Fighting Zika in the US: The Battle Over GMO Mosquitoes

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Along the southernmost end of the famed Route 1 highway that runs from mainland Florida through the Keys, Clay Greager enjoys an idyllic retirement in his blue-trimmed home surrounded by palm trees on the tiny island of Key Haven, just a few miles from Key West.

On a recent humid June day, he spent his afternoon resting on his back porch next to a citronella candle, talking to his wife, playing with his cat and swiping at mosquitoes.

Greager moved from Pennsylvania with his wife and four children in 1978 and describes living in the almost tropical Florida Keys the way others might describe living in Oz.

“I call the rest of the United States ‘Grayland,’” he said sitting among tropical plants in his backyard, which abuts a murky green canal, as tiny geckos raced across his driveway.

PHOTO: Fighting Zika in the US: The Battle Over GMO Mosquitoes

But Greager’s island escape may soon be threatened.

Zika virus, a mosquito-borne disease linked to devastating birth defects, is expanding throughout Central and South America and creeping north toward the U.S., in what the World Health Organization has called a “global health emergency.”

The sleepy community of Key Haven has been identified by one company as the perfect spot to experiment with a controversial method of combating Zika before it reaches U.S. shores — a method that has divided neighbors and could have broad implications across the country.

What's dividing members of the community: releasing genetically modified mosquitoes, with Key Haven as the possible testing ground.
The proposed test has riled up some residents in the Florida Keys. Many say they don't want to be guinea pigs for an experimental technology that could fly into their homes. Others, like Greager, support the idea.

"We've got to stop that Zika virus from being a flash fire coming through us to the rest of the country," he said with a sense of urgency. "And if they say it can't happen, they have no idea."

Neighbor Against Neighbor

Greager's quiet neighborhood has become a battleground, with neighbors facing off against each other over the possible use of genetically modified mosquitoes.

For decades, residents of the Florida Keys have been combating 45 species of mosquitoes that inhabit these islands. In recent years, the pesticides used have lost effectiveness against the mosquitoes, experts said, requiring more spraying and larvicide to control the populations.

The reason Key Haven was chosen as a possible testing ground for the genetically modified organisms (GMOs) predates the current Zika crisis. From 2009 to 2010, a mosquito species known as Aedes aegypti – the same kind of mosquitoes that carries Zika – sparked a dengue fever outbreak here that infected at least 88 people according to Florida Department of Health
Aedes aegypti is a bug seemingly built to spread disease. Jet black with white flecks, this species of mosquito has sparked waves of diseases, including dengue, Chikungunya and yellow fever, resulting in millions of deaths in human history.
And now Zika.

Already 191 people in Florida have been diagnosed with the disease, according to the Florida State Health Department. None were infected via mosquitoes in the U.S.
Able to live indoors and reproduce in a teaspoon of water, Aedes aegypti mosquitoes are difficult insects to find and kill with traditional methods. The Florida Keys Mosquito Control Board, made up of five elected commissioners, is debating whether to allow a test of GMO mosquitoes in Key Haven, pending approval by the Food and Drug Administration.

But releasing lab-created animals into the environment to artificially lower a population has many people nervous in the Keys, especially in Key Haven.

Those against using GMO mosquitoes say that there is not enough data on releasing them and that they are concerned that releasing these insects into the wild could lead to unintended consequences.

Key Haven is debating an experimental test of genetically modified mosquitos.

The Mosquito Called OX513A

The creator of the GMO mosquitoes is the British biotech company Oxitec.
During the dengue outbreak in 2009, the head of the Florida Keys Mosquito Control Board at the time asked Oxitec to explore the possibility of sending its GMO mosquito to the Keys.

Oxitec calls its GMO mosquito OX513A.

The modified insects — nearly all male — are created and bred in a lab with a genetic variant. When these GMO mosquitoes mate with females in the wild, up to 97 percent of their offspring can't survive, according to Oxitec. If enough GMO mosquitoes are released and mate, the population eventually declines.

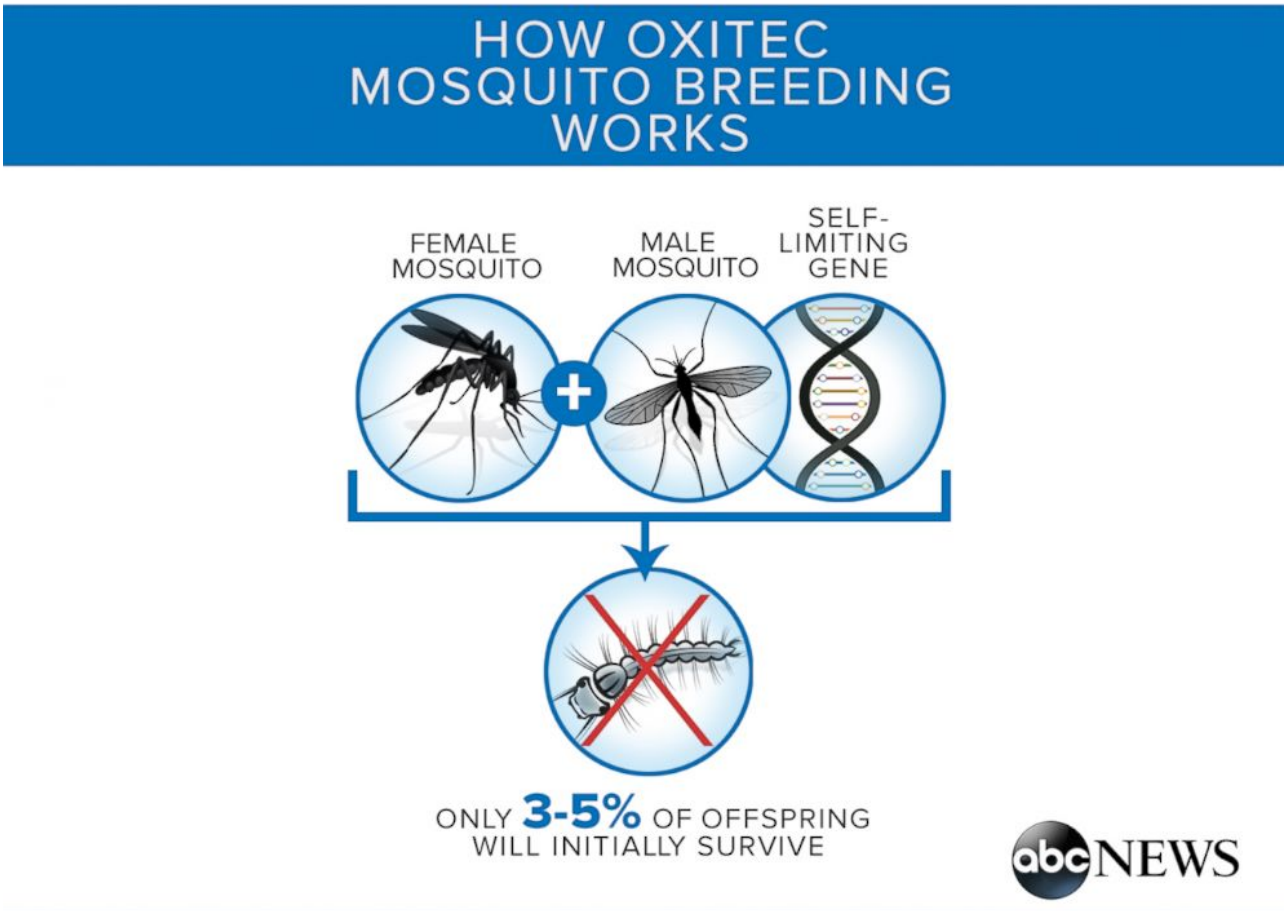
To create the specialized mosquitoes, two genes are added to the insect. One, called a self-limiting gene, makes the insect produce a protein that will essentially kill it unless it's given tetracycline, a common antibiotic.

The second gene adds a red fluorescence to the insect — which helps alert scientists that the insect is self-limiting. The males are released into the wild and live long enough to mate, passing the self-limiting gene to their offspring, which cannot survive without tetracycline.

In Brazil and Panama, where Oxitec trials have taken place, the local populations of Aedes aegypti have decreased by more than 90 percent, according to studies published in medical journals by Oxitec and its institutional partners.

The Food and Drug Administration is investigating if the technology is safe enough to conduct a field test and earlier this year said it reached a preliminary “finding of no significant impact.” This means it has not yet found evidence that the GMO mosquitoes would harm people or have a damaging effect on the environment.

In 2010, Oxitec built a lab in the mosquito board facility in Marathon, Florida, and started the daunting process to get FDA approval for OX513A.



The Oxitec mosquito has a self-limiting gene so that its offspring don't survive in the wild.

Derric Nimmo, the trial’s senior scientist, has been going to the Keys since 2010 to oversee the Oxitec lab and shepherd the project through FDA approval.

“The dangers from Zika, dengue and Chikungunya are very real,” he said. “The premise is, if you [keep] the mosquito under a certain level, you no longer get transmission of the disease.”

Nimmo said he hopes Oxitec’s previous studies in Brazil, the Cayman Islands and Panama, where tens of millions of mosquitoes have been released, will help people feel safe about the trial. The mosquitoes have been approved for use in the Cayman Islands, Panama and Brazil, where the current Zika outbreak started.

“We’ve had no reports of any adverse effects on humans or the environment,” he said of those trials. “And we have given that information in the environmental assessment, and we’re hoping that that helps to allay fears and also to inform people that are much more dangers from Zika, dengue and Chikungunya than there are from this particular technology.”

Oxitec is covering the cost of the experiment and will be liable if anything goes wrong. It’s unclear exactly how many mosquitoes would be released in the proposed trial in Key Haven, but in a study in the Cayman Islands, 3.3 million mosquitoes were released over six months.

Male mosquitoes do not bite or transmit disease. But Nimmo noted that approximately 1 in 10,000 of the released mosquitoes is female and, as a result, could bite people.

So what happens if a person is bitten by a GMO mosquito?

Oxitec research has shown that the genetic modification had no impact on the bite of the mosquito, so aside from the tweaked genes, it’s no different from any other mosquito found in the wild, Nimmo said.

And if the offspring survive? About 3 to 5 percent of the offspring reach adulthood, but they are very sick and don’t survive for more than a few days in the wild without high levels of tetracycline, which is not found in nature, according to Oxitec. Should they somehow reproduce, their offspring would also have the self-limiting gene.

Nimmo has been at heated town-hall meetings and gone door to door to educate residents. When asked what he thinks about critics of GMO mosquitoes, he picks his words carefully.

“There are still a certain proportion of people who are set against this particular technology,” he said. “They’ve been based around the feeling that this is genetically modified and there’s unintended consequences and the unknowns.”

Mila De Mier is a real estate agent, who lives a few miles from Key Haven.

Residents Against GMO: ‘No Consent’

Key Haven is connected to the main highway via a single road and is just a few miles from Key West. Among the tropical plants, canals and boats, there is no evidence of the possible trial except for the red yard signs emblazoned with “No consent” that pop up across the neighborhood.

These protests against the proposed Oxitec trial have been spearheaded by Mila De Mier, a real estate agent who lives a few miles from Key Haven.

A single mother of three boys, she admitted she initially thought the trial sounded exciting.

“This sounds like an awesome idea,” she recalled thinking. “Finally, mosquitoes wiped out by mosquitoes? Wow.”

But in recent years, De Mier has been worried about the safety of the trial. Among her biggest concerns are the lack of long-term research on the mosquitoes, the fact that not all the offspring die immediately and concerns that the mosquitoes could permanently affect the local environment.

“This is an island that has the Atlantic Ocean and the Gulf on one side,” she said. “The winds are coming in all kinds of directions. The mosquitoes are not going to stay there.”

In 2012, she said, she decided to act and has become the face of those opposed to the trial.

Last year she launched a Change.org petition that has garnered national coverage and more than 168,000 signatures, more than double the 75,000 people who live in the Florida Keys. She and other critics of the trial have brought up the issue multiple times at meetings of the Mosquito Control Board.

“I don’t want my kids to be used as lab rats,” she said. “My community [members] don’t want to be lab rats.”

PHOTO: Fighting Zika in the US: The Battle Over GMO Mosquitoes

Getting a Voice

On a muggy June afternoon, Keys residents spent three hours addressing the commissioners at the Florida Keys Mosquito Control Board.

The meeting was held in the old City Hall of Key West to allow more people to join from the island of Key Haven. As the sun slowly set outside, the air-conditioned room kept the oppressive humidity at bay as the debate intensified.

That contentious debate had high stakes.

If the FDA approves the GMO mosquito trial, it will be up to the five Mosquito Control Board commissioners to greenlight the field test in Key Haven.

“The science is not there,” Key Haven resident Bill Spotswood said at the meeting, one of several people who waited hours to voice their concerns, anger or support.

“I think we need to slow down, because I don’t want to be the guinea pig,” he added.

Applause greeted every person who objected to the trial, but those who supported it were met with only some halfhearted claps.

“For me, an experiment is done in a lab. I don’t want to be a part of the experiment,” said Gilda Niles, a resident of Key Haven. “I think the residents are smart enough to vote. I want you to give us that vote.”

After four hours, the five commissioners came to a decision: the community would get a voice.

They agreed to hold a November referendum to give residents of Key Haven and the rest of Monroe County a way to register their opinion on the Oxitec mosquito trial. Though the referendum is nonbinding because of local laws, at least three of the five commissioners agreed to adhere to voters’ wishes. Issues are decided by a majority of the commissioners.

“Mosquito control needs all of the tools that we can have to fight these mosquitoes,” said Jill Cranney-Gage, the commissioner for Key West and Key Haven. “I’m scared of these diseases just like everybody else is. Just like you guys are scared of [genetic modification]. I’m scared of Zika. I’m scared of dengue. We’re all on the same page as that. But people need to have a right to vote.”

Clay Greager has lived in Key Haven for 38 years.

A Flash Fire

While there is vocal opposition to the test, there are many people in Key Haven and the surrounding areas who support the idea, especially as the Zika virus continues to spread.

Clay Greager said he was upset in recent months when multiple neighbors approached him about signing a petition against the trial.

When he looked up the petition online, he found there wasn’t enough scientific evidence to dissuade him from supporting the trial.

“I grew up through tuberculosis. I grew up through measles and mumps,” Greager said while sitting on his back porch. “I remember the first heart transplant. And all of these things that no longer exist, [it] was all by the medical profession and scientists taking this harm away from us.”

“We are the front door,” Greager said of what experts believe is the inevitable invasion of Zika into the United States. “That way is Miami. We are their front door, and if we would look at it that way, I would say I want to close that door.”

For decades, residents of the Florida Keys have been combating 45 species of mosquitoes that inhabit these islands.**more** **+**

A Weapon to Protect Public Health

The trial would be the first of its kind in the U.S., but rapidly changing technology means that similar genetically modified organisms could be put to use in coming years.

Dr. Todd Kuiken, a senior program associate with the science and technology innovation program at the Woodrow Wilson Center in Washington, D.C., has been following the proposed Key Haven trial. He said the Oxitec GMO battle could be a harbinger.

“It’s already expanding rapidly, and based on the results of some of these field trials, if they’re successful, you’re going to see probably a rapid explosion in this particular application,” he said. “There’s been a lot of funding, particularly from private foundations.”

He said that a field trial in the U.S. may make sense as the next step on paper but that researchers must get people in the affected areas to agree to the test.

“You’re in this Catch-22 to be able to have more information to tell people whether it’s safe or not or whether it’s effective or not and actually removing the mosquitoes,” Kuiken said. “But you’re not going to be able to get these answers until you actually do one of these field trials.”