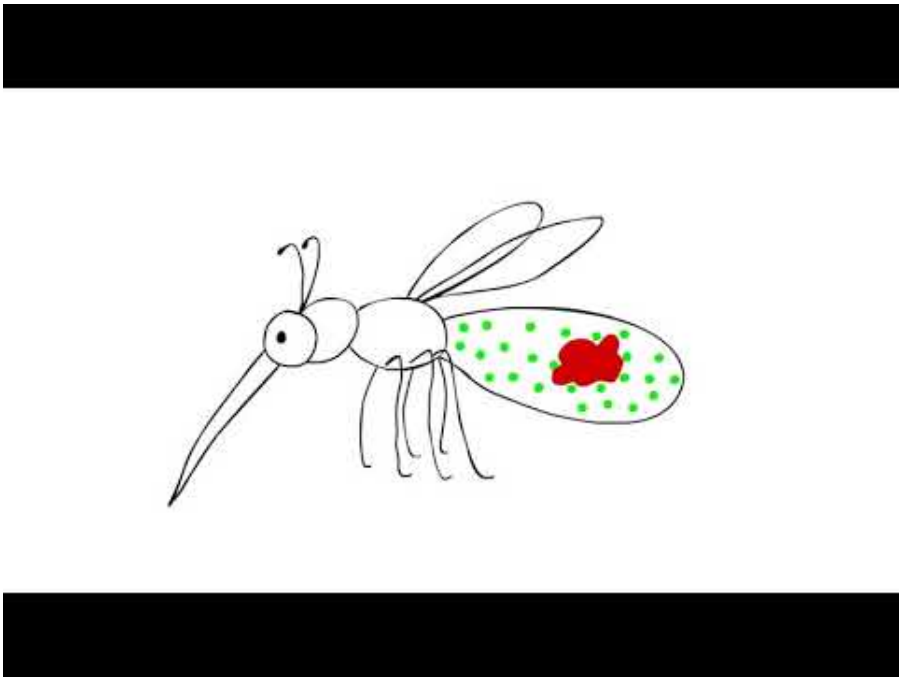
STANDARD DEVIATIONS: Managing Mosquitos

Greetings,

Maybe it's time for some good news. Efforts to control the *Aedes aegypti* mosquito are showing promising results in reducing dengue viral disease. Data just being published are astounding the arbovirus world with news of reductions in dengue cases that approach 80% where *Wolbachia* bacteria-carrying mosquitos have been introduced.

In November 2019, we looked at the **World Mosquito Program** (elinatedengue.com) and its work to protect the global community from mosquito-borne diseases (STANDARD-DEVIATIONS: Backing Bugs in Battle. 11.25.19). Here is a little video recap of the story:



{WMP youtube.com ~3 min.}

Incidence of dengue has been growing dramatically around the world in recent decades. The vast majority of cases are asymptomatic or mild and self-managed, but 4 billion people are at risk and around 400 million infections occur every year. In 2019, WHO recorded the highest number of infections and deaths from dengue in history.

The World Health Organization classifies dengue into 2 major categories: dengue (with / without warning signs) and severe dengue. Severe dengue is a potentially fatal complication, due to plasma leaking, fluid accumulation, respiratory distress, severe bleeding, or organ impairment.

The characteristics of severe dengue include:

- severe abdominal pain
- persistent vomiting
- rapid breathing
- bleeding gums
- fatigue
- restlessness
- blood in vomit.

There is no specific treatment for dengue fever.

Vector control is likely the most promising tool to control the disease, and the novel concept of introducing *Wolbachia*-modified *Aedes aegypti* into the breeding population is starting to show promise.

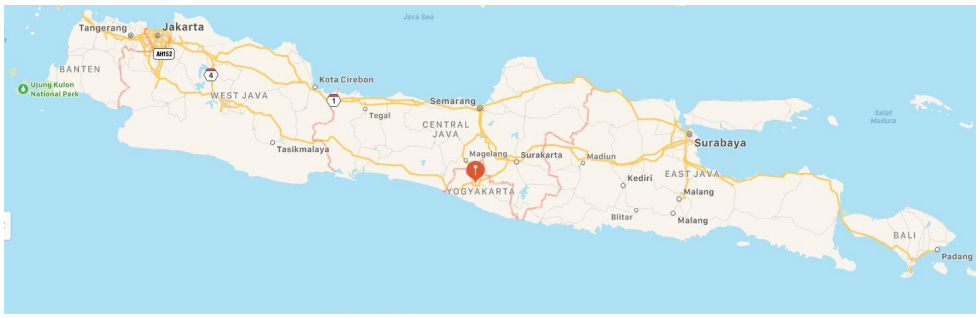
Wolbachia are natural bacteria present in up to 60% of species, including some mosquitoes. However, *Wolbachia* is not usually found in the *Aedes aegypti* mosquito, the primary species responsible for transmitting viruses such as dengue, Zika, chikungunya and epidemic yellow fever.

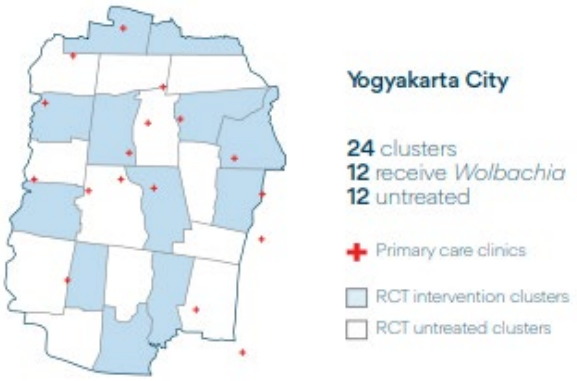
Wolbachia works in two ways within a mosquito. The first way is to boost the natural immune system of the mosquito to make it harder for the mosquito to support the dengue, Zika, chikungunya, or yellow fever infection. If the mosquito can't get infected, then it can't transmit these viruses to people.

The second way *Wolbachia* works is by competing for key molecules like cholesterol. Both the viruses and *Wolbachia* need cholesterol to survive inside the mosquito. When *Wolbachia* is present, it voraciously utilizes these molecules making it harder for a virus to propagate.

The concept of using *Wolbachia* as a vector control has been around for a decade, but it's taken years to get past the regulatory and ethical hurdles and put the idea into practice. Now, evidence is coming in to show the potential of the process.

A Cluster Randomized Controlled Trial (RCT) within Yogyakarta City, Indonesia, has demonstrated a 77% reduction in dengue incidence. Yogyakarta is the capital city of Special Region of Yogyakarta in Indonesia, on the island of Java.





Over 300,000 people participated in the study. *Wolbachia* was found in 93% of all *Aedes aegypti* trapped in treated areas. Rates of dengue in these areas were 77% lower compared with areas that did not receive the mosquitoes.

Early interpretation suggests people being 4 times less likely to develop dengue in *Wolbachia* treated areas. More study is needed, of course, and scaling of the operation must increase. Charities such as the Bill & Melinda Gates Foundation, Wellcome in London and Indonesia's Tahija Foundation have supported trials so far. The WHO and governments around the world will need to step up funding and acceptance of the program.

What is the favorite plant of Epidemiologists? The HEDGE. But “staggering” and “epochal” are adjectives being tossed around with these results. The study presents strong evidence that the *Wolbachia* technique may be a game-changer in our battle against deadly mosquito-borne diseases.

And that’s pretty cool.

Have a great week and be safe,

Bryan