FKMCD-Oxitec Public Educational Webinar #9

What's in the Box?: How Oxitec's Just-Add-Water Technology Helps Control the *Aedes aegypti* Population

16 December 2020

FLORIDA Mosquito Control DISTRICT KEYS

OXITEC

Introductions – Panelists With You Today

Andrea Leal
Executive Director
FKMCD

Meredith Fensom
Head of Public Affairs
Oxitec

Nathan Rose
Head of Regulatory Affairs
Oxitec

FKMCD-Oxitec Public Educational Webinar Series

FKMCD and Oxitec are hosting a series of public educational webinars to share information with residents of the Florida Keys and provide forums to answer questions.

- All webinars are open to everyone.
- All webinars are recorded and made available for everyone after the event.
- All questions relating to the webinar topic(s) will be answered (some in batches if questions are similar).
- If time runs out, we will accept questions in writing via florida@oxitec.com.
- Questions and answers will be published in writing after the event with external or related online resources/references.

Upcoming:

1. **Preparing for the FKMCD-Oxitec Pilot Project: Overview of Field Trial Design and Management** – coming in January!
2. **Roundtable Discussion: Controlling *Aedes aegypti*, the Vector of Dengue, Zika, Heartworm and Other Diseases** – coming in February!
3. **Community Partnerships: The Role Communities Play in our Pilot Project** – coming in March!

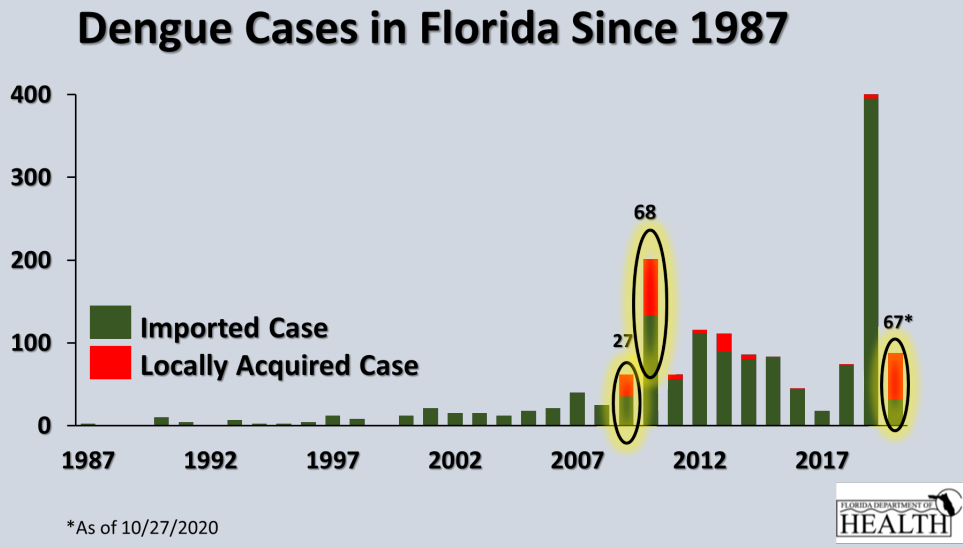
Welcome to Webinar #9!

Today's Agenda:

- *Aedes aegypti* in Florida
- OX5034: What's In the Box? Deployment of OX5034 Mosquitoes in Florida
- What's NOT In The Box?
- Your questions, answered.

Why now? – *Aedes aegypti* Mosquitoes in Florida

- Dengue is an ongoing challenge with over 65 confirmed locally-acquired cases in Monroe County so far in 2020
- The threat of other diseases such as Zika, chikungunya and yellow fever persists
- Insecticide resistance in local mosquitoes

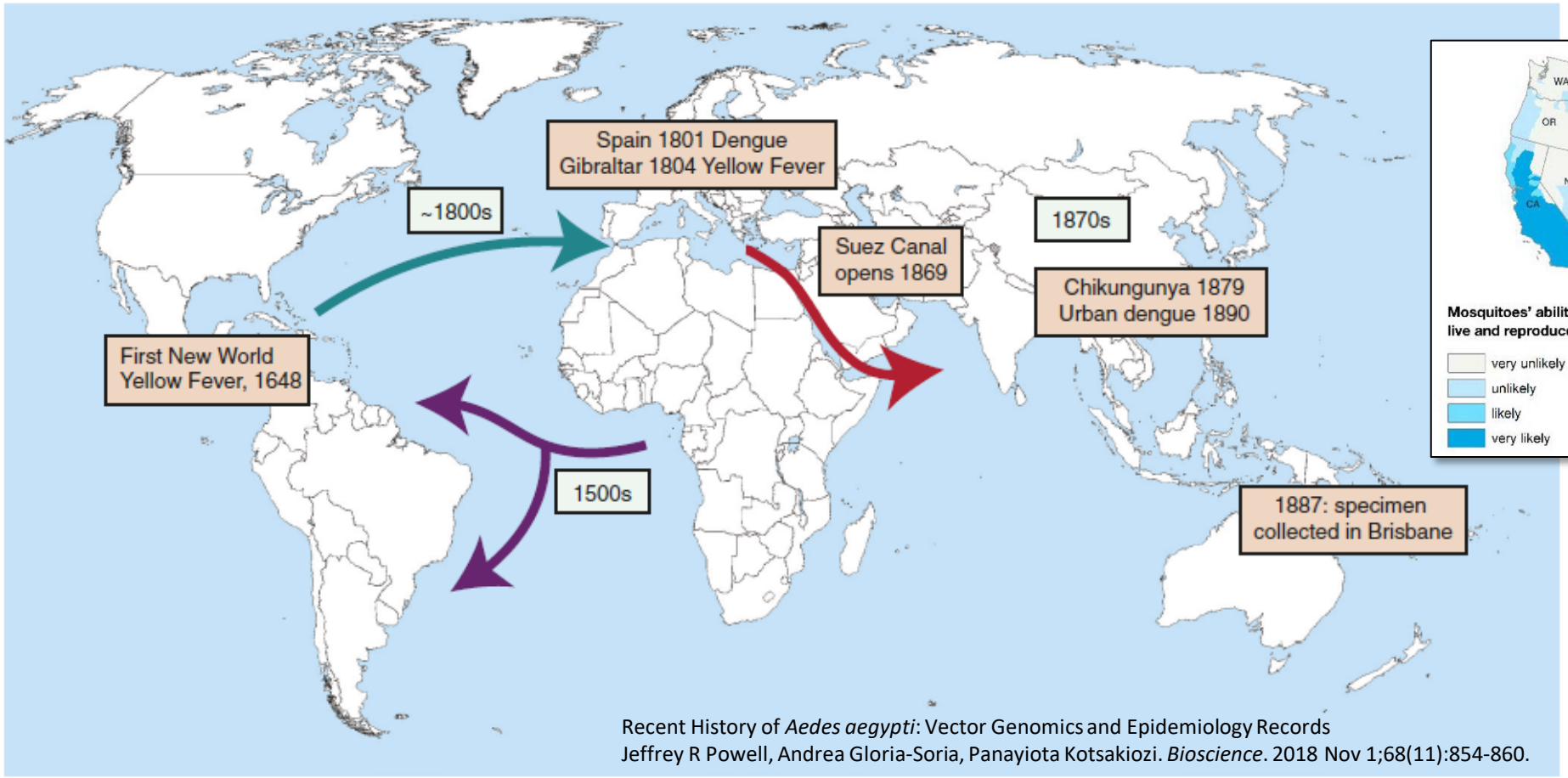


- Environmental impact is a major consideration, including for human health
- Using species-specific tools minimizes harmful impacts
- Nine national and state agencies concluded Oxitec male mosquitoes pose no risk to human or environmental health
- More than one billion Oxitec mosquitoes have been produced for release worldwide, with no negative impacts

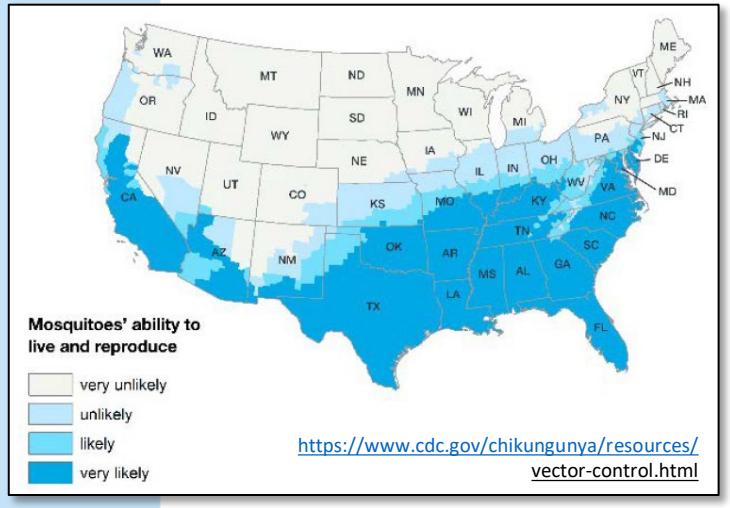
Endangered Schaus' swallowtail butterfly lives where the current dengue outbreak is.

The *Aedes aegypti* Mosquito*:* an Invasive Species in Florida

***Aedes aegypti* is not native to the Americas.** It was most likely transported from Africa by Portuguese ships sometime in the 16th century, **bringing viral diseases with it.**



Recent History of *Aedes aegypti*: Vector Genomics and Epidemiology Records
Jeffrey R Powell, Andrea Gloria-Soria, Panayiota Kotsakiozi. *Bioscience*. 2018 Nov 1;68(11):854-860.

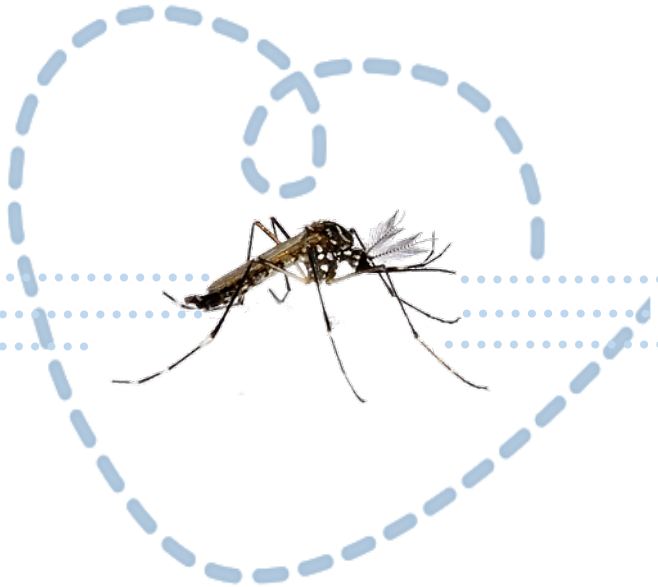


Aedes aegypti in Florida and surrounding U.S. states today.

Oxitec's *Aedes aegypti* Mosquito Technology ("OX5034")

OXITEC'S *AEDES AEGYPTI*

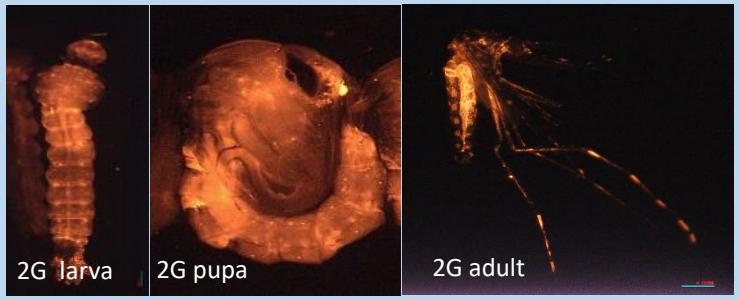
- ✓ TARGETED SUPPRESSION
- ✓ SAFE, NON-TOXIC, NON-ALLERGENIC
- ✓ PROVEN EFFECTIVENESS



- ✓ MALE-ONLY RELEASES (male mosquitoes do not bite)
- ✓ TRACEABLE IN THE FIELD
- ✓ SELF-LIMITING IN THE ENVIRONMENT

- No females produced
- Low-tech, egg-based devices enabled

- Easy track-and-trace in the field
- Non-toxic, non-allergenic



Moving to the Field: Decade of Performance, Lessons & Proof-Points

- Published **peak suppression performance of wild-type *Aedes aegypti* ranging from 92% to 96%** as compared to control sites (see below)
- **1Bn+ Oxitec mosquitoes produced for release**
- Deployments ranged from small-scale to **coverage of 65K people**
- **Successful suppression** of target *Aedes aegypti* populations in range of deployments
- Demonstrated **safe with no lasting impact on the environment, humans or animals**
- **Multiple pilot approvals** from biosafety regulators

SELECTED DEPLOYMENT PROGRAMS, 2010 – 2020

***Aedes aegypti* peak suppression measured in each program compared to control sites**

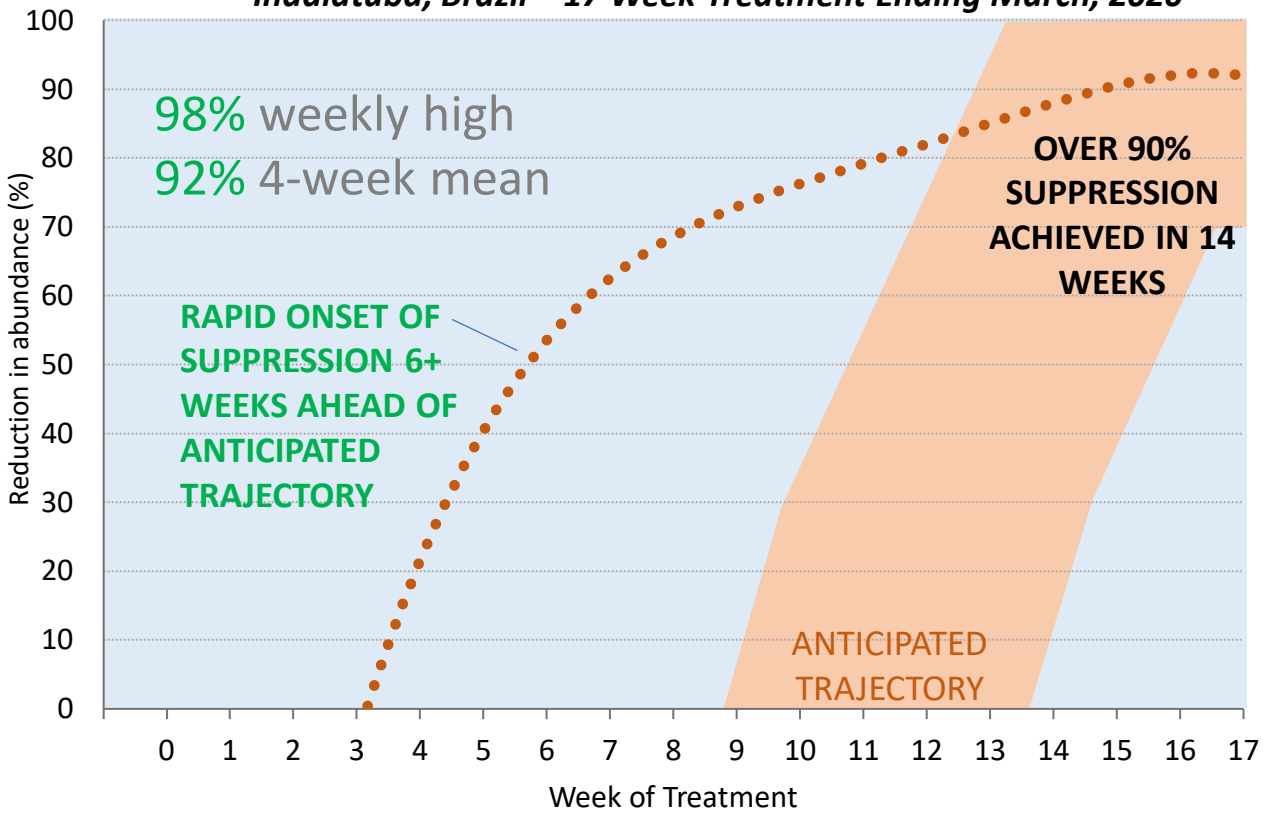
Demonstrated Effectiveness & Safety

Results:

- ✓ Safe – no unintended impacts
- ✓ Males only – no female release
- ✓ Fully self-limiting – no persistence
- ✓ Significant suppression (see graph)
- ✓ 90% reduction in operations
- ✓ 94%+ public acceptance

Pilot Project #1 for Mosquito Rearing Box – 1,000 Person Area

Indaiatuba, Brazil – 17 Week Treatment Ending March, 2020



6 Weeks Faster to Suppression than OX513A

90% More Efficient Production & Deployment

Why Was OX5034 Developed?

- Highly effective at reducing *Aedes aegypti* populations
- Species-specific
- Safe, non-toxic
- No female releases
- Harmless to ecosystem
- Integrated w/ IVM
- Cost-effective

FLORIDA Mosquito Control DISTRICT KEYS

OXITEC

How Was OX5034 Developed?

Oxitec introduced only two widely-used and well-studied genes to the *Aedes aegypti* mosquito that are safe, non-toxic and non-allergenic.

1. **MALE-SELECTING SELF-LIMITING GENE** (‘tTAV’)
2. **MARKER GENE** (‘DsRed2’)

How Does the Self-Limiting Gene Work?

SELF-LIMITING FEATURES:

- Females cannot survive
- Male OX5034 mosquitoes are unaffected:
  - Male-only production;
  - Egg release devices;
  - Suppression of wild mosquito populations, as female offspring cannot survive.

No OX5034 females are released

20 million

male OX5034 mosquitoes released in Brazil

1 billion

OX513A mosquitoes produced for release globally

Zero Negative Impact

How Does the Fluorescent Marker Gene Work?

THE DSRED2 PROTEIN:

- Allows us to track Oxitec mosquitoes after release
- Widely used in biology for 20 years
- Produced in OX5034 mosquitoes at all life stages
- Male OX5034 mosquitoes can pass on the gene to their offspring

Non-toxic, non-allergenic protein that is visible under special filters

Do Oxitec Mosquitoes Bite?

No.

Oxitec mosquitoes do not bite.

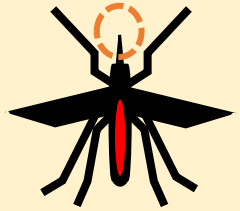
Only female mosquitoes bite.

There will be no Oxitec female mosquitoes.

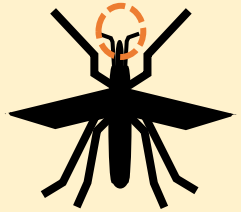
Oxitec male mosquitoes are safe and non-toxic.

MALE MOSQUITOES CANNOT BITE

FEMALE: Biting mouthparts



MALE: Non-biting mouthparts



The mouthparts of males mean they are physically unable to bite people

Oxitec is Expanding OX5034 Male Mosquito Releases in Brazil

The Health Secretary of Indaiatuba, Dr. Graziela Garcia, said, “Indaiatuba is privileged to have Oxitec’s Friendly™ *Aedes aegypti* technology because without this solution we could have two epidemics together, COVID-19 and dengue. Our results with this technology are remarkable and we are happy to be able to expand the project.”

Photo: Eliandro Figueira Ric/Divulgação Prefeitura de Indaiatuba

In May 2020, Oxitec received full biosafety approval for this technology from Brazil’s national biosafety regulatory authority CTNBio after demonstrating the technology’s full safety to human health and the environment.

What's In The Box?

- ✓ OX5034 mosquito eggs
- ✓ Mosquito diet to feed developing larvae
- ✓ Water

Approximately 10 days after activation, non-biting male OX5034 mosquitoes will start to emerge from the box.

All components of the box have been reviewed by EPA and State of Florida regulators and are safe for humans and the environment.

What's NOT In The Box?

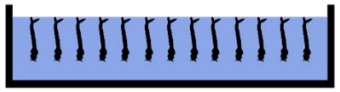
- ✓ NO adult female OX5034 mosquitoes will be released
- ✓ NO tetracycline in the box
- ✓ NO risk to humans, animals or the environment

How Are OX5034 Mosquitoes Produced in the UK?

1

Eggs hatch into larvae. Small amount of tetracycline is added to larval water so females can survive.

PARENT LARVAE



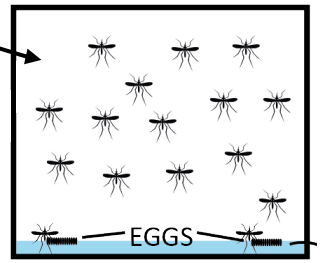
2

PARENT PUPAE

Once larvae pupate, they are washed and moved to clean water.

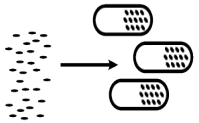
No tetracycline used beyond this point

PARENT ADULTS

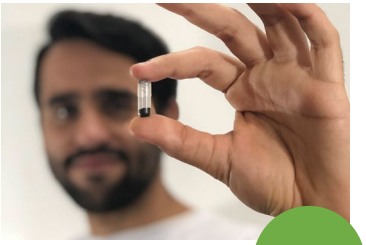


3

EGGS SURFACE-STERILIZED



EGGS PACKAGED IN MINI CAPSULES



4

To produce all the eggs required for this project, Oxitec will use less tetracycline than sugar in a 5g packet

- ✓ EPA compliant quality control at every step
- ✓ Egg surfaces sterilized with sanitizer 4x stronger than hospital-grade disinfectant

Quality Control

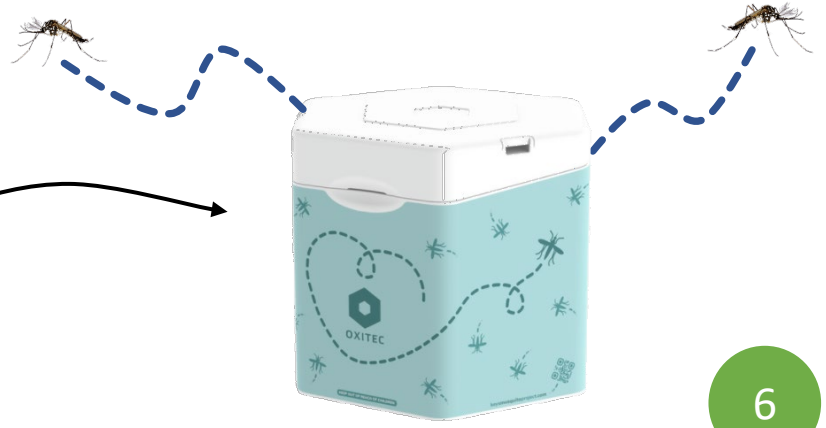
on every batch of eggs to check self-limiting gene function and male performance

How Are OX5034 Mosquitoes Delivered to the Keys?

EGGS PACKAGED IN MINI CAPSULES

4

5



6

BOXES ARE PLACED BY FKMCD/OXITEC OPERATORS

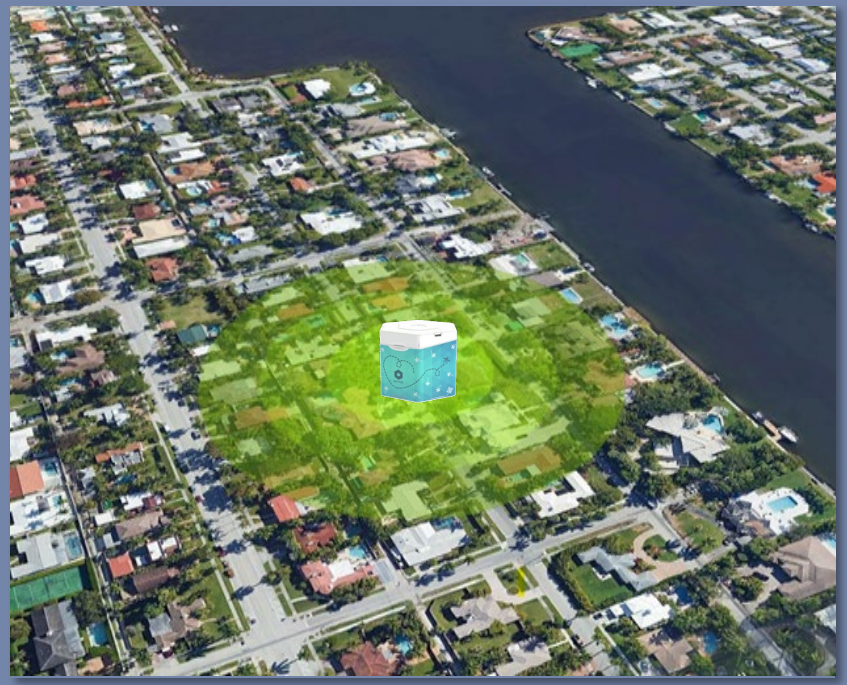
7

- ✓ No female release & no biting
- ✓ Only male adults in the box
- ✓ **No tetracycline in the box**
- ✓ **No tetracycline in Florida**
- ✓ Boxes will be placed in out-of-the-way areas and serviced occasionally

Project Locations and Mosquito Releases

PROJECT A

SINGLE POINT RELEASE



1 box placed per week in up to 9 small areas

~12 weeks

LOCATIONS

TO BE SELECTED W/ FKMCD FOLLOWING PEST MONITORING AND COMMUNITY ENGAGEMENT

TRAP TO COLLECT MOSQUITO EGGS

TRAP TO COLLECT MOSQUITO ADULTS

PROJECT B

MULTIPLE RELEASE POINTS

Small number of devices placed per week in up to 6 areas

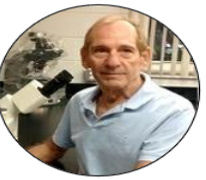
~16 weeks

Recent Community Engagement

INDEPENDENT ADVISORY BOARD
TECHNICAL AND OPERATIONAL OVERSIGHT

UF IFAS UNIVERSITY of FLORIDA Florida Medical Entomology Laboratory

Florida HEALTH Monroe County



Dr Jorge Rey
University of Florida – IFAS Florida Medical Entomology Laboratory
Member, Project Independent Advisory Board

Bob Eadie
Monroe County Department of Health
Member, Project Independent Advisory Board

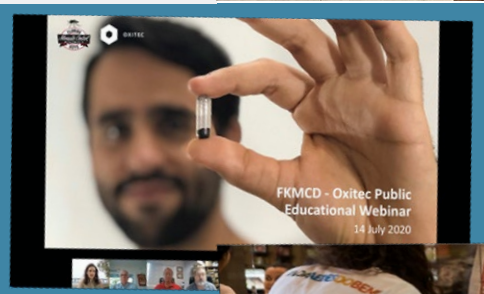
Dr Douglas Mader
Veterinary Specialist
Fellow, Royal Society of Medicine
Member, Project Independent Advisory Board

Sherri Crilly
FWC Marine Turtle Permit Holder and Save-A-Turtle Volunteer
Member, Project Independent Advisor Board

FKMCD - #Oxitec Public Educational Webinar #8:...
69 views • 2 weeks ago

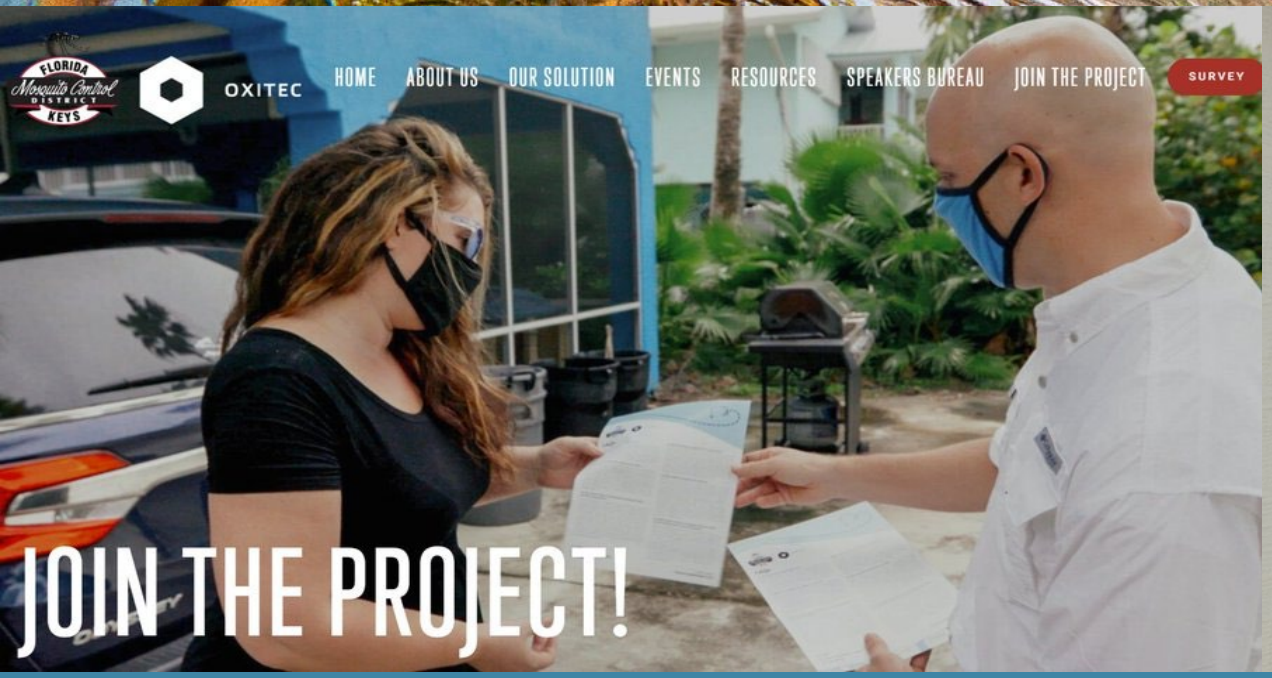
Virtual Tour: Inside #Oxitec Labs Worldwide
346 views • 2 weeks ago

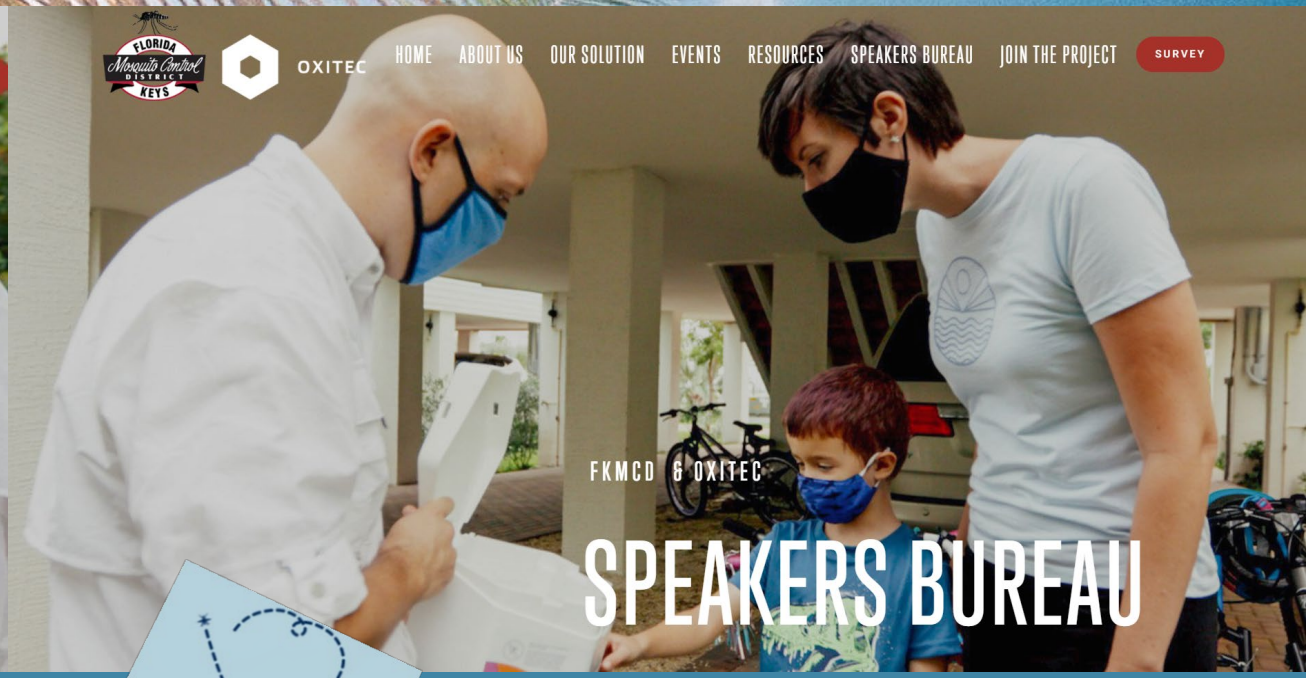
FKMCD - #Oxitec Public Educational Webinar #7:...
64 views • 1 month ago

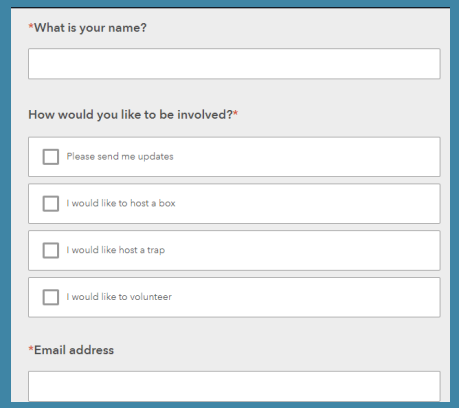


YouTube

Get Involved!







- ✓ Request a box
- ✓ Request a trap
- ✓ Sign up for updates
- ✓ Volunteer as a Project Ambassador

keysmosquitoproject.com

Question and Answers

Any and all questions on this evening's topics are welcome!

(If we run out of time tonight, email florida@oxitec.com and we will attempt to answer your question if it isn't included in the growing FAQ or post-event summary we publish online at oxitec.com/florida and keysmosquitoproject.com)

Conclusion

THANK YOU!

A summary of this event, as well as more Q&As, resources, facts, and background materials are available at oxitec.com/florida and keysmosquitoproject.com.