General SIT FAQ

Invasive Mosquito Preventative Release Program

What is SIT? *(Sterile Insect Technique)*

As part of an integrated vector management program to prevent the spread of mosquito-borne viruses, the Sterile Insect Technique (SIT) is an environmentally-friendly insect pest control method involving sterilization of a target pest, followed by the systematic, localized area-wide release of sterile males where they mate with wild females. The SIT technique results in no offspring and a declining pest population, reducing the presence of the specific breed of virus-spreading mosquitoes.

Why is OCMVCD considering the SIT technology over other control methods?

The District is exploring and investigating different SIT methods. Using this specific SIT method would reduce the population of the invasive *Aedes* mosquito using an environmentally-sound method. The process provides for the lab-reared male mosquito to mate with wild *Aedes* aegypti females, suppressing this species of virus-spreading mosquito. The specificity of this process leaves non-target species, such as bees and butterflies, unharmed.

Will SIT harm the environment or other insects?

No. SIT specifically works to control invasive *Aedes* mosquitoes. These mosquitoes are not originally found in California, so they don't have a place in our natural ecosystem. Reducing or controlling these mosquitoes will not harm insect-eating animals that are native to California. Also, sterile male mosquitoes only mate with invasive *Aedes* aegypti females. The self-limiting suppression effect is specifically targeted to *Aedes* aegypti mosquitoes, which means non-target insects, such as bees and butterflies,will not be harmed by SIT.

What is the SIT process and how long would it take?

OCMVCD is supportive of the development and study of this and other SIT technologies. The process would consist of an approval from the OCMVCD Board of Trustee consisting of representatives from each city the District serves in addition to a single county representative. If the program is approved, OCMVCD would then take certain steps and measures to begin the process:

The District would also conduct a series of trials before officially making the project a county wide effort:

1) Starting a trial in a defined area

2) Surveillance (collecting science drive data)

3) Providing consistent data to measure the project's success (pros and cons)

4) Bringing the finalized information to the Board to report trial outcomes

Where can I find more information from other organizations?

Centers for Disease Control

https://www.cdc.gov/mosquitoes/mosquito-control/community/sit/genetically-modified-mosquitoes.html

World Health Organization

https://www.who.int/news/item/14-11-2019-mosquito-sterilization-offers-new-opportunity-to-control-chikungunya-dengue-and-zika#:~:text=The%20Sterile%20Insect%20Technique%20(SIT,with%20females%20in%20the%20wild.

National Institutes of Health

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2946175/

Sacramento-Yolo Mosquito Control District

https://www.fightthebite.net/education/sit/

Debug Fresno

https://cmad.maps.arcgis.com/apps/MapJournal/index.html?appid=f90115bcf15943928fc82a79af89d71e

IAEA

https://nucleus.iaea.org/sites/naipc/dirsit/Pages/SIT-for-mosquitoes-FAQ.aspx

Wolbachia FAQ

What is Wolbachia?

Wolbachia (wohl-bach-ee-uh) is a common type of bacteria found in insects. Approximately 6 in 10 of all types of insects, including butterflies, bees, and beetles, around the world have *Wolbachia. Wolbachia* bacteria cannot make people or non-target animals (for example, fish, birds, pets) sick.

More information about Wolbachia:

https://www.cdc.gov/mosquitoes/mosquito-control/community/sit/wolbachia.html

How does Wolbachia help control invasive mosquitoes?

When male *Ae. aegypti* mosquitoes with *Wolbachia* mate with wild female mosquitoes that do not have *Wolbachia*, the eggs will not hatch. Non-biting male mosquitoes with *Wolbachia* are released regularly into an area by mosquito control professionals. Male mosquitoes with *Wolbachia* mate with wild female mosquitoes. Because the eggs don't hatch, the number of *Ae. aegypti* mosquitoes decreases.

Is Wolbachia harmful to people or other animals?
Wolbachia are safe for humans and the environment. Independent risk analyses indicate that the release of *Wolbachia*-infected mosquitoes poses negligible risk to humans and the environment.

More information about Wolbachia:

https://www.cdc.gov/mosquitoes/mosquito-control/community/sit/wolbachia.html

https://debug.com/how/

Will this method help decrease disease outbreaks?

Releasing mosquitoes with *Wolbachia* is not intended to stop a disease outbreak. However, releasing these types of mosquitoes over several months can reduce the number of a specific mosquito species, such as the invasive Aedes mosquito which can transmit diseases.

What can I do as a resident to help OCMVCD to help combat this invasive species?

Mosquito control is a shared responsibility. Everyone must take charge of their yard and eliminate standing water and unneeded containers weekly. Residents can sign up to become a mosquito advocate in their neighborhood to educate their community: https://www.ocvector.org/become-a-neighborhood-advocate

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IAEA

Irradiation FAQ

What is irradiation?

Irradiation, such as with gamma rays and X-rays, is used to sterilize mass-reared insects so that, while they remain sexually competitive, they cannot produce offspring. SIT does not involve transgenic (genetic engineering) processes.

What is the process of irradiation?

Large numbers of mosquitoes are raised in a lab. Male mosquito pupae are separated from female pupae. Males are irradiated, using ionizing radiation, to make them sterile. Male mosquitoes are bred and sterilized using the same radiation found in x-rays. Males are then regularly released to mate with wild females. The resulting eggs will not hatch.

Is it harmful to humans or other animals?

Irradiated mosquitoes cannot make people or animals (for example, fish, birds, pets) sick.

Will this method help decrease disease outbreaks?

Releasing males that are irradiated is not intended to stop an outbreak. However, releasing these types of mosquitoes over several months can reduce the number of a specific mosquito species, such as the invasive Aedes mosquito which can transmit diseases.

What can I do as a resident to help OCMVCD to help combat this invasive species?

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GM Mosquitoes FAQ

What is a GM Mosquito?

GM mosquitoes are mosquitoes that have been implanted with a gene which was not originally present or naturally occurring in the insect. In one case, the implant in question is a self-limiting gene that disrupts the normal processes of mosquitoes' offspring. These offspring will, in turn, not survive to adulthood. These lab-grown Aedes aegypti mosquitoes would be released into the wild to mate with the wild population – where their offspring's inability to grow to adulthood would lower the population of mosquitoes. These are also often referred to as transgenic mosquitoes.
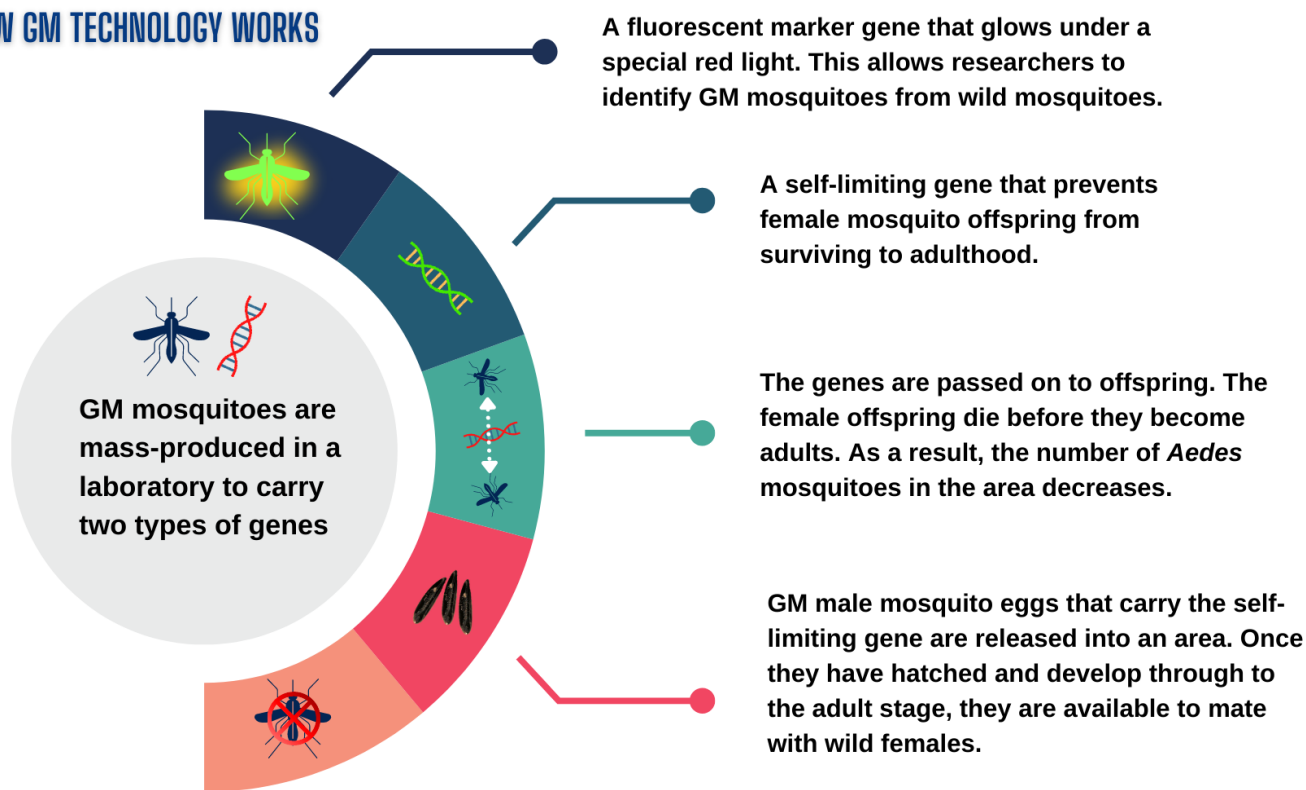
How are they Genetically Modified?

GM mosquitoes are mass-produced in a laboratory to carry three types of genes:

- o A **fluorescent marker gene** that glows under a special red light. This allows researchers to identify GM mosquitoes from wild mosquitoes.

- A **self-limiting gene** that prevents female mosquito offspring from surviving to adulthood.
- A **male-selecting gene** that allows males to pass on their genes in a wild population for multiple generations, while the females never become adults.

GM male mosquito eggs that carry the self-limiting gene are released into an area. Once they have hatched and develop through to the adult stage, they are available to mate with wild females. The genes are passed on to offspring. The female offspring die before they become adults. As a result, the number of *Ae. aegypti* mosquitoes in the area decreases.

HOW GM TECHNOLOGY WORKS

A fluorescent marker gene that glows under a special red light. This allows researchers to identify GM mosquitoes from wild mosquitoes.

A self-limiting gene that prevents female mosquito offspring from surviving to adulthood.

GM mosquitoes are mass-produced in a laboratory to carry two types of genes

The genes are passed on to offspring. The female offspring die before they become adults. As a result, the number of *Aedes* mosquitoes in the area decreases.

GM male mosquito eggs that carry the self-limiting gene are released into an area. Once they have hatched and develop through to the adult stage, they are available to mate with wild females.

Is it healthy for the environment to release GM mosquitoes?

The U.S. EPA, State of California have confirmed there is no adverse effect on humans or wildlife from implementing the SIT process.

For more information, see EPA's Human Health Risk Assessment

Is using GM mosquitoes effective?

Using GM mosquitoes may be more effective if used along with other mosquito control methods as part of an integrated mosquito management (IMM) approach, including:

- Educating the community about how they can control mosquitoes in and around their homes
- Conducting mosquito surveillance (tracking and monitoring the number of mosquitoes, types of mosquitoes in an area)
- Removing standing water where mosquitoes lay eggs
- Using larvicides and insecticides to control mosquito larvae, pupae, and adult mosquitoes
- Monitoring how effective mosquito programs are at reducing numbers of mosquitoes.

Will this method help decrease disease outbreaks?

Release of GM mosquitoes is not intended to stop an outbreak. However, releasing GM mosquitoes over several months can reduce the number of a specific mosquito species, such as the invasive Aedes mosquito which can transmit diseases.

What can I do as a resident to help OCMVCD to help combat this invasive species?

Mosquito control is a shared responsibility. Everyone must take charge of their yard and eliminate standing water and unneeded containers weekly. Residents can sign up to become a mosquito advocate in their neighborhood to educate their community: https://www.ocvector.org/become-a-neighborhood-advocate

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