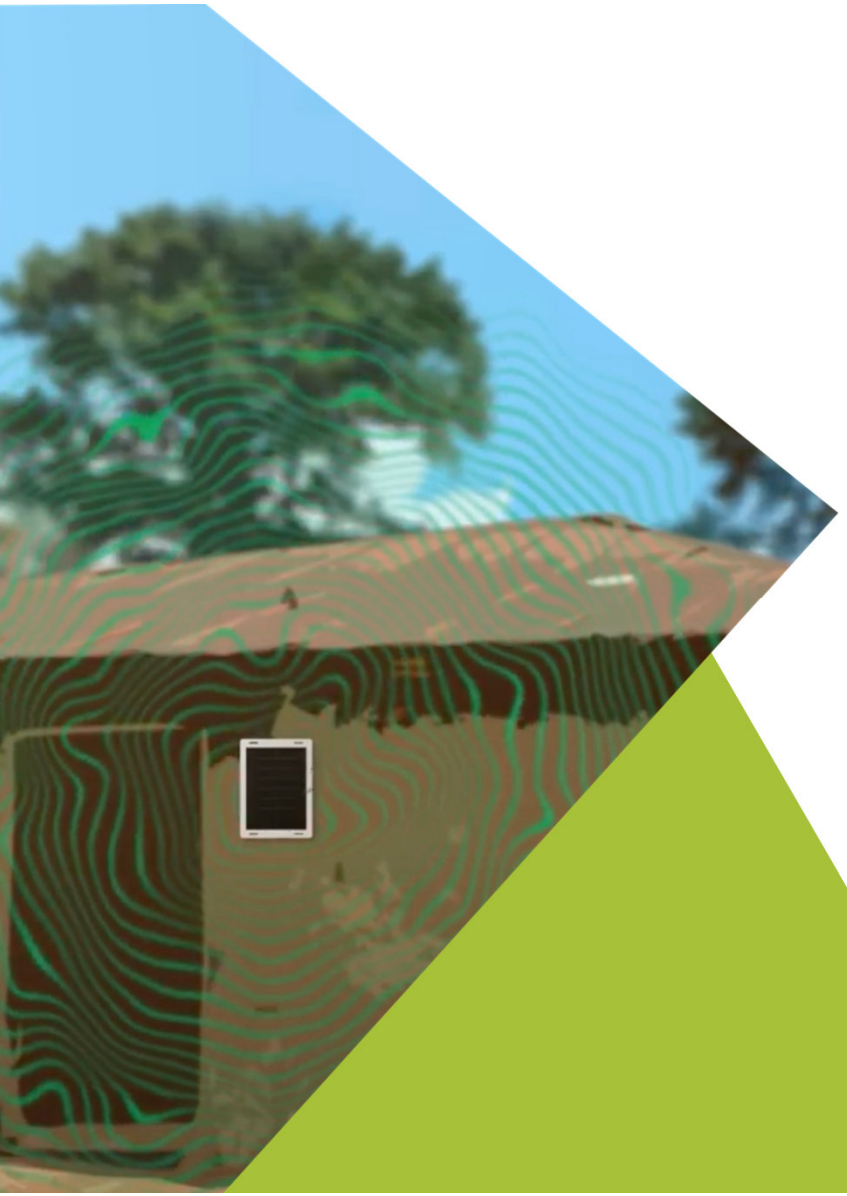
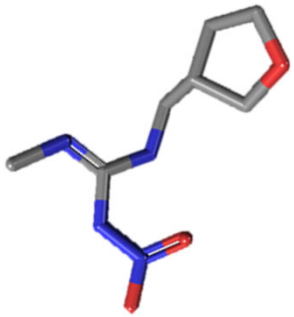
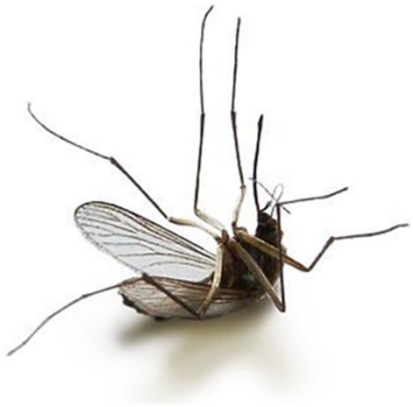


ATSB®

(Attractive Targeted Sugar Bait)

By Westham CO.





Agenda

- Introduction of ATSB®
- Methodology & Application
- Status
- Next Steps
- Q&A (commonly asked questions)
- Take home messages

ATSB® Introduction

- ATSB® is a new vector control product class developed by Westham, based on Prof. Schlein & Dr. Muller experiments, to control outdoor malaria transmission in a peri-domestic environment
- ATSB® product development started over a decade ago and included the method, application, deployment and overall operation
- In 2016 and 2017, large-scale proof-of-concept field studies were conducted in Mali, which demonstrated a significant impact on mosquito density and survival
- Following the support from the Bill & Melinda Gates Foundation, our focus is on vector control in sub-Saharan African countries
- Our objective is to be ready for deployment right after WHO-PQ approval of ATSB® (expected 2025)

The ATSB® Methodology

The ATSB® method is a unique *'Attract & Kill'* approach to eliminate mosquitoes that feed on a bait attractant

- ATSB® is a new product class for mosquito control which exploits mosquito sugar-feeding behavior
- Newly emerged mosquitoes seek and forage on sugar for their immediate energy needs before seeking a blood meal
- Adult mosquitoes take sugar meals every day or two (depending on species)
- Plant-based attractants detected by mosquito sensors signal to mosquitoes that a sugar meal is available. Sugar stimulates feeding

ATSB® Application

Two-dimensional Bait-Station – hang on walls

Two component system:

- Bait formulation: includes the attractants, feeding stimulant, and insecticide
- Bait station: Protects the bait from abiotic conditions and non-target insects while providing access to mosquitoes

ATSB® Application (continue)

Main capabilities of the new method for malaria control

Outdoor vector control method

- Targets exophilic mosquitoes with limited exposure to core vector control methods (IRS, LLINs), and propose to sustain malaria transmission control
- Prolonged outdoor use (6 months) without the need for CO2 generation

Oral delivery of insecticides

- Bypasses resistance mechanisms (penetration through wax/cuticle layer)
- Allows repurposing existing active ingredients with different modes of action for vector control, lowering probability for resistance development

Status

- Initiated and supported by IVCC, we conducted a successful proof-of-concept in Mali during 2016-2017
- Since then, Westham has optimized the product design and manufacturing
  - An assembly line for 3,000 stations/day operated at our site
  - Over 350,000 stations produced and shipped to Mali, Zambia and Kenya for product evaluation
- Entomological trials, supported by IVCC, were completed (next slide)
- IVCC already started epidemiological trials in Mali, Zambia and Kenya
- WHO-PQ regulatory and policy process is on track as we are waiting for public health value demonstration (Epi trial results)

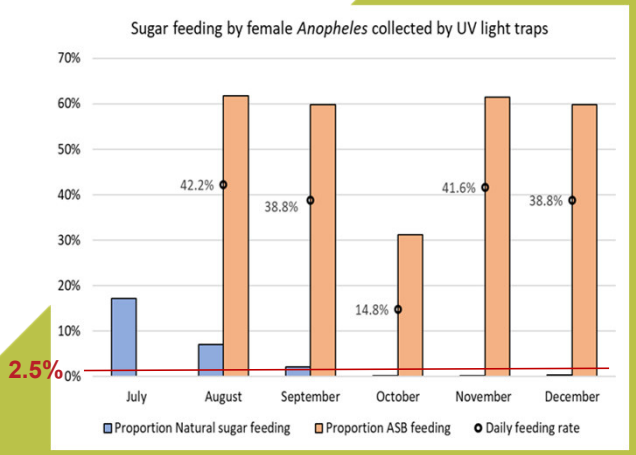
Field Feeding/ASB Trials

- Studies in Zambia, Kenya and Mali using ASBs (without dinotefuran) to determine level of feeding on baits by wild anophelines in the different locations.
- Daily feeding rate exceeds the 2.5% threshold that corresponds to 30% reduction in malaria incidence.

In Mali

Daily feeding rate in *An. gambiae s.l.* from 14.8% - 42.2%. Based on one cluster 'look and see' study.

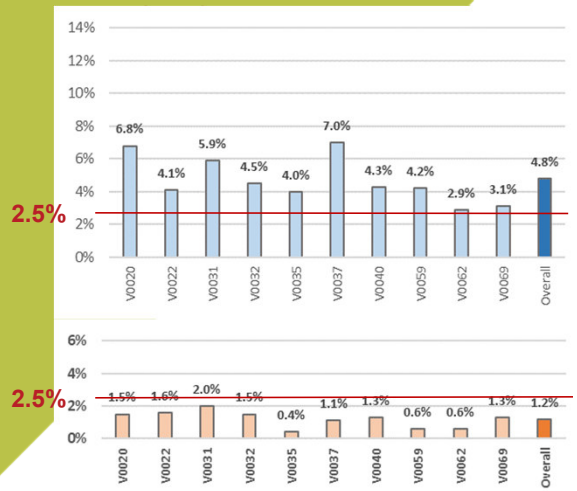
It was already identified that 2 bait stations per structure was enough



In Kenya

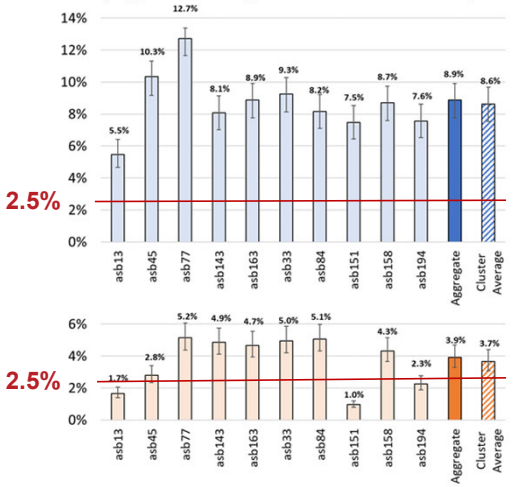
Overall daily feeding rate of 4.8% for *An. funestus* (dominant vector) and 1.2% for *An. gambiae.*

No difference between 2 or 3 baits



In Zambia

Overall daily feeding rate of 8.9% for *An. funestus* (dominant vector) and 3.9% for *An. gambiae.* *No difference between 2 or 3 baits*



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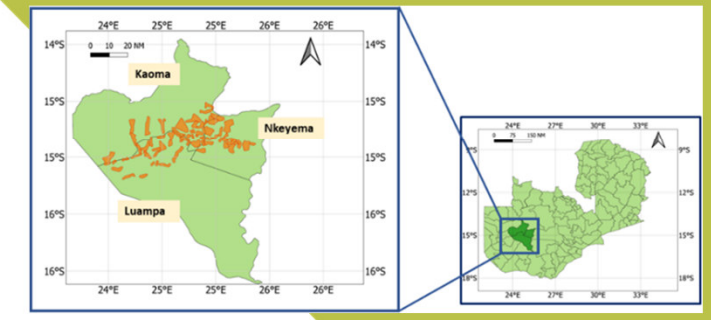
Epidemiology study in progress since November 2021 in Zambia



Deployment in 70 clusters
35 per arm,
40,000 bait stations

Cohort study
2,450 Children age 1-14
2 x 6 month seasonal cohorts
1 x interim analyses

Entomological monitoring
20 clusters
8 months

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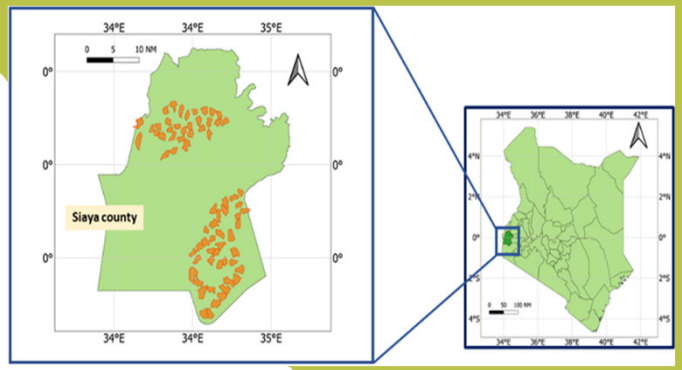
Epi Trials in Kenya & Mali

Kenya

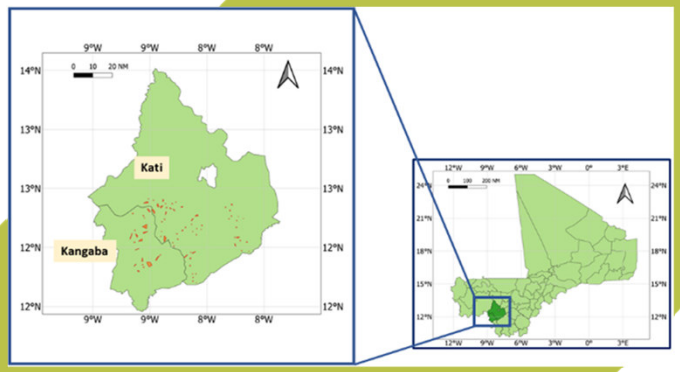


Deployment in 70 clusters
35 per arm,
80,000 bait stations

Cohort study
Children age 1-14
4 x 6 month cohorts
2 x interim analyses

Entomological monitoring
16 clusters
12 months

Mali



Deployment in 76 clusters
38 per arm,
52,000 bait stations

Cohort study
Children age 5-14
2 x 8 month cohorts
1 x interim analyses

Entomological monitoring
30 clusters
24 months

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Next Steps

- In order to be ready for deployment, we plan to initiate an access plan which includes the following:

    1. NMCP engagement to establish local requirements
    2. Understanding WHO policy, PQ listing and national regulatory requirements
    3. Collaborative engagement with international donors
    4. Broad stakeholder engagement to anticipate potential challenges and define deployment strategy
    5. Production & scale up

- We expect to demonstrate ATSB® public health value by 2024 and secure WHO-PQ listing in 2025

Q & A – commonly asked questions

Pollinators (bees)
Bees are not attracted and cannot access the bait

Risk for children and pets
The low-risk active ingredient presents very low risk for human and pets. Bittrex, a powerful deterrent agent added to the bait

Environmental effect of the stations
The bait-stations contain a very low dose of active ingredient behind the membrane and no toxin spreads to the environment

Deployment method
Two stations per structure hang on the wall (1.8m high)

Personal protection
This method aims at community protection (vs. personal protection)

Take Home Messages

- ATSB® is the first in Class Vector Control Intervention for outdoor use and is expected to address the gaps of existing indoor interventions
- Modelling suggests that even a modest daily feeding/kill rate of 2-3% would translate in a substantial decrease in transmission of malaria burden
- We are in the process of engaging with NMCPs to be ready for access and scale up in 2025
- We are looking for broad stakeholder engagement to anticipate potential challenges and define deployment strategy for optimal impact
- **We are still in the process of learning about the challenges and the potential of this new intervention**

Thank you

Non-Target Observations (honeybees) on ATSBs

- Weekly timed (2 minute) observations on ATSBs at field stations in Kenya, Mali and Zambia for over 6 months.
  0 honeybees in >100 hours of observations
- Trail cameras observing ATSBs with photographs taken every 5 mins from dawn to dusk in Kenya, Mali and Zambia.
  0 honeybees in 151,476 captured images

- Two wild colonies of *Apis mellifera* are present at the field station in Zambia where ATSBs have been hung for over six months.
- The colonies are <120m from the ATSBs and remain active.

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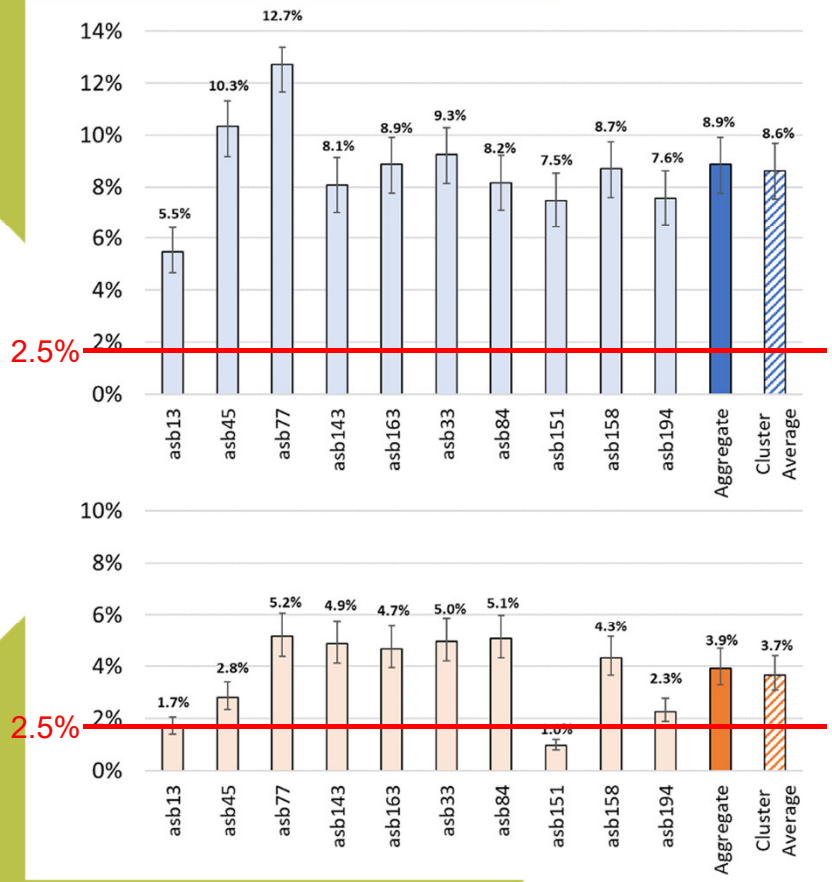
Key outcomes of full Zambia ASB trial (1)



Overall daily feeding rate of 8.9% (cluster mean 8.6%) for *An. funestus.*

All clusters met the 2.5% daily feeding rate threshold.

Substantial variability by cluster ranging from 5.5%-12.7%

40,949 samples tested

Overall daily feeding rate of 3.9% (cluster mean 3.7%) for *An. gambiae.*

7/10 clusters met the 2.5% daily feeding rate threshold.

Substantial variability by cluster ranging from 1.0% - 5.2%

1,906 samples tested