

A GRAND CHALLENGE | Agenda for Entomology



## Non-Transgenic Replacement and Suppression of Vector Mosquitoes

Stephen Dobson

13 March, 2016

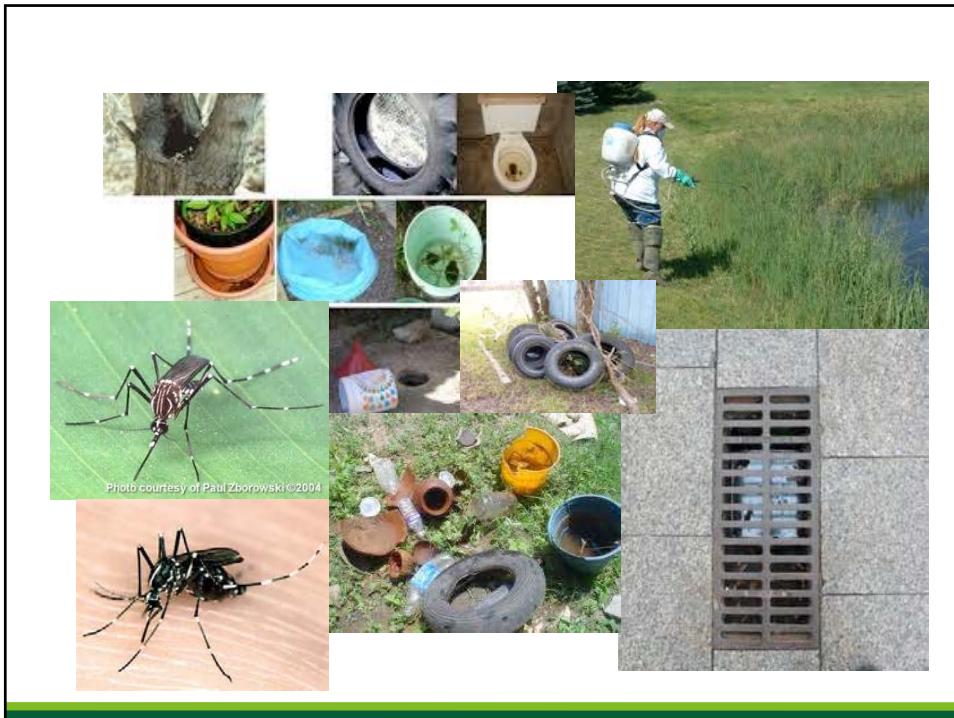
Summit on the *Aedes aegypti* Crisis in the Americas:  
Joining Together to Address a Grand Challenge

Maceió, Brazil



[www.entomologychallenges.org](http://www.entomologychallenges.org)





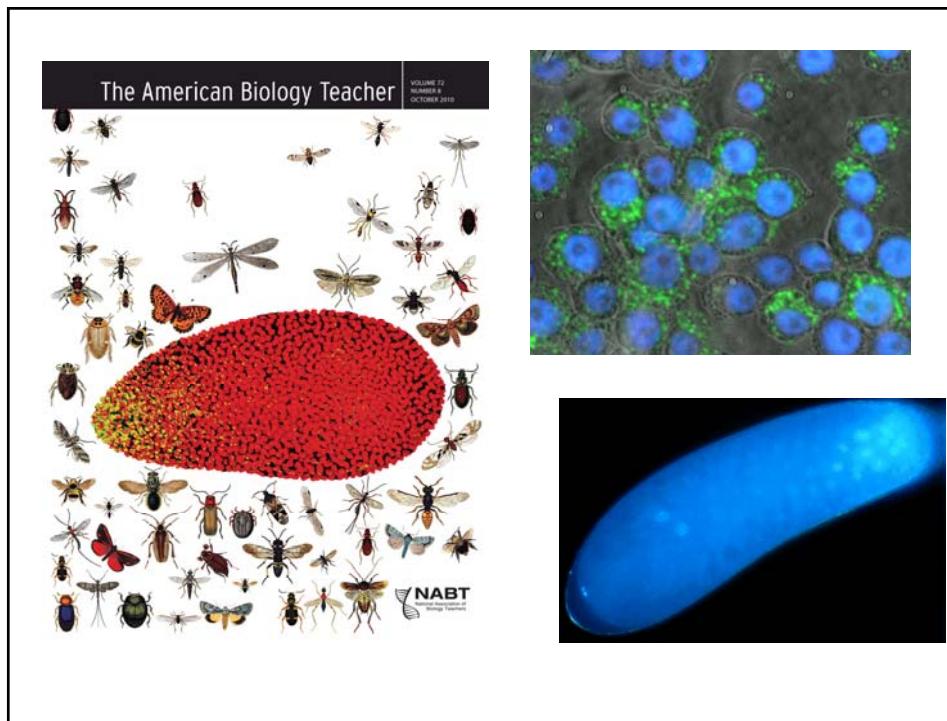
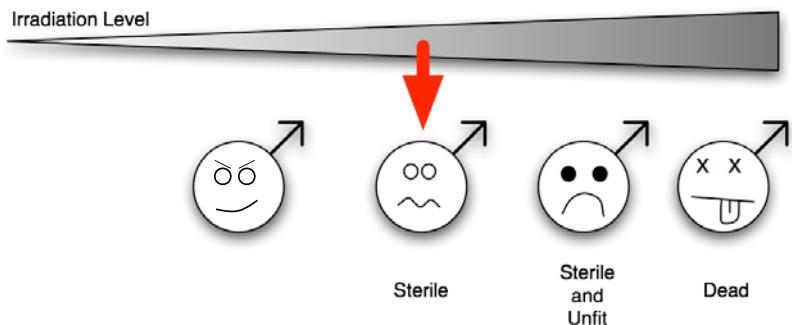
### Classical Sterile Insect Technique via Irradiation ... several success stories in agriculture.

- Screw Worm Fly
- Mediteranean Fruit Fly
- Pink Boll Worm

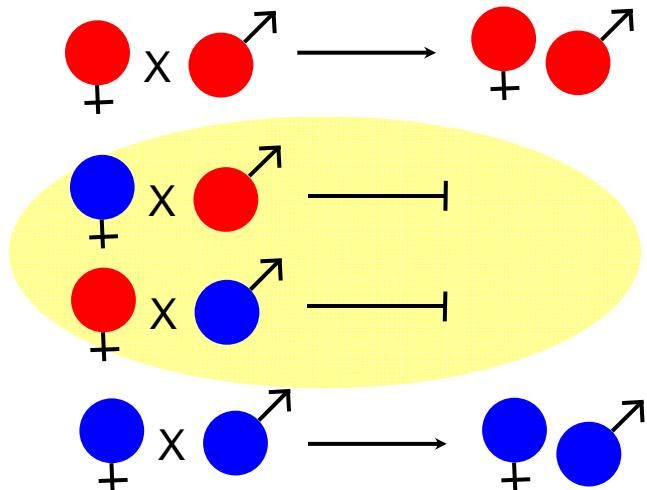


## Classical Sterile Insect Technique via Irradiation

... but hasn't worked well with mosquitoes



## Bidirectional Incompatibility



INFECTIOUS DISEASES

## Australia to Test 'Mosquito Vaccine' Against Human Disease

10 DECEMBER 2010 VOL 330 SCIENCE [www.sciencemag.org](http://www.sciencemag.org)

## Wolbachia-based Strategies



- Population Replacement
  - Release of *Wolbachia* infected **females**
  - Goal: **NOT intended as a pesticide**; no reduction of the *Ae. aegypti* population
  - Goal: **infect local populations** of mosquitoes with *Wolbachia*, which is intended to interfere with virus transmission
- Wolbachia Suppression
  - Release of *Wolbachia* infected **males**
  - Goal: **reduce mosquito densities** with sterile male releases (similar to insecticides)
    - *Aedes albopictus*
    - *Aedes aegypti*

## Wolbachia-based Strategies



- Population Replacement
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**Self-sustaining**   **Potential virus selection**   **Zika? other viruses?**  
**Interference: Fitness Costs**
- Wolbachia Suppression
  - Release of *Wolbachia* infected **males**
  - Goal: **reduce mosquito densities** with sterile male releases (similar to insecticides)
 

**Not self-sustaining**   **Successful examples of SIT**  
**(unless achieve elimination)**
  - *Aedes albopictus*
  - *Aedes aegypti*

**Wolbachia does not negatively effect male fitness**

## Regulatory Consideration – Wolbachia Microbial Pesticide



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### Biopesticides and Pollution Prevention Division Contacts

Biopesticides and Pollution Prevention Division (BPPD) is responsible for all [regulatory activities associated with biologically-based pesticides](#). BPPD activities also include work to reduce pesticide risks by promoting [integrated pest management](#) and coordinating the [Pesticide Environmental Stewardship Program](#) and [Strategic Agricultural Initiative](#).

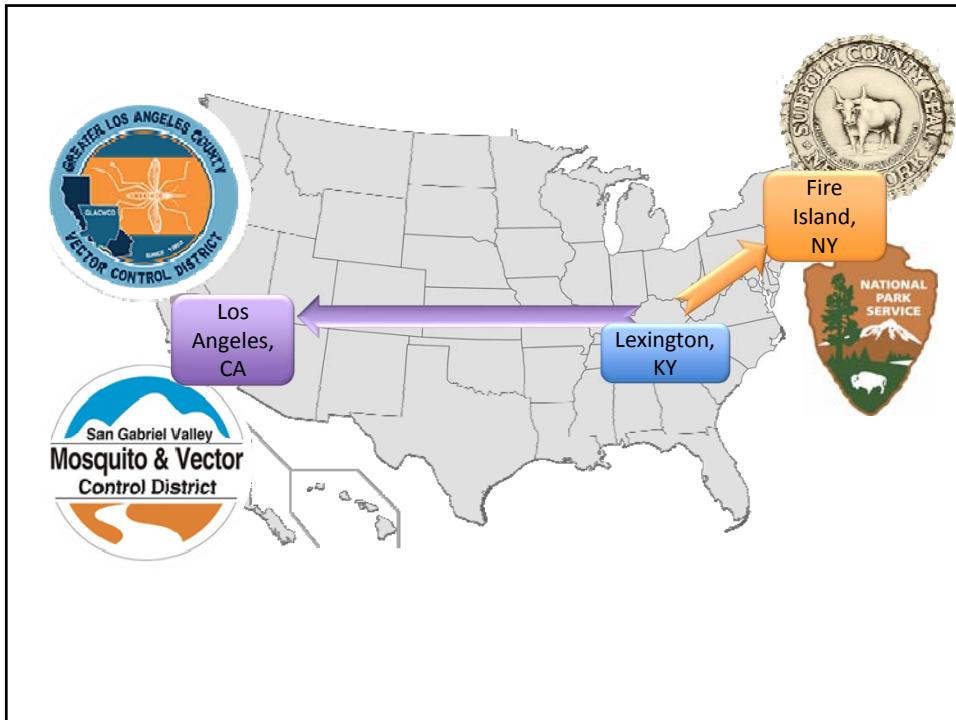
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Keith Matthews	matthews.keith@epa.gov	703-308-8712	Director
Mike McDavid	mcdavit.michael@epa.gov	703-305-7761	Associate Division Director

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<http://www.epa.gov/oppbppd1/biopesticides>

6



## BRAZIL TO STERILIZE ZIKA MOSQUITOES WITH RADIATION

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**HEALTH**

### BRAZIL MAY ZAP MOSQUITOES WITH GAMMA RAYS TO COMBAT ZIKA

RADIATION WILL CREATE A GENERATION OF STERILE MOSQUITOES

By Claire Maldarelli | Posted February 23, 2016

*by JI*

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**CNN Home**

### Stopping Zika: Mass sterilization of male mosquitoes

by Sandee LaMotte, CNN  
Updated 1939 GMT (0339 HKT) March 7, 2016

[EMAIL](#) [F](#) [T](#)



**Story highlights**

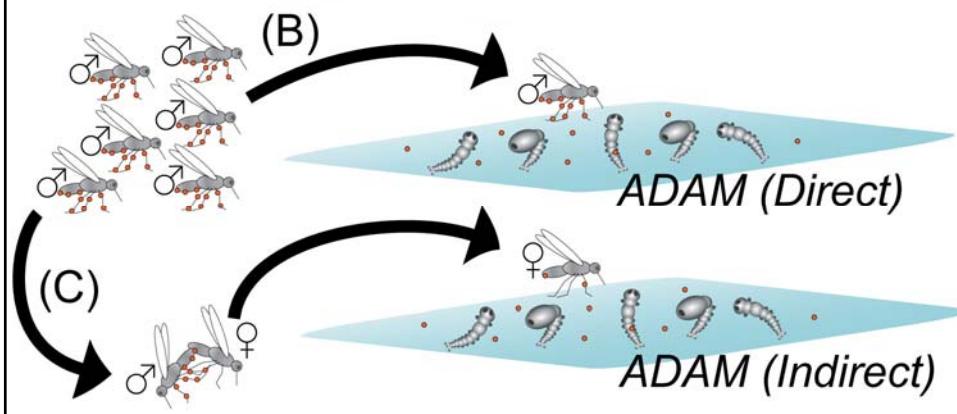
Billions of sterilized male mosquitoes are needed to stop population growth

Screwworms, Medflies and tsetse flies have been successfully controlled in the past

Many questions remain about how well the radiation technique will work with mosquitoes

**(CNN)**—The International Atomic Energy Agency recently announced a plan to help Brazil and other countries hard hit by the Zika virus produce "gamma-irradiated" male mosquitoes for mass release in those countries. Within the next few months, the agency says, it will send a cobalt-60 gamma cell irradiator to Brazil's Moscamed research center.

## Auto-Dissemination by Autocidal Males (ADAM) Hormone Treatment



- Effects conspecifics in the same breeding sites
- Interspecific and Intraspecific effect

