Targeting Mosquito Vectors to Curb Disease Transmission in The Pacific

Dr. Hervé Bossin PhD - MBA
ILM - Medical Entomology Laboratory
PSI – 02 March 2009
Polynésie française
Dengue and Filariasis

- Major Public Health Issues
Dengue

- *Aedes aegypti*
- More frequent outbreaks
  - 2001
  - 2006-2007
  - 2009 - DEN4 alert
Dengue

- No vaccine
- No specific drug treatment
- Clinical tests underway
- No commercialization expected before 5 to 7 years
Filariasis

- Mass-drug administration (MDA) strategy
- PacElf (WHO)
- Limited impact in areas where *Aedes polynesiensis* is the vector
Why is MDA insufficient after >8-years of treatment?

- Lack of adequate treatment observance?

- Characteristics of *Aedes polynesiensis* vector
  - Mode of disease transmission
  - Variety of breeding sites
  - Lack of efficient control methods
Limited efficacy of conventional vector control methods

- Limited efficacy against *Aedes*
- Short-term
- No long-term sustainability

- Thesis K. Laille, 1997
Increasing interest in sustainable vector control strategies

- Medical Entomology Workshops
An MDA strategy integrating vector control to eliminate and prevent LF resurgence
International collaborators
Toward an integrated strategy for filariasis elimination
Toward an integrated strategy for filariasis elimination
Biological control

Wolbachia cytoplasmic incompatibility
Incompatible Insect Technique

Colonisation
  ↓
Mass production
  ↓
Selection of males
  ↓
Sterilization
  ↓
Male inundative release - Monitoring

= Reduction of pest population
Incompatibilité bidirectionnelle

Souche sauvage

Souche IC

Lâchers sur le terrain
**Incompatible male mosquitoes**

- Do not blood feed
- Do not bite
- Do not transmit diseases
- Do not establish in the field

- *Wolbachia strain naturally present in French Polynesia*
Toward an integrated strategy for filariasis elimination
Ae polynesiensis breeds in crab burrows
Insecticide-laiced crab baits
Ae polynesiensis breeding in crab burrows
Toward an integrated strategy for filariasis elimination

**Human Population**

- Mass-Drug Administration (MDA)
- Filaria Control
  - Lymphatic Filaria (LoF)
  - Biology of the disease

**Mosquito Population**

- Vector Control
  - Bio-Ecology of the vector
- Elimination
  - Biological Control (*Wolbachia* CI)
    - Crab baits
    - Treated targets
    - Replacement
(Biodegradable) Lethal Ovitraps
Lethal Targets treated with insecticide
Field sites – Raiatea
Field Evaluation – Validation
Population Elimination
Integrated Vector Control
Strategy implementation at the local ... and regional level

Strategic action plan
Anticipated benefits

• Addresses Public Health challenges in French Polynesia and globally
• Toward an integrated sustainable vector/disease management
• Environmentally safe
• Possible technology transfer in other regions and against other mosquito species
Acknowledgements

Pr. S. DOBSON and his team - University of Kentucky
Pr. R. RUSSELL - University of Sydney
Dr. S. RITCHIE - James COOK University
Dr. S. SINKINS - University of Oxford
Dr. N. DAVIES - Berkeley Research Station, Moorea