Non-Transgenic Replacement and Suppression of Vector Mosquitoes

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

Maceió, Brazil
Classical **Sterile Insect Technique** via Irradiation ... several success stories in agriculture.

- Screw Worm Fly
- Mediterranean Fruit Fly
- Pink Boll Worm
Classical **Sterile Insect Technique** via Irradiation

... but hasn’t worked well with mosquitoes
Bidirectional Incompatibility

[A diagram showing the reproductive incompatibility between Aedes aegypti males and females]

Australia to Test 'Mosquito Vaccine' Against Human Disease

[An article from Science magazine discussing the testing of a mosquito vaccine in Australia]
**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)
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    - *Aedes aegypti*

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    - *Aedes albopictus* **Not self-sustaining**
    - *Aedes aegypti* **Successful examples of SIT**

  **Self-sustaining**
  - Potential virus selection
  - **Zika? other viruses?**
  - **Interference: Fitness Costs**

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

  **Wolbachia does not negatively effect male fitness**
Regulatory Consideration – Wolbachia Microbial Pesticide

http://www.epa.gov/oppbppd1/biopesticides
BRAZIL TO STERILIZE ZIKA MOSQUITOES WITH RADIATION

HEALTH

BRAZIL MAY ZAP MOSQUITOES WITH GAMMA RAYS TO COMBAT ZIKA

Radiation will create a generation of sterile mosquitoes

By Claire Malzard - Posted February 23, 2016

Stopping Zika: Mass sterilization of male mosquitoes

By Sandee LaMotte, CNN

(CNN) - The international Atomic Energy Agency recently announced a plan to help Brazil and other countries hardest hit by the Zika virus produce "gamma-irradiated" mosquitoes for mass release in those countries. Within next few months, the agency says, it will send a cocoon gamma cell irradiator to Brazil's Moscamed research institute.
Auto-Dissemination by Autocidal Males (ADAM)
Hormone Treatment

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

![Map showing the distribution of Aedes aegypti and Aedes albopictus in the United States, with Clovis, CA and Lexington, KY highlighted.](map.png)