# Researchers field test genetically modified mosquitoes to combat dengue fever

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Field site and larval fluorescence. Image from *Nature Biotechnology* (2011) doi:10.1038/nbt.2019

(PhysOrg.com) -- Oxitec, a British company spun off from Oxford University has announced the results of its field test of genetically altered mosquitoes to combat the infamous dengue fever. As they report in their paper published in *Nature Biotechnology*, the team found that their genetically altered males comprised 16% of those found in subsequent samples obtained from the area, and that they had sired 10% of the larvae.

In past studies, insects have been genetically altered in ways that would make them sterile. The thinking went that they would mate with local females, but no offspring would result, which would then lead to a smaller population of mosquitoes because those females would not mate again. Unfortunately, in most cases, the modified males were also apparently less suitable mates and therefore met with little success in

mating. For this reason, the Oxitec team took a different approach.

Instead of creating sterile insects, they genetically altered male mosquitoes that produce offspring of both genders that die before reaching an age where they could mate. The idea being that male mosquitoes altered in this way, when released in the wild, would mate with females and produce offspring that would not live long enough to produce offspring of their own. To keep the genetically modified male mosquitoes alive so they could breed with the females once they were released, they were given an antibiotic. Based on the results of their field test, it appears the population of the targeted mosquitoes would be diminished by ten percent. By expanding the field test to include more mosquitoes released, and doing so repeatedly, theoretically, the population could be reduced dramatically.

In the field test, just one species of mosquito was modified and released, Aedes aegypti. This is because it's the sole carrier of dengue fever, as opposed to the myriad species that carry other diseases such as malaria. The gene modification causes both genders of the mosquito to overproduce a certain protein that leads to the underproduction of other proteins necessary to keep them alive. At a certain point, before they mature, they simply die. Tetracycline is used to keep the males alive that are bred in the lab and then released into the wild. Without the tetracycline, their offspring cannot survive.

And while the field test, done in a part of the Caymen Islands, does appear promising, some worry that not enough testing was done to ensure that a monster species of mosquito isn't created and unleashed unto an unsuspecting population. While that appears unlikely in this case, due to the fact that only males (who don't bite people) are being modified, there is of course always a risk. Especially in light of the fact that some 0.5 percent of those modified are in fact female due to errors in separating the mosquitoes before the procedure is performed. There is

also the worry about what happens when a very small number of those altered manage to survive and mate, producing over time, mosquitoes that evolve in ways that can't be predicted.

**More information:** Field performance of engineered male mosquitoes, *Nature Biotechnology* (2011) doi:10.1038/nbt.2019

**Abstract**

Dengue is the most medically important arthropod-borne viral disease, with 50–100 million cases reported annually worldwide1. As no licensed vaccine or dedicated therapy exists for dengue, the most promising strategies to control the disease involve targeting the predominant mosquito vector, Aedes aegypti. However, the current methods to do this are inadequate. Various approaches involving genetically engineered mosquitoes have been proposed2, 3, 4, including the release of transgenic sterile males5, 6, 7, 8, 9, 10. However, the ability of laboratory-reared, engineered male mosquitoes to effectively compete with wild males in terms of finding and mating with wild females, which is critical to the success of these strategies, has remained untested. We report data from the first open-field trial involving a strain of engineered mosquito. We demonstrated that genetically modified male mosquitoes, released across 10 hectares for a 4-week period, mated successfully with wild females and fertilized their eggs. These findings suggest the feasibility of this technology to control dengue by suppressing field populations of A. aegypti.

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