

Debate surrounds use of gene-altered mosquitoes to curb dengue fever

By Tim Johnson, McClatchy Foreign Staff on 10.17.13

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A Health Ministry worker fumigates in an area near the Panama Canal in July 2013. Mosquitoes can breed in stagnant water collected in parked or abandoned autos, barrels, flowerpots and tires. Tim Johnson/MCT

PANAMA CITY — They've been called "suicide mosquitoes," dead-end bugs and even Frankenskeeters.

They're gene-altered mosquitoes, and Panama is among a growing list of countries that are testing to see whether they have a place in the public health arsenal in the war against mosquito-borne diseases such as dengue fever.

Dengue, which isn't well-known outside tropical regions, is on the rise worldwide, with outbreaks reported this year in Texas and Florida. The mosquito that carries the dengue virus has spread to 100 countries and potentially exposes 2.5 billion people to the excruciating disease, also known as bonebreak fever. Some 50 million to 100 million people contract dengue each year, of which about 25,000 die, the World Health Organization reports.

"A person with dengue will be prostrate for several days," said Dr. Carlos Galvez, the head epidemiologist for Panama's Health Ministry. "They grow dehydrated very fast. In a matter of hours, the cases can grow more complicated."

This has been a particularly bad year for dengue in the Western Hemisphere, with the Pan American Health Organization reporting 1.4 million cases. The Florida Department of Health issued an alert in late August amid an outbreak there, and the state had reported 19 cases by mid-September, none lethal.

Panama has one of the most developed public-health systems in Latin America, a legacy of the U.S. military presence during much of the 20th century to oversee the operation of the Panama Canal. Yet even Panama struggles to cope with a type of mosquito known as *Aedes aegypti*, an aggressive urban dweller originally from North Africa that's the principal carrier of the dengue virus.

Teams patrol the streets fumigating with insecticide in a constant battle against the mosquito, and public service ads remind Panamanians to drain standing water in eaves, buckets, flowerpots and old tires, where mosquitoes breed.

Before long, public health officials may have a new tool — OX513A — a genetically modified mosquito from a British biotech company, Oxitec Ltd. of Abingdon, England, that's a spinoff from Oxford University.

Oxitec mosquitoes have been altered to contain a "lethality gene." When the mosquitoes, all male, are released into the wild, they mate with females but the offspring don't survive. That's why they're called "dead end" bugs. Only if they're exposed to tetracycline, an antibiotic, do the transgenic mosquitoes survive.

If Panama's National Biosafety Commission gives the green light, sometime early next year technicians will release tens of thousands of gene-altered mosquitoes in Arraijan, a bedroom community that's across the canal from Panama City at the canal's Pacific end.

"We plan to do about 50,000 per week," said Dr. Nestor Sosa, the head of the Gorgas Memorial Institute for Health Studies, an autonomous public research body. "You have to have a proportion of at least 10 to 1 (transgenic) mosquitoes to native mosquitoes. You have to overwhelm them."

If all goes according to plan, the OX513A release will result in a drop in the mosquito population.

"If you lower the number of mosquitoes, you lower the possibility of infection with dengue," Galvez said.

The transgenic mosquitoes have generated opposition, with complaints ranging from doubts about their effectiveness to concern about whether the impact on the ecosystem has been adequately studied.

"There are scenarios in which the dengue could worsen," said Dr. Helen Wallace, a mathematician who's the executive director of GeneWatch UK, a British group that monitors genetic science. Wallace said that if the program succeeded in reducing the population of the *Aedes aegypti* mosquito, there was nothing that prevented some other type of mosquito from adapting to fill its niche and carry the virus.

“It could be harder to get rid of than the targeted mosquito,” she said.

Another critic, Camilo Rodriguez-Beltran, a French-trained biosecurity expert working in Chile, said the gene-altered mosquitoes could cross international boundaries, violating international treaties on biosafety.

“All consequences that could occur are unforeseen,” Rodriguez said. “It’s been developed very rapidly.”

A Panamanian environmental lawyer, Olmedo Carrasquilla, said his nation should use better techniques to educate the public on mosquito control.

“Why invest millions in methods and technology when there are no guarantees? When we know there are rudimentary methods that work?” he asked.

Sosa, the health official, dismissed some of the criticism, especially about the transgenic mosquito’s potential impact on the ecosystem.

“The mosquito dies in a few days. So it’s very improbable that it will go into the environment or into another organism,” Sosa said. “It’s not that we are doing something that is environmentally unfriendly.”

Mosquito control officials in the Florida Keys announced last year that they were considering testing the Oxitec mosquito. In response, a Key West businesswoman gathered more than 120,000 names on a petition, halting the plan temporarily.

Hadyn Parry, the chief executive of Oxitec, said in a telephone interview that his company thought its transgenic mosquito was safer than using insecticides, which he asserted “affect all insects in a given area” and can filter through the ecosystem and persist.

By using dead-end mosquitoes, only one species is affected, he said.

“It’s a highly targeted sniper’s rifle instead of a blunderbuss that takes out everything it finds,” Parry said.

Mosquitoes generally spend their three-week life spans in an area 200 yards from where they were born. The Oxitec mosquitoes, he said, can always be detected.

“You can actually look at any of our insects under a fluorescent light, and you’ll see a red color. This is so important when it comes to monitoring. We can tell how far our insects fly and where they are going,” Parry said.

Oxitec mosquitoes have been tested in the Cayman Islands, Malaysia and Brazil, Parry said, and he expects tests in India and in the Florida Keys, if the U.S. Food and Drug Administration and Florida authorities give final approval.

Officials in the Cayman Islands kept the 2009 and 2010 tests secret for more than a year, angering some residents even as Oxitec reported that it had reduced the mosquito population in a test area by 80 percent.

In tests earlier this year in the village of Mandacaru, in Brazil's northeastern Bahia state, Oxitec reported 96 percent suppression of the dengue mosquito.

Health experts say they need additional tools to combat dengue, and they encourage the global pharmaceutical companies that are racing to create a vaccine. But research is costly and slow, partly because there are four virus types for dengue, each different. A French company, Sanofi Pasteur, announced in July that its trials in Thailand found that a potential vaccine was effective against several types of dengue but not Type 2, a more disease-producing strain.

The most severe cases, once called hemorrhagic dengue because of the bleeding they provoke, often are caused when a person who has contracted one type of the dengue virus is later sickened by a different type.

Quiz

- 1 Which of the following excerpts from the article shows how the OX513A got their name?
- (A) “A person with dengue will be prostrate for several days,” said Dr. Carlos Galvez, the head epidemiologist for Panama’s Health Ministry. “They grow dehydrated very fast. In a matter of hours, the cases can grow more complicated.”
 - (B) Teams patrol the streets fumigating with insecticide in a constant battle against the mosquito, and public service ads remind Panamanians to drain standing water in eaves, buckets, flowerpots and old tires, where mosquitoes breed.
 - (C) Oxitec mosquitoes have been altered to contain a “lethality gene.” When the mosquitoes, all male, are released into the wild, they mate with females but the offspring don’t survive.
 - (D) “We plan to do about 50,000 per week,” said Dr. Nestor Sosa, the head of the Gorgas Memorial Institute for Health Studies, an autonomous public research body. “You have to have a proportion of at least 10 to 1 (transgenic) mosquitoes to native mosquitoes...”
- 2 Which of the following statements from the article BEST shows why some people object to the use of the OX513A?
- (A) If all goes according to plan, the OX513A release will result in a drop in the mosquito population. “If you lower the number of mosquitoes, you lower the possibility of infection with dengue,” Galvez said.
 - (B) Another critic, Camilo Rodriguez-Beltran, a French-trained biosecurity expert working in Chile, said the gene-altered mosquitoes could cross international boundaries, violating international treaties on biosafety.
 - (C) A Panamanian environmental lawyer, Olmedo Carrasquilla, said his nation should use better techniques to educate the public on mosquito control.
 - (D) “The mosquito dies in a few days. So it’s very improbable that it will go into the environment or into another organism,” Sosa said. “It’s not that we are doing something that is environmentally unfriendly.”

- 3 Read the following paragraph from the article.

Dengue, which isn't well-known outside tropical regions, is on the rise worldwide, with outbreaks reported this year in Texas and Florida. The mosquito that carries the dengue virus has spread to 100 countries and potentially exposes 2.5 billion people to the excruciating disease, also known as bonebreak fever. Some 50 million to 100 million people contract dengue each year, of which about 25,000 die, the World Health Organization reports.

Which of the following from the paragraph helps show how dangerous dengue fever is?

- (A) "is on the rise worldwide"
- (B) "spread to 100 countries"
- (C) "exposes 2.5 billion people"
- (D) "also known as bonebreak fever"

- 4 Read the following from the article.

Hadyn Parry, the chief executive of Oxitec, said in a telephone interview that his company thought its transgenic mosquito was safer than using insecticides, which he asserted "affect all insects in a given area" and can filter through the ecosystem and persist.

By using dead-end mosquitoes, only one species is affected, he said.

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In this context, which of the following describes the OPPOSITE of "blunderbuss"?

- (A) his company thought its transgenic mosquito was safer
- (B) can filter through the ecosystem and persist
- (C) only one species is affected
- (D) The Oxitec mosquitoes ... can always be detected