

# Google Is Releasing DNA-Rigged X-Files Mosquitoes Around The World, Will Their Bite Make You Muslim?

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(Bloomberg) -- Silicon Valley researchers are attacking flying bloodsuckers in California's Fresno County. It's the first salvo in an unlikely war for Google parent Alphabet Inc.: eradicating mosquito-borne diseases around the world.

A white high-top Mercedes van winds its way through the suburban sprawl and strip malls as a swarm of male *Aedes aegypti* mosquitoes shoot out of a black plastic tube on the passenger-side window. These pests are tiny and, with a wingspan of just a few millimeters, all but invisible.

"You hear that little beating sound?" says Kathleen Parkes, a spokesperson for Verily Life Sciences, a unit of Alphabet. She's trailing the van in her car, the windows down. "Like a duh-duh-duh? That's the release of the mosquitoes."

Jacob Crawford, a Verily senior scientist riding with Parkes, begins describing a mosquito-control technique with dazzling potential. These particular vermin, he explains, were bred in the ultra-high-tech surroundings of Verily's automated mosquito rearing system, 200 miles away in South San Francisco. They were infected with Wolbachia, a common bacterium. When those 80,000 lab-bred Wolbachia-infected, male mosquitoes mate with their counterpart females in the wild, the result is stealth annihilation: the offspring never hatch.

Better make that 79,999. "One just hit the windshield," says Crawford.

Mosquito-borne disease eradication is serious stuff for Alphabet, though it is just one of many of the company's forays into health care and life sciences. Through Verily and other branches of the company, Alphabet is investigating smart contact lenses, artificial intelligence applications for health care, and the molecular mechanisms of aging. Just this month, Alphabet hired Geisinger Health CEO David Feinberg to oversee its many health-care initiatives.

Verily guards its technology closely. But it stands to reason that if it succeeds in making mosquito control easy and cheap enough, it could have a lucrative offering on its hands: Many governments and businesses around the globe might be glad to pay for a solution to their mosquito problems.

In the arid climate of California's Central Valley, *A. aegypti* are detested for their vicious bite. But there, at least, they don't typically transmit disease. Other places aren't so lucky. The

mosquito species is among the world's deadliest, spreading diseases such as dengue fever and chikungunya in the tropics and subtropics. The diseases its bite carries kill tens of thousands of people every year and infects millions more. Releasing Wolbachia-infected mosquitoes into the wild may eventually wipe out entire populations of deadly mosquitoes and the diseases they carry.

At least that's the plan if the field tests pan out in California. Every morning during mosquito season—which runs from April to November—the van, emblazoned with “Debug Fresno,” cruises through leafy housing tracks full of multistory homes. At predetermined locations, an algorithm automatically releases carefully calculated numbers of mosquitoes, counting each individual insect with the help of a laser as it exits the van.

As the efforts to wipe out mosquito-borne diseases have ramped up, a few different approaches to the problem have emerged. Bill Gates alone has pledged more than \$1 billion for technologies that may help wipe out malaria, including controversial efforts to [genetically modify mosquitoes](#). Verily's approach relies on a variation of a very old strategy known as sterile insect technique, in which a population is gradually killed off by interfering with the ability to reproduce.

It's unclear what would happen if the world's disease-causing mosquitoes were done away with. The ecological role that mosquitoes play hasn't been thoroughly studied, though some scientists suggest we might be just fine without them. But it's clear that *A. aegypti* has no business in Fresno County. Native to warmer, wetter climes, no one knows where they came from

when they first showed up in 2013. All that's certain is that they spread extremely rapidly.

"After we detected it, we did a massive and extensive effort to prevent the mosquito from establishing and eliminate it," says Jodi Holeman, the scientific services director for Fresno County's Consolidated Mosquito Abatement District. "We were not successful, in any way, shape, or form."

The county went from having not much of a mosquito problem at all to one that made residents avoid their backyards and porches. Unlike most mosquitoes, *A. aegypti* lives and breeds in places inhabited by people, laying its eggs in, say, the few droplets of stagnant water at the bottom of a wine glass left on a balcony, then hiding under beds and in closets, biting legs and ankles. This makes it much harder to fight. Going door-to-door and begging residents to dump out standing water wasn't cutting it, so in 2016, Fresno teamed up with a scientist named Stephen Dobson and his company, [MosquitoMate](#).

It was Dobson's lab that figured out how to infect mosquitoes with a form of Wolbachia that's different from the type of the bacteria that mosquitoes usually carry. That's what makes the eggs unviable. MosquitoMate makes two species of mosquitoes infected with Wolbachia, *A. aegypti* and *Aedes albopictus*. Fresno became one of its test sites.

The initial Fresno trials were the first time male *A. aegypti* infected with the bacteria had ever been released in the U.S. The next year, Verily stepped in to help scale those efforts up, bringing more advanced technologies to the breeding and release process that would, they hoped, eventually make fighting mosquitoes massively scalable.

It seems to be working. This year, Verily signed on for a second season of releases. Two Verily trucks ply four different neighborhoods, hitting more than 3,000 homes. Over six months, the company released more than 15 million mosquitoes. Results from 2017 suggested the population of biting female mosquitoes dropped by two-thirds. This year, tweaks to the program have cut the mosquito population by a whopping 95 percent. A second project by Verily in Innisfail, Australia, that concluded in June reduced the mosquito population by 80 percent. This bodes well for eventually bringing the technology to other parts of the world—regions ravaged not just by itchy ankles but by deadly disease.

At first, Verily executives were worried about community resistance to fighting bugs with more bugs. So the company set up an outreach booth, complete with a cage full of male mosquitoes that people could stick their hands in to learn that males don't bite. (Only female mosquitoes bite, which is why this and similar projects are careful to only release males.)

"We really appreciate you being here," Clifford Lopes, a resident, told the company. "I brag to people about how I can sit on my porch now and not get bit."

In videos of the original trials, you can see Holeman, the Fresno County scientist, gingerly blowing the mosquitoes out of a tube. The release van is now filled with proprietary technology, including software that determines exactly what areas of a neighborhood mosquitoes should be released in and a laser

sensitive enough to count every single one as it exits, generating loads of data that can later be used to fine-tune the process.

At Verily's headquarters, the "factory" where the mosquitoes are bred incorporates even more automation. Once the eggs are laid, robots rear the mosquitoes to adulthood, packaging them in containers filled with water and air, feeding them, and keeping them warm. Still other robots sort them by sex, first by size (females are bigger) and then optically, using proprietary technology. Mosquitoes are all given a digital identifier that makes it possible to follow them from egg-state to the specific GPS coordinate where they're released.

With this year's season wrapping up, the company has yet to decide whether it will further expand the program next year. Verily wouldn't say how much it costs to manufacture and release tens of thousands of mosquitoes every day, but it's a safe bet that it's still an expensive proposition.

"The key part is trying to be able to do a program like this in a very affordable and efficient way," Crawford, the Verily scientist, says, "so that we can go to places where there isn't a lot of money."