MOSQUITO OVI-TRAP PROJECT

A Sustainable Community-Based Solution Toward Malaria Reduction In Zambia

Project Vision

- To control the 4th Vector of *Anopheles* mosquito management and reduction of malaria transmission in Zambia
- To support and integrate with existing vector control measures in malaria prevention

How Can We Accomplish This?

- Building mosquito larvae traps of a specific design, made of locally sourced materials, deployed throughout the catchment within zonal village house clusters and breeding sites.

Current EH Vector Management Plan in Rural Zambia

- ITN distribution and usage
- Indoor IRS spraying
- Personal/ Environmental Control Factors:
  - Cutting tall grass
  - Filling of potential standing water sites
  - IEC for malaria control within the community

Project Overview

- OVI-Trap Project addresses 2 of the 4 Vectors of Malaria Management
  - Larval Control
  - IEC: Information, Education, and Communication

Project Sites

- Initial deployment to take place at two sites
  - 1) Mutiti: primary site (pop. Approx 9,500)
  - 2) Chisunka: secondary site (pop. Approx 4,200)
- Intent to spread to additional catchments
  - throughout Luapula Province
  - within greater Zambia

Our Team

Mutiti RHC Project Team:

- **Project Head** - Antoine Katowa, *EHT Mutiti RHC*
- **Lead Project Coordinator** - Nathan Cutlan, *Peace Corps Community Health, Mutiti RHC*

Chisunka RHC Project Team:

- **Project Lead -** Edwin Kabwe, *EHT Chisunka RHC*
- **Lead Project Data & Adherence -**Tyler Snow, *Peace Corps Community Health, Chisunka RHC*

Additional Team Consultants:

- **Digital Mapping Coordinator** - Ashley Riley, *Peace Corps Community Health*
- **Training and Curriculum Development** - Brooke Cutlan, *Peace Corps Education*

OVI-Trap Design and Construction

- Discarded automotive tires
- Bent steel rod, for hanging brackets
- Flexible 2.5 cm hose cut at 15cm for drain
- Attractant-laced water and paper "laying sheets"
- Screw cap from discarded soda bottles for drain plug

OVI-Trap Interior

- **Water**
- **Attractant**
  - ✓ Milk solution
  - ✓ Cedrol solution
  - ✓ Pheromone solution
  - ✓ Cheese solution
- **Paper sheets for gravid Anopheles egg deposit**

Anopheles Oviposition

Gravid anopheles need:

✓Water for egg growth
✓A floating substrate upon Which to lay eggs
✓A degree of protection from environmental extremes

+-200 eggs per mosquito

- Each female deposits a pheromone marker, a signal to other gravid mosquitoes of suitable breeding position

- The more eggs laid, the more attractive the trap

Project Deployment Plan

- Three point process following the research of **Ulibarri, Betanzos, and Rojas** (2016):
  - Effective education of designated community health workers to act solely as zonal "ZMAT" Malaria Agents, in the daily maintenance and function of the traps.
  - Procurement of materials for trap construction, deployment, and maintenance
  - Engagement and education of the community to promote participation in the program.

Project Deployment Plan

- Utilizing research on attractants isolated to the anopheles genus, determine effective baiting solution to lure gravid females to lay in the traps vs. other environmental breeding sites.

Attractants

- Determine through controlled deployment, effective attractant to yield greatest egg numbers per trap
  - Water (control)
  - Limburger cheese (Knols et al, 1997. 2015)
  - Milk-based solution (Hawaria, et al. 2015)
  - Cedrol (Cedar oil) solution (Varela, et al. 2015)

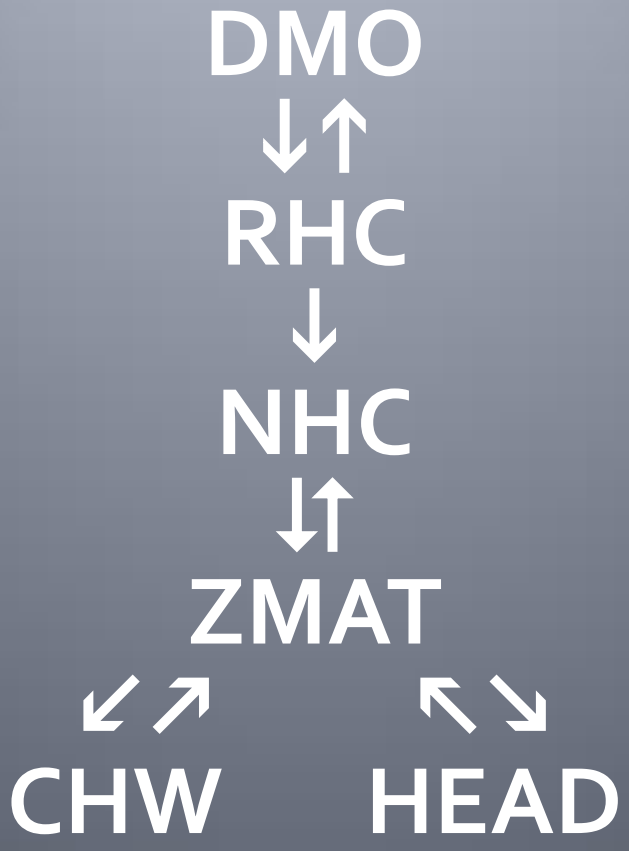
Determining Attractant Success

- To determine appropriate attractant, four traps will be deployed in March 2017 in close proximity to each other at Mutiti RHC and at Chisunka RHC
  - Control (water), milk based, cedrol, and cheese
  - Daily monitoring and visual analysis of recovered laying sheets via 100x field microscope
  - Over 1 month period, determine most effective attractant for mass deployment

Implementation Specifics:

- Training:
  - 1-2 team member in each zone (ZMAT) to maintain traps
  - Ongoing support and monthly meetings with project team members
- District Involvement:
  - Possible procurement of materials: tires, fuel, consistent supply of malaria RDT.
  - Ongoing and mutual communication (updates, meetings, etc.)

Chain of Communication



Implementation Timeline

Jan-Feb 2017
- Procure needed materials

Mar-Apr 2017
- Build 80 OVI traps
- Train ZMAT Members

May-June 2017
- Deploy and test traps at both sites

July-Sept 2017
- Train, assess ZMAT Members
- Trap usage begins

Oct-Apr 2018
- Malaria Season
- Trap maintenance and continued data collection

May-June 2018
- Data review
- Next steps (transition team, etc.)

Current Funding

- The initial phase of the Ovi-Trap project is currently funded through a Small Project grant from World Connect (K7,200)
  - This will carry us through the initial phase in Mutiti and Chisunka
  - However, we are seeking future funding to expand if data shows success.

Project Expansion

- In order for the OVI-Trap project to expand, based on a successful trial at both sites, future needs would include:
  - Trap construction materials (donation or purchase)
  - Continued funding for training and maintenance
  - Future leadership and catchment expansion
  - Continued district approval and support

OVI-Trap Added Benefits

- Utilizes and repurposes available local materials (tires, soda tops, old hose, etc.)
- Employs local workers
  - metalsmiths, other laborers
- Involves community health workers by providing them with additional training, knowledge, and responsibility
- Provides a low-resource, chemical-free method of vector control to reduce malaria

Research

- **Braack, Hunt, Koeckmoer (2015)** Biting behaviour of African malaria vectors: 1. where do the main vector species bite on the human body? *Parasites and Vectors* 8:76
- **Hawaria, Santiago, Yewhawlaw (2015)** Efficient attractants and simple odor baited sticky trap for surveillance of Anopheles arabensis in Ethiopia. *The journal of Infection in Developing Countries* 10(1) 82-89
- **Knols, Van Loon, et al. (1997)** Behavioural and electrophysical responses of the female malaria mosquito Anopheles Gambiae (Diptera: Cullicideae to Limburger cheese volatiles) *Bulletin of Entomological Research* 87, 151-159
- **Onyabe, Conn (2001)** The distibution of two malaria vectors, Anopheles Gambiae and And Anopheles arabiensis, in Nigeria. *Men Inst. Oswaldo Cruz, Rio De Janiero* 96: 1081-1084
- **Ulibarri, Betanzos, Rojas (2016)** Control of *Aedes Egypti* , A prospective evaluation of integrated web-based Health Worker training, low-cost Ovillantas, and community engagement In a remote Guatemalan community vulnerable to Dengue, Chickungunya, and Zika Virus. *F1000 Research* 5:598
- **Varela, Karlson, Torto (2015)** Discovery of an oviposition attractant for gravid malaria vectors of the Anopheles Gambiae species complex. *Malaria Journa*l 14:119