

New process kills mosquito larvae using bacteria in the male's gut microbiome

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A team of undergraduate student researchers at Ben-Gurion University of the Negev (BGU), who competed in the 2019 iGem competition, have developed an innovative targeted biological approach that kills mosquito larvae, using natural bacteria delivered by the male mosquito while mating.

The student team decided to focus on the worldwide problem of [mosquitoes](#) which spread many diseases including the deadly Zika virus. According to the World Health Organization (WHO), mosquitoes infect over 300 million people a year with malaria causing 800,000 casualties annually.

The BGU team, "FlyGem," was just awarded a gold medal for their "Trojan Mosquito" innovation in the prestigious annual Genetically Engineered Machine (iGEM) event, a worldwide synthetic biology team competition held this year in Boston, from Oct. 31—November 4.

The students found in previous research that bacteria in the mosquito's gut called BTI (*Bacillus*

Thuringiensis israelensis) produces a toxin that only kills mosquito [larvae](#). The BTI bacteria and toxin have been used commercially for the past 30 years. Since BTI is diluted in large water sources, and isn't always effectively consumed by mosquitos it decreases, but doesn't eradicate the pests.

"Our targeted delivery approach employs a natural bacterium engineered to use the BTI toxin in the gut microbiome of the male mosquito," says Prof. Lital Alfonta, team advisor and member of the BGU Department of Life Sciences. "With this approach, the adult female mosquito infects its own larvae in a targeted manner."

The researchers tweaked the male mosquito's gut microbiome to express BTI and released the males to mate with females, who in turn transferred the bacteria onto their eggs. In the BGU experiment, when the larvae were born, most of them died immediately. The team also discovered that those that survived initially, fed on the dead, infected larvae and then died themselves.

"While we focused on a single type of mosquito, *Aedes aegypti*, we have the ability to target other disease-carrying mosquitoes," says Prof. Alfonta. "Once we conduct a pilot project in urban areas to test out our approach, there is a good chance that this is feasible as a successful biological pest control solution."

This is a targeted, innovative method that could replace the current methods of global mosquito control," says student team leader Mey-Tal Banar.

Provided by American Associates, Ben-Gurion University of the Negev

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