

# Billions of GE Mosquitoes Released, Health Risks Ignored

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May 28, 2022

## STORY AT-A-GLANCE

- › In March 2022, the EPA granted biotech company Oxitec a two-year extension of its emergency use permit
- › This allows Oxitec to release additional GE mosquitoes in Florida as well as release the GE insects in four counties in California for the first time
- › The extension was granted even before Oxitec had publicly released results from its 2021 field trial release in Florida
- › Oxitec's trial does not reveal whether the release of GE mosquitoes suppresses wild mosquito populations, or, importantly, whether it reduces transmission of diseases carried by *A. aegypti*
- › The health and environmental effects of this reckless experiment remain completely unknown, and the EPA continues to prioritize corporate interests over public health

Biotechnology company Oxitec spent years trying to gain approval to release its controversial genetically engineered (GE) mosquitoes in the U.S., specifically in Key West, Florida. In June 2020, the Florida Department of Agriculture and Consumer Services gave the go-ahead for the plan,<sup>1</sup> following the U.S. EPA's granting of an experimental use permit (EUP) that would allow the GE mosquitoes to be released in Florida as well as Texas.<sup>2</sup>

April 2021 marked the culmination of Oxitec's efforts, when nearly 5 million GE *Aedes aegypti* mosquitoes were released in the Keys over a seven-month period<sup>3</sup> – despite

backlash from residents and environmental groups. In March 2022, the EPA granted Oxitec a two-year extension of its EUP,<sup>4</sup> which would allow Oxitec to release additional GE mosquitoes in Florida as well as release the GE insects in four counties in California for the first time.

The EPA's extension to Oxitec's EUP paves the way for up to 2.45 billion GE mosquitoes to be released — an extension that was granted even before Oxitec had publicly released results from its 2021 field trial release in Florida.<sup>5</sup>

## **What Are GE Mosquitoes?**

The *Aedes aegypti* mosquito species, (*A. aegypti*), carries yellow fever, dengue fever, chikungunya, Zika, West Nile and Mayaro,<sup>6</sup> a dengue-like disease. (Malaria is transmitted by a different mosquito, *Anopheles*).<sup>7</sup> Oxitec created the GE mosquitoes in an attempt to control mosquito-borne diseases like yellow fever, dengue, chikungunya and Zika, though it's unknown whether they work for this purpose.

The male *A. aegypti* mosquitoes have been genetically engineered to carry a "genetic kill switch," such that when they mate with wild female mosquitoes, their offspring inherits the lethal gene and cannot survive or reproduce in the wild. In the U.S., Oxitec is marketing the insects as Oxitec Friendly™ mosquitoes and explained:<sup>8</sup>

*"After releases of Friendly™ males into the field, which find and mate with wild female mosquitoes, reduction of the target population is achieved as the female offspring of these encounters cannot survive. Male progeny survive, carrying a copy of the self-limiting gene; in turn, these males are able to pass on the self-limiting gene to half of their offspring, of which female carriers of the gene cannot survive.*

*The self-limiting gene can thereby persist but declines over time, offering potentially multiple but still self-limiting generations of suppression for every Oxitec Friendly™ *Aedes aegypti* male released."*

The U.S. FDA, which was previously reviewing the GE mosquitoes, initially stated that GE mosquitoes will not have a significant impact on the environment, but was reportedly interested in how the “genetic kill switch” would behave in the wild and whether it could humans or other animals.<sup>9</sup>

In October 2017, the FDA then transferred the power for regulatory approval over to the EPA, after apparently categorizing the GE mosquitoes as pesticides rather than drugs to prevent disease.<sup>10</sup> The transfer was a huge win for Oxitec, as the EPA is required to review new pesticides quickly, within 12 months of submission, while the FDA has no set time lines.

After the handover to the EPA, Oxitec wasted no time in resubmitting its request to release mosquitoes in Florida, as well as Texas – and won the EPA’s approval – but residents have protested the release of the GE insects into their local environment. In addition to Florida, Oxitec's GE mosquitos were previously released in the Cayman Islands, Malaysia, Panama and Brazil.<sup>11</sup>

## **EPA Ignores Potential Health and Environmental Effects**

The Florida Department of Agriculture and Consumer Services (FDACS) has already approved the EPA’s extension of Oxitec’s field trial despite unknown risks posed by the GE mosquitoes. This raised backlash from environmental groups and scientists. Jaydee Hanson, policy director at Center for Food Safety, told Sustainable Pulse:<sup>12</sup>

*“FDACS should have required Oxitec to cease claiming as ‘confidential business information’ their data on the human health and environmental effects of the release of the mosquitoes. In Spain, when Oxitec withheld the data, the Spanish government told Oxitec to make public the health and environmental safety effects of their genetically engineered insect.*

*Florida should have done the same. Moreover, FDACS should not have allowed a second major release without making public the data from the first trial and having it reviewed by unbiased scientists in the field.”*

Barry Wray, director of Florida Keys Environmental Coalition, echoed these concerns, particularly with regard to the EPA's failure to look out for the public:<sup>13</sup>

*"We should all be very concerned about an EPA that forgets its middle name, protection, with this approval. Our public trust is abused by Oxitec's lack of scientific transparency and no independent scientific investigation from EPA to show this experimental insect will not create infinitely more problems than it will solve ... It is ethically repugnant to release these mosquitoes."*

## **Brazil Trials Show GE Genes Escaped to the Wild**

Red flags have already been raised by Oxitec's previous trials, including the release of Oxitec's GE mosquitoes, dubbed OX513A, which occurred in the city of Jacobina in Bahia, Brazil. About 450,000 male mosquitoes were released weekly for 27 months in the region in an attempt to reduce numbers of disease-carrying mosquitoes.<sup>14</sup>

"If lethality is complete, releasing this strain should only reduce population size and not affect the genetics of the target populations," researchers wrote in Scientific Reports.<sup>15</sup>

However, this wasn't the case. The Yale University researchers monitored the population of *A. Aegypti* mosquitoes in Jacobina to determine if the release of GE mosquitoes was affecting the genetics of the wild population by transferring genes. The GE mosquitoes contain a fluorescent protein gene, which allows the GE offspring to be detected.

When analyzed six, 12 and 27 to 30 months after release, the researchers found "clear evidence that portions of the transgenic strain genome have been incorporated into the target population."<sup>16</sup> The study explained:<sup>17</sup>

*"Evidently, rare viable hybrid offspring between the release strain and the Jacobina population are sufficiently robust to be able to reproduce in nature. The release strain was developed using a strain originally from Cuba, then outcrossed to a Mexican population."*

*Thus, Jacobina Ae. aegypti are now a mix of three populations. It is unclear how this may affect disease transmission or affect other efforts to control these dangerous vectors."*

A tri-hybrid population of GE mosquitoes now exists in Jacobina (Cuba/Mexico/Brazil). Due to their distinct genetic makeup, the study found, the population is likely "more robust" than it was prior to the GE mosquitoes release due to "hybrid vigor."<sup>18</sup>

## **Oxitec Releases Webinar of Field Trial Data**

In April 2022, after the EPA extended Oxitec's EUP, the company presented a webinar going over results from its open-air Florida mosquito trial. To conduct the study, boxes of GE mosquito eggs were placed onto private properties, surrounded with traps. The male GE mosquitoes hatched and circulated in the area, in a one-hectare (2.47 acres) range that's similar to the range wild mosquitoes inhabit.

After the mosquitoes mated and wild females laid eggs in the traps, researchers collected about 22,000 of them and brought them to a lab to hatch. Females with the inherited GE gene were identified because they fluoresce under a light in the lab.<sup>19</sup>

Oxitec stated that all females that inherited the GE gene died prior to adulthood and that the gene was no longer found in wild mosquitoes after a few generations.<sup>20</sup> They also noted that no GE mosquitoes were found to have traveled beyond 400 meters (437.4 yards) of the release site.<sup>21</sup>

Yet, the pilot study does not reveal whether the release of GE mosquitoes suppresses wild mosquito populations or, importantly, whether it reduces transmission of diseases carried by *A. aegypti*. Thomas Scott, an entomologist at the University of California, Davis, made an interesting point when he told Nature, "They're not going to be able to do a trial to show that it actually has a public-health impact. There's not enough *Aedes*-transmitted viral infection in the Florida Keys."<sup>22</sup>

If rates of *Aedes*-transmitted diseases are so low in Florida, why release the GE insects in the first place? According to the CDC:

- Dengue – “Nearly all dengue cases reported in the 48 contiguous US states were in travelers infected elsewhere.”<sup>23</sup>
- Chikungunya – From 2016 to 2020, there have been no cases of locally acquired chikungunya virus in the U.S.<sup>24</sup>
- Eastern equine encephalitis virus (EEEV) – “Only a few cases are reported in the United States each year.”<sup>25</sup>
- Zika virus – From 2018 to 2020, no locally acquired cases have been reported.<sup>26</sup>

What’s more, according to Scott, even very low populations of *A. aegypti* can lead to disease outbreaks, so even if Oxitec’s GE mosquitoes succeed in reducing local populations, it may not translate to reduced disease. “It’s just not that simple,” he said.<sup>27</sup> Adding further question to the need for GE mosquitoes at all, *A. aegypti* account for only about 4% of mosquitoes in the Florida Keys.

“The black salt marsh mosquito (*Aedes taeniorhynchus*) – more of a nuisance than a disease vector – probably represents about 80% of the mosquito population on the islands,” according to Nature, which means that the release of GE mosquitoes also will not reduce the need for pesticides.<sup>28</sup>

## **Releasing GE Mosquitoes in the Wild Is a Bad Idea**

Residents are right to be concerned about the release of GE insects in their backyard, as the outcome of this reckless experiment remains completely unknown, and the EPA has been less than transparent about its analysis of the data. According to Sustainable Pulse:<sup>29</sup>

*“Unfortunately, the EPA did not publicly share its entire public health analysis, and data about allergenicity and toxicity were redacted from public documents. EPA’s key environmental assessments were also insufficient and did not mandate scientific tests using caged trials ahead of environmental release.”*

Dana Perls, emerging technology program manager at Friends of the Earth, expressed further dismay at the EPA's prioritization of corporate interests over public health:<sup>30</sup>

*“Poorly done, secretive science and lack of transparency is once again being rewarded with a free pass by government officials who are ignoring the voices of concerned scientists and those most impacted. First in Brazil, and now in Florida, government agencies have missed the mark and promoted the interests of a private corporation over public health and ecosystem protection.”*

Mosquitoes certainly can transmit disease, so while the release of GE mosquitoes is dangerous and misguided, taking sensible measures to avoid getting bitten is wise. You can do this by:

- Wearing long sleeves and pants if you know you'll be outdoors in a mosquito-prone area
- Using natural insect repellants (not synthetic chemical versions), like cinnamon leaf oil, citronella essential oil or catnip oil, if necessary
- Using a house fan in your backyard to keep mosquitoes away while you're outdoors, Strategic planting of marigolds, which mosquitoes tend to stay away from
- Draining standing water, including pet bowls, gutters, garbage and recycling bins, spare tires, bird baths and children's toys, as this is where mosquitoes breed
- Installing a bat house, as mosquitoes are one of their favorite meals

## Sources and References

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- <sup>1</sup> [Guardian June 17, 2020](#)
- <sup>2</sup> [EPA May 1, 2020](#)
- <sup>3, 19, 21, 22, 27, 28</sup> [Nature April 18, 2022](#)
- <sup>4</sup> [U.S. EPA March 7, 2022](#)
- <sup>5, 12, 13, 29, 30</sup> [Sustainable Pulse May 5, 2022](#)
- <sup>6</sup> [American Journal of Tropical Medicine and Hygiene 2018 Jun; 98\(6\): 1563](#)
- <sup>7</sup> [CDC November 14, 2018](#)
- <sup>8</sup> [Oxitec June 3, 2019](#)
- <sup>9, 10</sup> [Wired October 17, 2017](#)

- <sup>11</sup> Science magazine October 13, 2016
- <sup>14, 15, 16, 17, 18</sup> Scientific Reports volume 9, Article number: 13047 (2019)
- <sup>20</sup> The Scientist May 4, 2022
- <sup>23</sup> CDC Dengue in the US States
- <sup>24</sup> CDC, Chikungunya
- <sup>25</sup> CDC, Eastern Equine Encephalitis
- <sup>26</sup> CDC, Zika