

California's first lab-grown mosquitoes may take flight—stirring controversy

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A biotech firm is seeking permission to release genetically modified mosquitoes into the open air of California for the first time later this year, aiming to reduce the expanding populations of invasive mosquitoes

and prevent deadly disease.

The controversial research project—planned for the Tulare County community of Visalia, with potential expansion into Fresno, San Bernadino and Stanislaus counties—will over time introduce 2 million [male mosquitoes](#) with a "kill switch" built into their DNA. When they mate with wild insects, their offspring die, causing an eventual collapse of the population.

Their target: Swarms of the mosquito, first detected in Los Angeles County in 2011, which have since spread northward into 20 California counties. While California's native mosquito emerges at dusk, these black-and-white-striped invaders hunt for blood during the day, when people are outside. Elsewhere, they transmit potentially fatal Zika, dengue, yellow fever, chikungunya and other viruses.

The lab-bred insects—trademarked under the name "Friendly" by British company Oxitec—are male, so they don't bite or spread disease. Modified they only mate with others of their species, not California's native mosquitoes. Only the female offspring die; the males live and become carriers of the deadly gene, passing it on to shrinking future generations.

Approved by [federal regulators](#) this month and now under review by the state's Department of Pesticide Regulation, the research project is welcomed by Tulare County's Delta Vector Control District.

It's a more ecologically beneficial way to control mosquitoes than spraying insecticides, said the district's Mustapha Debboun, a medical and veterinary entomologist and retired U.S. Army colonel who has worked more than 27 years in the field of insect-borne diseases. Insects are increasingly resistant to pesticides, he said. And the engineered mosquitoes do not harm beneficial bugs like bees and butterflies.

"It's ingenious," said Debboun, who worries that Zika and Dengue virus could quickly spread if introduced into the U.S. by travelers from a country where the pathogens are found.

"Instead of using a human being to apply a pesticide to kill these mosquitoes, we're using male mosquitoes to do the job for us," he said. "It's nature against nature."

Some Tulare County residents complain that the invasive mosquitoes, which arrived in the region five years ago, are a growing nuisance. At a meeting of Visalia's City Council, Councilman Brian Poochigian said that he and his family were bitten six or seven times every time they left home.

"I'm scared to send my kids outside without spraying them down," he said, according to the Visalia Times-Delta. "We can't eat outside in our backyard because we get bitten."

But others say the project is being rushed into field testing without sufficient review and public consultation.

"We're lab rats," said Angel Garcia, a native of Tulare County's citrus-growing town of Lindsay.

"The community was not included in the process. If they really want to protect public health, we need to be at the table," said Garcia, of Californians for Pesticide Reform. "There seems to be no transparency, no independent review and no public participation."

According to critics, there's no publicly available data to support Oxitec's claims that the introduced mosquitoes will reduce incidence of mosquito-borne diseases. According to an independent peer-reviewed study from Yale University scientists, two years of continual releases of the

mosquitoes at a test site in Brazil failed to reduce populations of .

Furthermore, none of the worrisome viruses have been transmitted within California, opponents say.

"The California release would be the largest release of any genetically engineered insect in the United States," said Sacramento resident Dana Perls of Friends of the Earth. "It's much larger than we feared. And it's irresponsible."

The male mosquitoes carry two introduced genes.

One, called the self-limiting gene, prevents offspring from surviving to adulthood. It disrupts the proper functioning of the young insect's cells by over-producing a protein, interfering with the cells' ability to produce other essential proteins needed for development.

The other is a fluorescent marker gene. It produces a protein throughout the body of the insects, which glows red under a special light. This helps researchers track the insects in the wild.

It is part of a growing effort to explore the use of genetic engineering as an alternative to pesticides. The U.S. Department of Agriculture is seeking to enlist such techniques to eradicate an invasive diamondback moth in New York, which eats vegetable crops, and a cotton-munching pink bollworm in Arizona.

Millions of the Oxitec mosquitoes were released in the Florida Keys last year. The company says that the results of that project will be shared in the coming months as data is evaluated.

For the California experiment, the male mosquitoes and eggs will arrive in just-add-water "Mosquito Rearing Boxes."

The [pilot project](#) will take place in residential neighborhoods of Visalia, the gateway to Sequoia and Kings Canyon National Parks in the agricultural San Joaquin Valley. The precise locations and start date will be announced if the project receives state approval.

Visalia was selected because the problem with the invasive mosquito is greatest in urban settings, such as backyards, said Debboun. The insect can breed in tiny wet spaces, such as soda bottle caps.

If Oxitec later finds female mosquitoes with the gene surviving to adulthood, it must stop the project and apply pesticides to the treated area where the surviving females were detected, according to the EPA. Animals that eat mosquitoes are not expected to be harmed.

The experiment will be contained naturally because the invasive mosquito is a homebody, rarely venturing more than 500 feet from its birthplace, say supporters. But in the event of storms, wildfires or other significant natural disasters, the company is required to move the rearing boxes to a secure facility with triple shatter-proof containment.

The assurances do not appease critics such as University of California, San Francisco-based Dr. Robert Gould, president of San Francisco Bay Physicians for Social Responsibility.

"Once released into the environment, genetically engineered [mosquitoes](#) cannot be recalled," he said. "Rather than forge ahead with an unregulated, open-air genetic experiment, we need precautionary action, transparent data and appropriate risk assessments."

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