



**Attractive toxic sugar baits (ATSB):  
From Basic Science to Product -  
a new paradigm for vector control.**

**Günter C. Müller<sup>1</sup> and Amir Galili<sup>2</sup>**

1: Hebrew University, Hadassah Medical School, Kuvim Center, Jerusalem, ISRAEL

2: Westham Innovations Ltd., Tel Aviv, ISRAEL

## The Basics:



Both male and female mosquitoes require for survival regular feeding on plant sugars.

Common sources in nature are plant tissue, honeydew, floral and extra floral nectar.

Mosquitoes have clear preferences and are finding suitable sugar sources not by chance, they are guided by chemical attractants.

*Sugar itself is not volatile and is not attractive from a distance, it is a feeding stimulant only.*

These simple facts are the basis for Attractive Toxic Sugar Baits (ATSB).



## The Concept:



*“using a mosquito’s own drive for daily sugar meals against itself”*

Once attracted mosquitoes feed and are exposed to a low level dose of insecticide within the bait.

**but**

ATSB competes in the field directly with natural sugar sources, accordingly the

*quality of the Attractant is crucial.*

***A Bait and a Trap are not the same***

## The Beginning

In early trials we applied **non-attractive** toxic sugar baits on highly attractive flowers (using their scent) to attract mosquitoes towards the bait.



though this approach can be used to control efficiently mosquitoes  
major problems are

- the lack of suitable flowering vegetation
- a devastating impact on non-target insects, especially pollinators

## Consecutive Developments: The Bait

We identified highly attractive fruits and flowers, prepared extracts of the same, mixed them with sugar baits and came up with the first generation of **Attractive Toxic Sugar Baits (ATSB)**.



These simple baits could be applied on non-flowering, green vegetation.

## Consecutive Developments: Bait Stations

In numerous trials we tested and refined the design of suitable bait stations to control mosquitoes in areas without suitable vegetation to spray and for indoor use.



A major breakthrough is a recently developed high tech protective membrane covering the bait.

Without this technology long lasting mosquito bait stations are not viable.

## **But though the concept is simple it was a long way to develop viable commercial products**

The early crude “home-made” baits were attractive and effective for mosquito and sand fly control but the ingredients were not suitable for a stable commercial product.

At the same time for areas without suitable vegetation different types of bait stations needed to be developed and field tested.

Early Bait Station Designs were not able to protect the baits for long periods from dust and rain, were misused, or were simply too expensive.

## The commercial product is addressing those points



- **Readily available ingredients for production**

The main ingredients of the Westham baits are date extracts and sugar, both ingredients are available in unlimited quantities.

- **Production in industrial scale**

The baits can be produced within existing facilities of the food industry.

- **Long shelf life of a packed product**

The shelf life of the bait is > 3 years, there are no special requirements for storage.

- **Long attraction distance**

Though unprocessed ingredients are barely attracting mosquitoes the commercial bait attracts mosquitoes from distances up to 8m.

- **Easy application in different environments**

The bait can be sprayed with back pack sprayers, vehicle mounted units or applied in different types of bait stations.

- **Stability of the bait under severe environmental conditions**

On vegetation the bait is stable up to 2 months, in bait stations > 6 months. ***On bait stations the surface of the bait is protected by a membrane.***

- **Possible combination with a variety of pesticides**

Numerous pesticides (including several reduced-risk pesticides, even some food compounds) in sugar baits effectively kill mosquitoes. It appears that biting flies have no receptors to “taste” pesticides in the bait.

*ATSB is a new platform to use numerous unconventional gut toxins as an alternative to the traditional contact pesticides with their known resistance issues.*

- **Minimum impact on non target organisms**

Pollinating insects are barely attracted to ATSB if presented in suitable bait stations or if sprayed on green, non flowering vegetation. ***On bait stations additionally the surface of the bait is protected by a membrane.***

- **Intellectual Property (IP)**

There are 3 layers of patents including an application patent on the method, a patent on the bait formulation, and an application patent regarding the membrane.

Additional undisclosed key steps regarding preservation and production make it difficult to copy the product.

- **Active Ingredients & Registration**

Established relation with *Mitsui Chemicals* a large company and IP holder of key pesticides.

## Different products for different needs

### Consumer products for developed countries:

nuisance species especially *Aedes* and *Culex*

- Efficacy 4-6 weeks
- EPA exempt Active Ingredients

### Vector control in Africa:

vector species mainly *Anopheles*

- Efficacy > 6 months
- Registered Pesticide



## How effective is ATSB in controlling Anophelines?

In several short trials in Mali with the same type of bait but different application forms (spray and bait stations) *Anopheles gambiae* s.l. were controlled well with up to 90% population reduction.

***Older, potentially malaria infected An. gambiae (> 4 gonotrophic cycles), were almost completely eliminated within the first week of application.***



## Ongoing field trials in South Mali within IVCC and Grand Challenge projects:

### Testing Commercially viable Bait-Stations for *in and out-door* *control of Anopheles* in Africa

Evaluate efficacy of Bait Stations in the Southern Sahel  
a challenging area with:

- Annual precipitation > 1200mm with lush sugar rich environment
- LINN coverage > 90%; level of pyrethroid resistance >80%
- Transmission period > 9months
- Prevalence of Malaria > 40%



## Products for US market



### ***Terminix AllClear Mosquito Solutions***

For Pest Control Companies ***Bait Concentrate***  
(sales 2015 several hundred tons)

For the retail market ready to use products  
in spray cans.

The Active Ingredient (AI): EPA exempt,  
food-grade micro encapsulated essential oils



*A highly effective and environmentally friendly  
product for control of Aedes and Culex in urban  
environment.*

Tested in numerous trials in several countries,  
results published in scientific journals

## Products for US market



A new product is especially targeting container-breeding *Aedes*. The formulation is combining the ATSB approach of attracting and killing the adults with larvicidal properties.

The Active Ingredients are EPA exempt, food grade, micro encapsulated essential oils which are both adult and larvicidal.

While treating vegetation for adults a few accidental drops in a container are sufficient to control the larvae.

Later rainfalls continue to wash larvicides into containers and small water bodies creating long term effects.



# Products marketed in the USA from 2017



## *Terminix AllClear Mosquito Solutions*

For the retail market ready to use **In & Out-door Bait Stations**

The Active Ingredient: EPA exempt, food-grade micro encapsulated essential oils



*The surface of the bait is protected by a high tech patented membrane.*

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