

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)

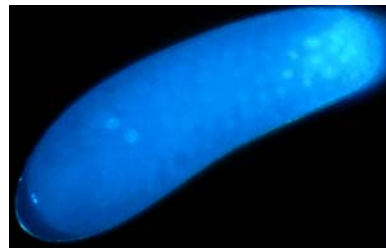
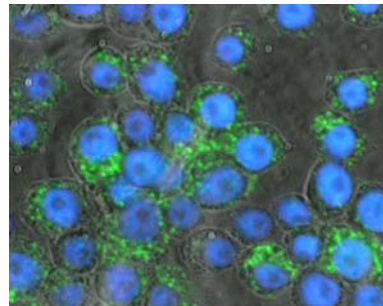
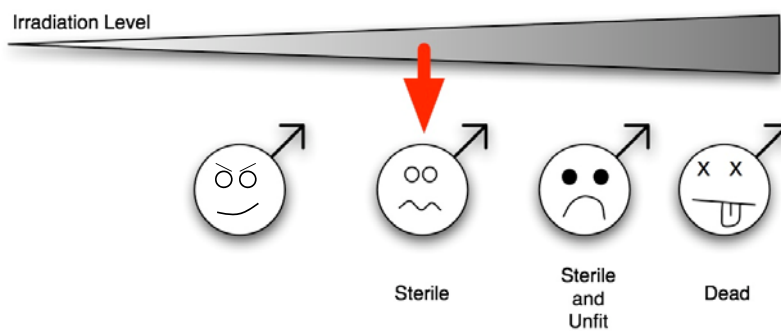


- Screw Worm Fly
- Mediteranean Fruit Fly
- Pink Boll Worm

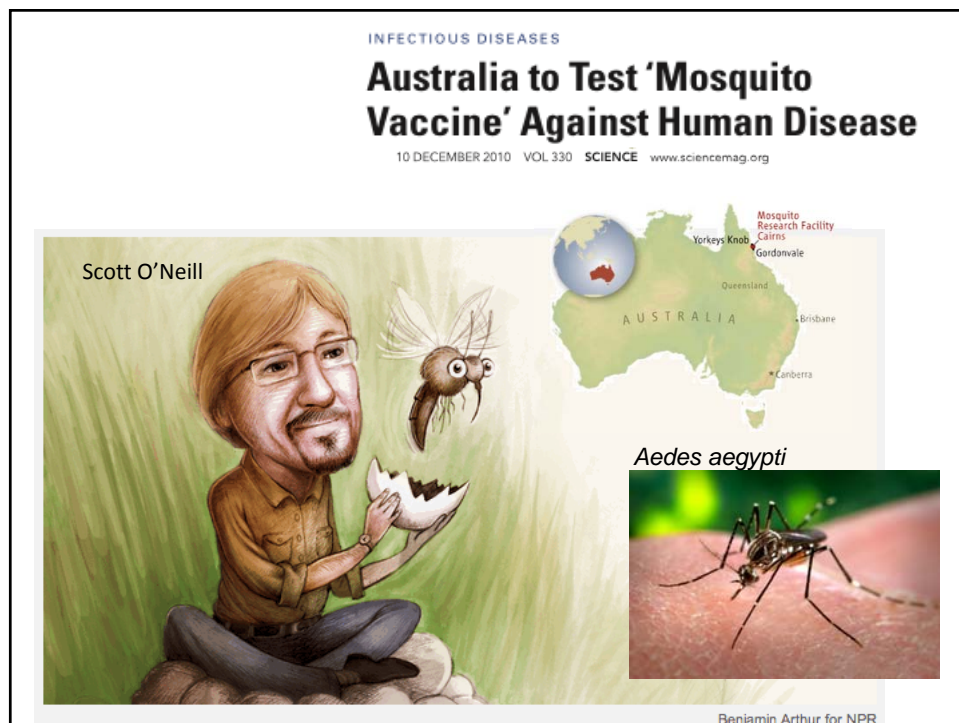
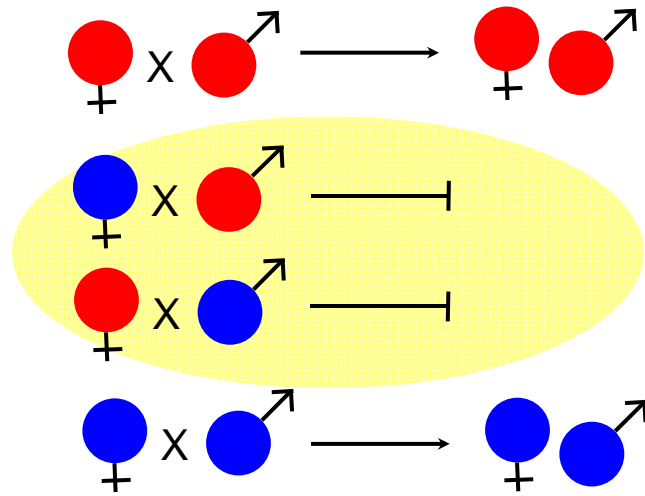


## Classical **Sterile Insect Technique** via Irradiation

... but hasn't worked well with mosquitoes



## Bidirectional Incompatibility



## 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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  - 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
    - 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)**
    - Wolbachia does not negatively effect male fitness**
  - *Aedes albopictus*
  - *Aedes aegypti*



## Regulatory Consideration – Wolbachia Microbial Pesticide



U.S. ENVIRONMENTAL PROTECTION AGENCY

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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](#).

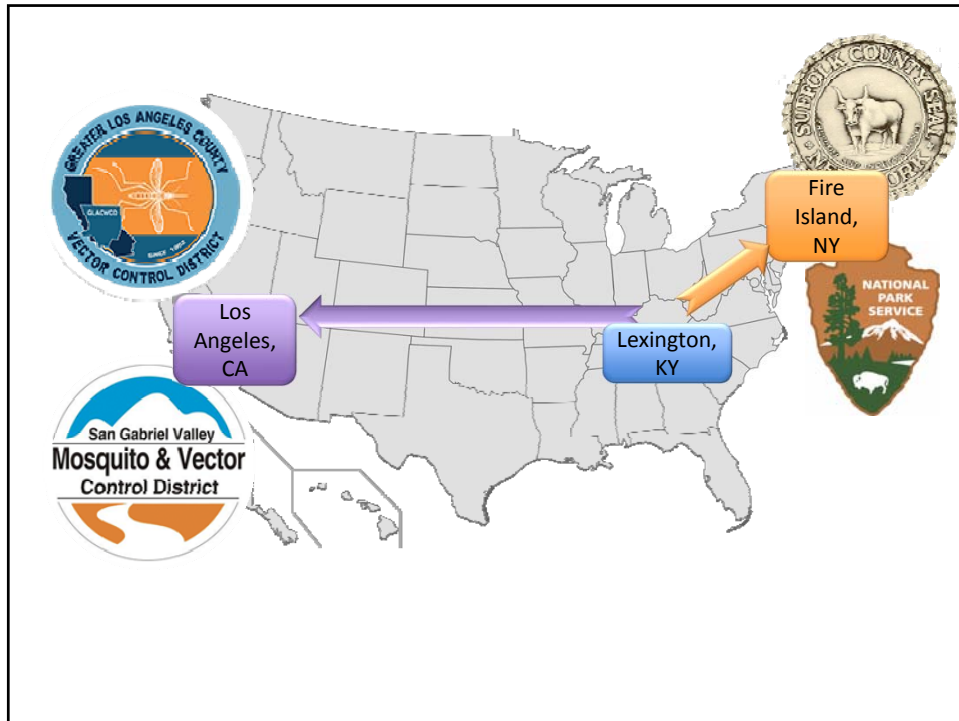
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**Questions/Comments?**

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





## 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




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## Stopping Zika: Mass sterilization of male mosquitoes

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



**Story highlights**

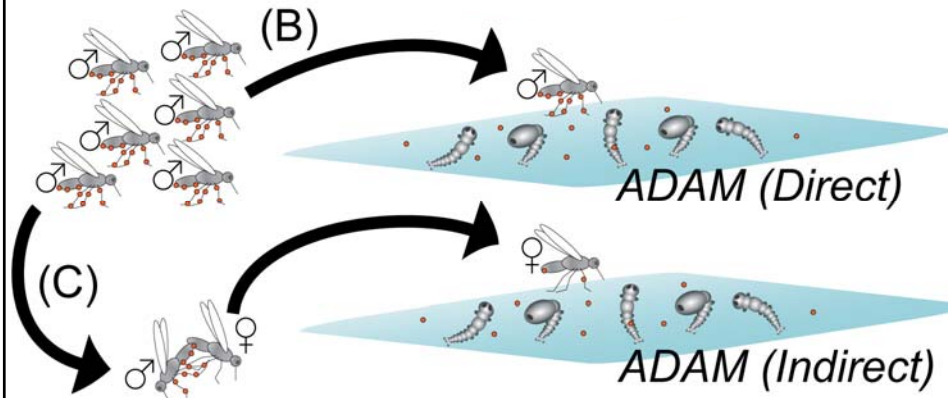
- Billions of sterilized male mosquitoes are needed to stop population growth
- Screwworms, Medflies and tsetse flies have been successfully controlled in the past
- Many questions remain about how well the radiation technique will work with mosquitoes

**Editor's Note:** This is the second in a four-part series about efforts to stop the spread of Zika virus through the use of modified and engineered mosquitoes. [See all places here.](#)

**(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" sterile 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

