

OXITEC

# ***Genetic engineering to control mosquitoes: The Oxitec solution***

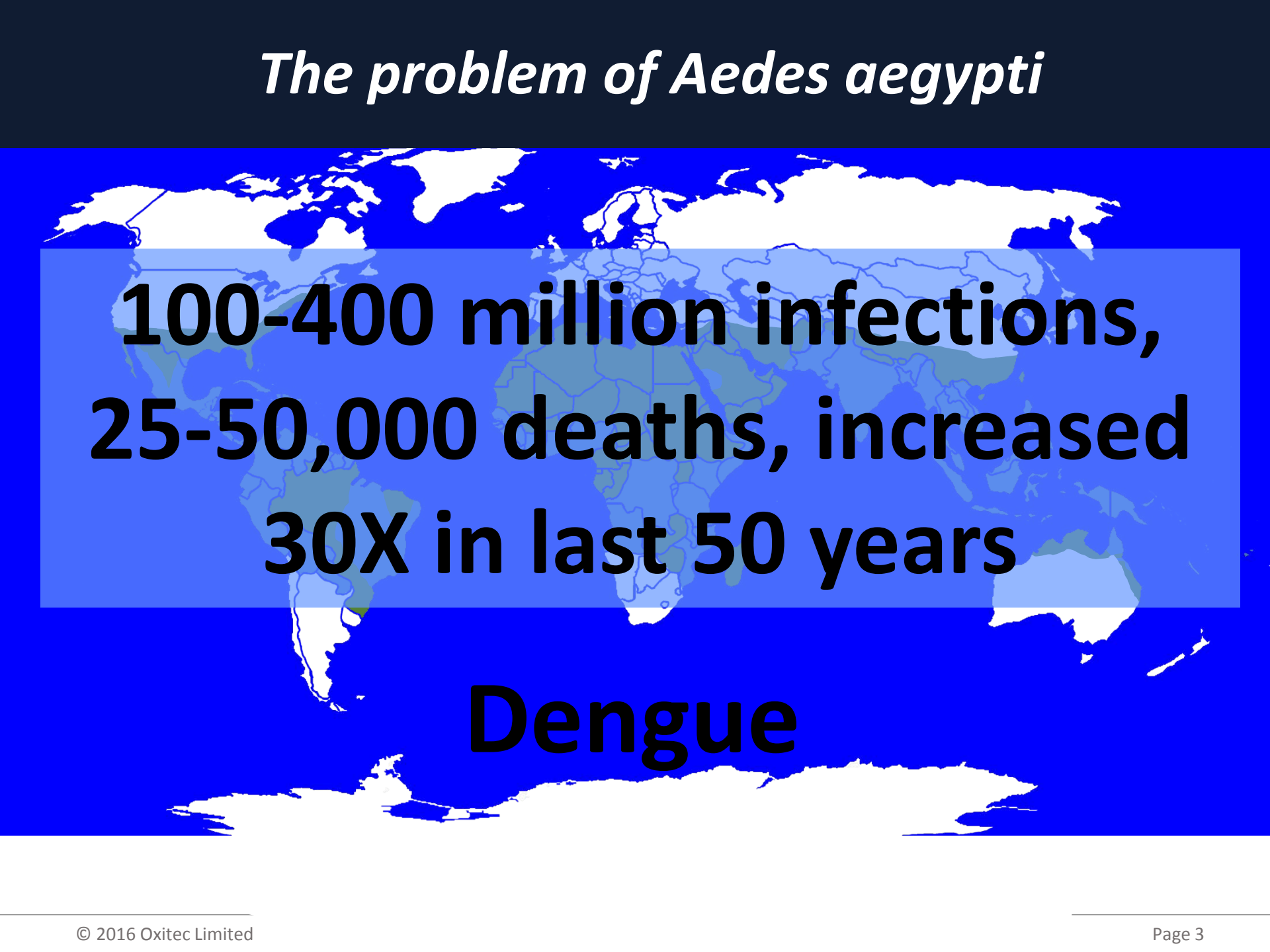
Derric Nimmo PhD

December 2016

# *The problem of **Aedes aegypti***



# *The problem of Aedes aegypti*

A world map is visible in the background, with a semi-transparent blue rectangular box overlaid in the center. The box contains text about dengue infections and deaths. The word 'Dengue' is written in large, bold, black letters at the bottom of the slide.

**100-400 million infections,  
25-50,000 deaths, increased  
30X in last 50 years**

**Dengue**

# *The problem of Aedes aegypti*

A world map with a blue background. Landmasses are outlined in white. Countries are shaded in various colors: dark blue for North America, light blue for South America, green for Europe and Africa, and yellow for Asia and Australia. A semi-transparent blue rectangle is overlaid on the map, containing text.

**Over 1.2 million cases in the  
Americas alone, 200 deaths,  
spreading fast**

**Chikungunya**

# *The problem of Aedes aegypti*

**Spreading rapidly, symptoms mild but link to microcephaly during pregnancy**



# *The problem of Aedes aegypti*

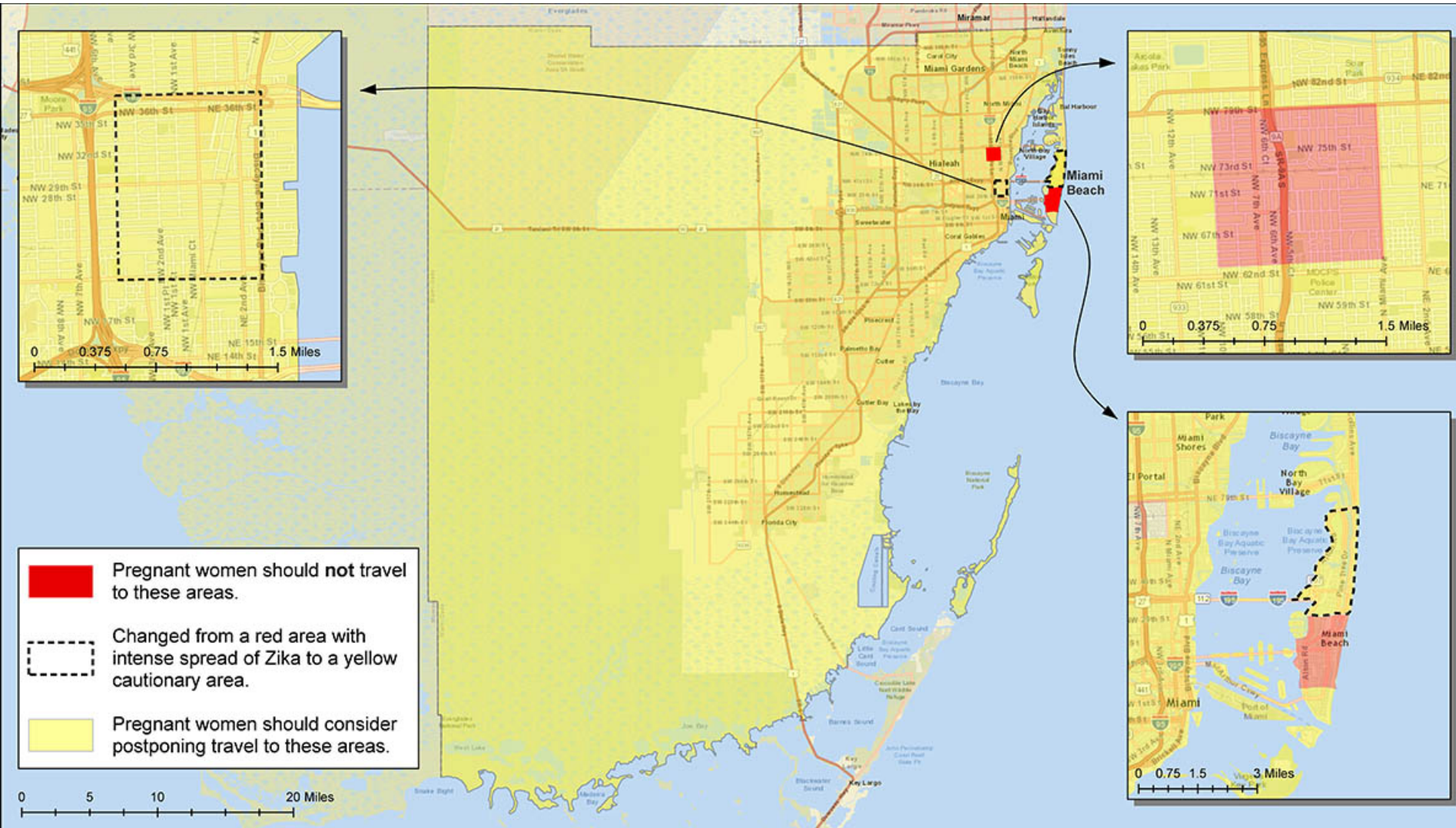
A world map with a blue background. Landmasses are outlined in white. Countries are shaded in light blue or light green. The distribution of Aedes aegypti is indicated by these shaded areas, which cover most of the world except for the Arctic and Antarctic regions. The text "If you don't remove the vector:" is overlaid on the map in large, bold, black font.

**If you don't remove the  
vector:**

**What's next?**



# Miami – the threat is real



Source: <https://www.cdc.gov/zika/intheus/florida-maps.html> (Page accessed December 1, 2016; Page last updated November 22, 2016)

# Traditional approaches are ineffective

- Against *Aedes aegypti* 30-50% effective at best (FKMCD data)
  - Private property prevents access
  - Insecticide resistance
  - Finding breeding sites

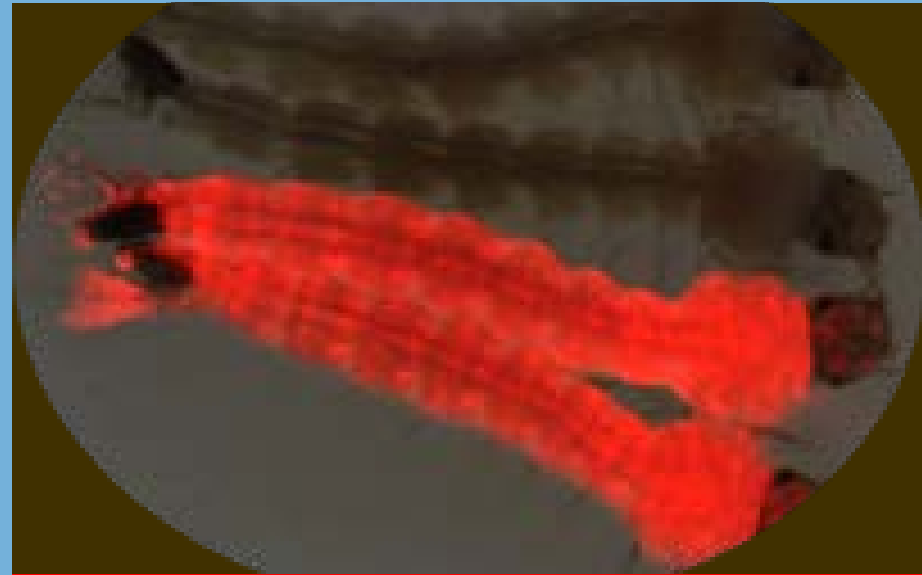




# Oxitec OX513A Friendly™ mosquitoes

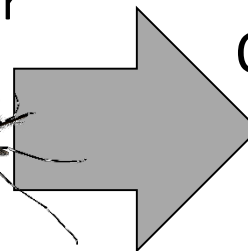


Self-limiting Gene



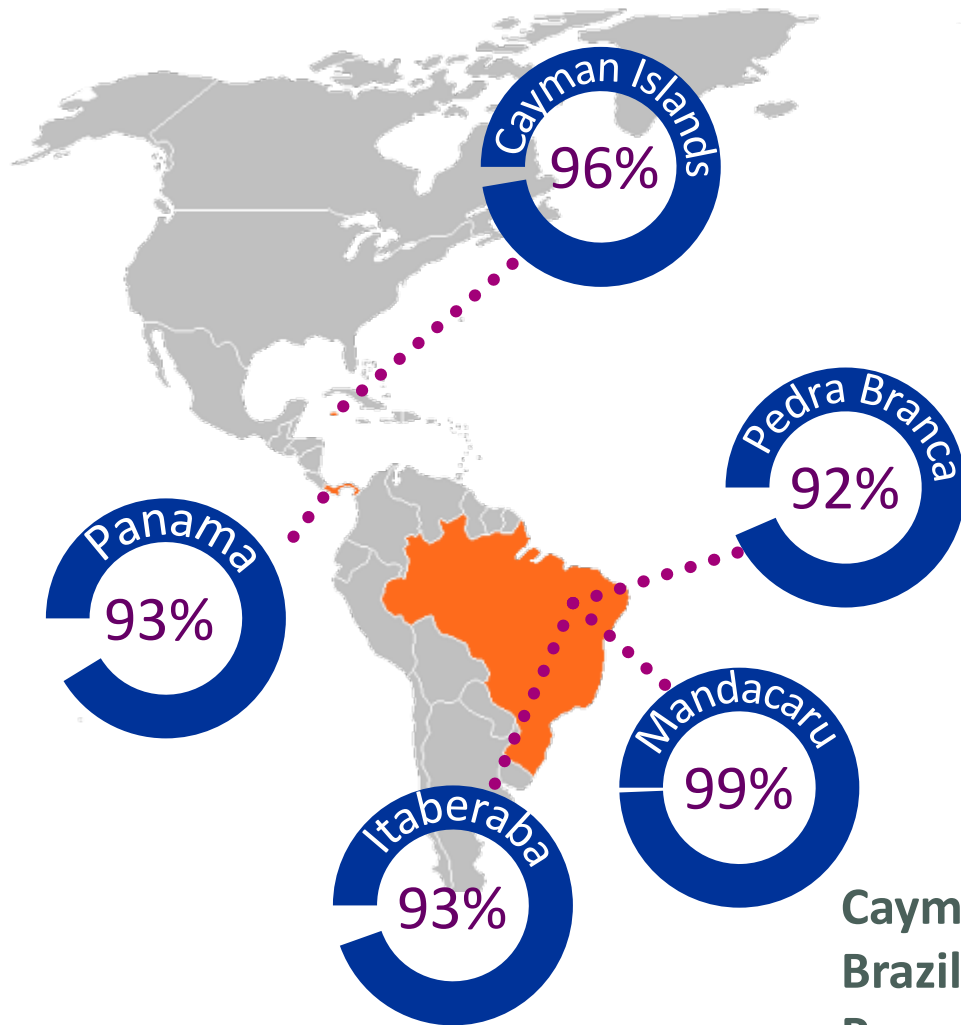
Fluorescent Marker Gene

Oxitec male mosquitoes are produced for release and mate with pest females



Offspring die before they can reproduce and transmit disease

# Oxitec OX513A success



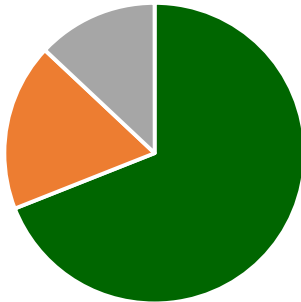
**Efficacy field trials show  
90+%<sup>1</sup> suppression of  
*Aedes aegypti*.**

**Cayman:** Mosquito Research and Control Unit  
**Brazil:** University of São Paulo and Moscamed  
**Panama:** The Gorgas Institute

<sup>1</sup> Relative to control sites

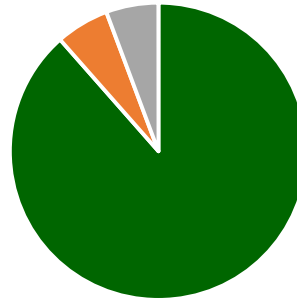
# Strong public support Worldwide

Cayman Islands



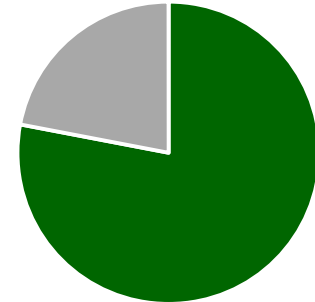
■ Support ■ Neutral

Piracicaba, Brazil



■ Support ■ Neutral ■ Oppose

USA\*



■ Support ■ Oppose

## Extensive community engagement



\* <https://www.purdue.edu/newsroom/releases/2016/Q1/survey-public-supports-use-of-gmo-mosquitoes-to-fight-zika-virus.html>

# A comprehensive road to success



2010  
Three trials in  
Brazil:  
All >90%  
suppression

2009  
Caymans  
trial: 96%  
suppression

2002  
OX513A  
created



2014  
Panama trial showed:

- 93% suppression
- No *Albopictus* niche replacement
- No persistence in the environment



2014-2016

**Brazil:** CTNBio Approval,  
ANVISA announcement

**US:** FDA Final FONSI & EA

**Global:** WHO/PAHO/CARPHA  
recommend pilot deployment  
under operational conditions

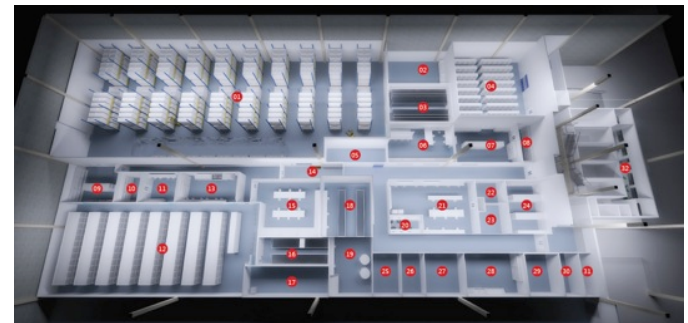
**Launches:** Piracicaba, Brazil  
expansion (65,000 people)  
and Cayman Islands





# *Beyond a trial: Scaling up production*

- Industrialized production
  - Efficient, clean processes
  - Quality controlled outputs
- Capacity:
  - Space >5,000m<sup>2</sup>
  - 60 million OX513A males/week
  - Up to 3 million people covered maintenance phase
- Detailed design facilitates rapid start in other locations and at any scale
  - Investment
  - New jobs





# *Now operational in Piracicaba, Brazil*



*Capacity of new factory is 60 million Oxitec mosquitoes per week. This capacity can cover circa 3 million people*



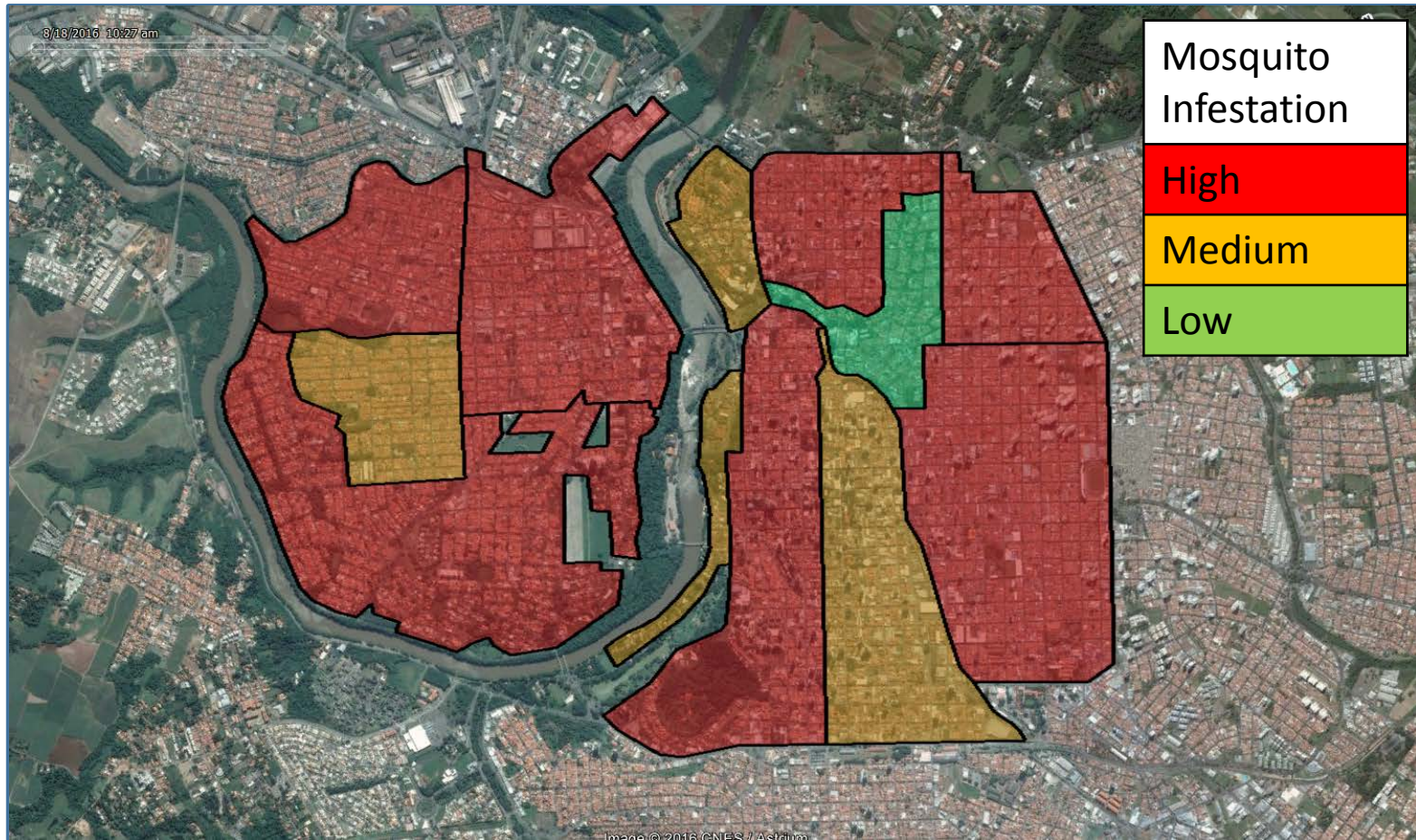
# *Inside our Brazil factory*





# Control Programme: Mapping

Define infestation levels by subareas -> Initial Release Rates by subareas

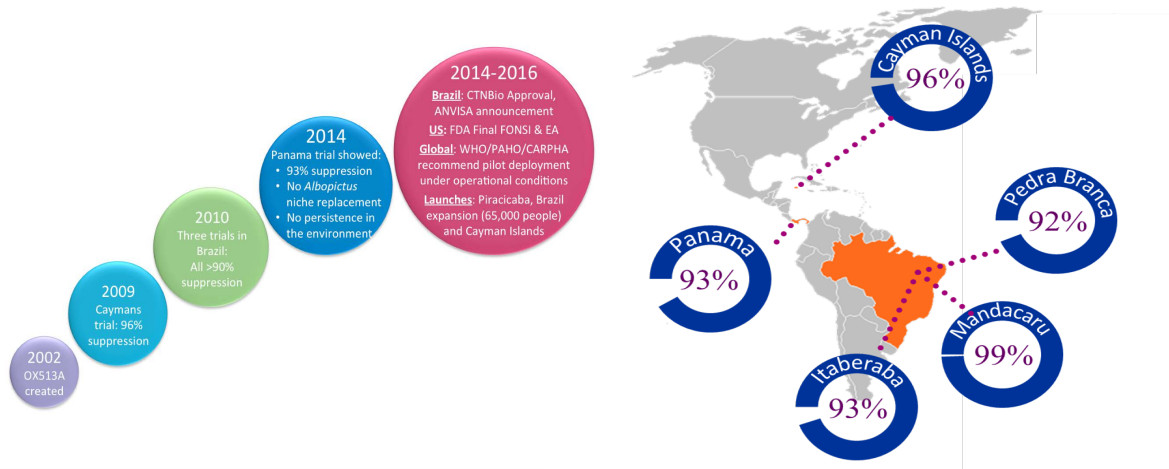




# *Mosquito distribution simple and efficient*



# Oxitec has the solution



Years of independent research

Proven safe and effective in other countries



Confirmed scale-up capabilities and programmatic deployment

## Oxitec preparing for Worldwide control of *Aedes aegypti* using a genetically engineered mosquitoes



# Thank you



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