

INTRODUCTION OF THE AFRO-EUROPEAN MEDICAL AND RESEARCH NETWORK

The Afro-European Medical and Research Network (AEMRN) is a non-governmental and not for profit organisation with a strong vision of helping to improve the quality of life for people living in low-income countries especially Sub-Saharan Africa.

This vision includes AEMRN serving as a network where active professionals from medicine and allied professions can work together to promote the exchange of skills, experiences and expertise for addressing challenging issues such as malaria in hard to reach communities in low-income countries. We also use simple low resolution technology to link communities across countries willing to learn from each other and share their knowledge so that together we can address our challenges and improve the work that we do in these communities.

AEMRN members strive to contribute their knowledge and experience to improve the quality of their work so that the communities they interact with benefit from improved performance irrespective of race, creed, beliefs, faith and social affiliation.

MALARIA BACKGROUND

Malaria caused by a parasite called Plasmodium is transmitted via the bites of infected Anopheles female mosquitoes. In the human body, the parasites multiply in the liver, and then infect red blood cells eventually producing the signs and symptoms of malaria. There are six species of malaria parasites that infect humans, P. ovale, P. vivax, P. malariae, P. falciparum and recently P. knowlesi.

Plasmodium falciparum is the predominant cause of severe malaria accounting for more than 90% of all malaria infections. However, there are occasional occurrences of mixed infections with P. malariae and P. ovale. According to the World Health Organisation (WHO), about 3.3 billion people - half of the world's population - are at risk of malaria leading to about 250 million malaria cases and nearly one million deaths yearly. People living in the poorest countries are the most vulnerable.

Malaria is especially a serious problem in Africa, where one in every five (20%) childhood deaths is due to the effects of the disease. An African child has on average between 1.6 and 5.4 episodes of malaria fever each year and every 30 seconds a child dies from malaria

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A technological leap forward in mankind's fight against mosquitoes, malaria and other mosquito-borne diseases is the development of a new formulation of *Bacillus thurengiensis israeliensis* (Bt) incorporated into a system that delivers pesticides directly to adult mosquitoes. The ProVector™ is the first device capable of killing adult mosquitoes with Bt biopesticide; which is virtually non-toxic according to the U.S. Environmental Protection Agency.

The ProVector™ imitates the look, smell and taste of flowers in order to trick the adult mosquitoes into ingesting the new Bt formulation.



The parts include a plastic flower with color and chemical attractants and a refill disc containing Bt. The wavelengths of the colors are optimized to attract different species of mosquitoes that transmit malaria, dengue virus and other diseases. The center of the flower contains a fine mesh which allows only mosquitoes to feed through, therefore blocking non-target species from eating the bait. One refill disc lasts six months and will kill approximately 10,000 mosquitoes. The ProVector is used indoors to effectively reduce mosquito populations.

Indoor Residual Spraying (IRS) is very effective in the spatial elimination of malaria because it 1) reduces the adult mosquito population and 2) kills them before the malaria parasite can develop in the mosquito. The malaria parasite typically takes 10 to 14 days to develop, depending on temperature. The ProVector Bt shares the same advantages as IRS as it eliminates the adults and in less than 10 days. An advantage the ProVector Bt has that IRS does not, is that it uses a virtually non-toxic biopesticide that is harmless to people and pets. Because the ProVector is targeted towards adult mosquitoes by luring them to feed on the formulation, it is approximately 8,000 times more cost effective than aerial sprayed pesticides such as malathion and does not have harmful environmental effects on non-target species. Insecticide treated bed nets are very effective in reducing the mosquito species that transmit malaria but are not effective against day biting

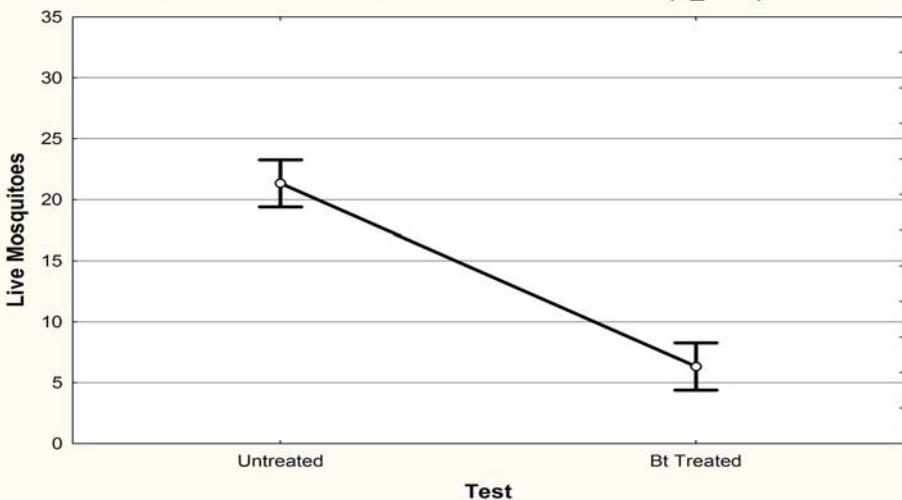
mosquitoes or mosquitoes that transmit malaria during dusk and dawn. While bed nets effectively protect one person at a time while they are sleeping; the ProVector helps the entire household (average of 7 people) 24 hours a day. Integrated vector management should be practiced by cleaning up breeding sites, using IRS and insecticide treated bed nets and ProVector Bt.

LABORATORY TRIALS

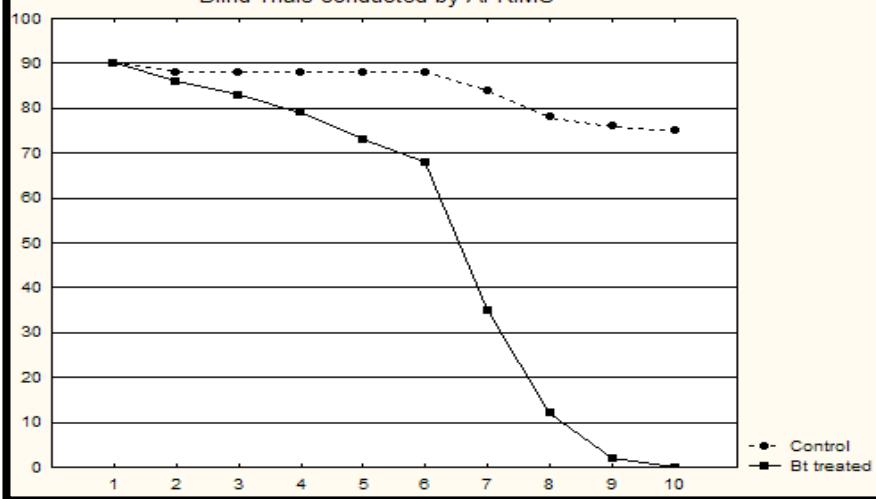
Laboratory trials conducted at the Biodefense and Infectious Disease Laboratory, Georgia Southern University and in blind trials in Thailand by the U.S. Armed Forces Research Institute of Medical Sciences, Walter Reed Army Institute of Research have shown ProVector Bt to effectively kill mosquitoes that transmit malaria and other pathogens (figures below).

ProVector Bt killed adult *Aedes aegypti* rapidly after one feeding and killed *Anopheles dirus*, the principal vector of malaria in SE Asia, before the time period required for the development of the malaria parasite.

Figure 1. ProVector Bt - Mosquito Survival After One 24hr Period
Vertical bars denote 0.95 confidence intervals ($P \leq 0.05$)

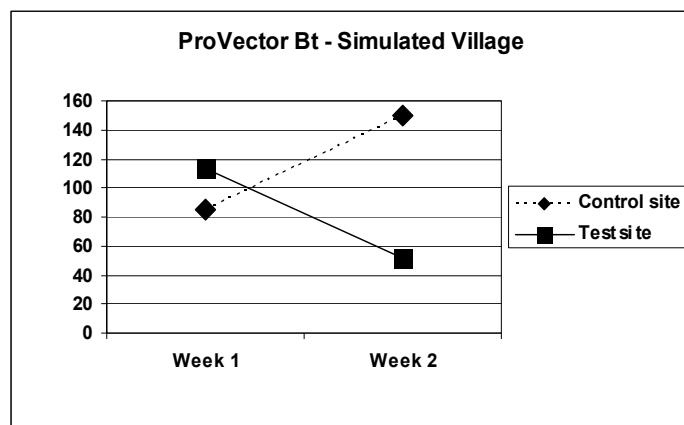


ProVector Bt - *Anopheles dirus* survival after 10 days
Blind Trials conducted by AFRIMS



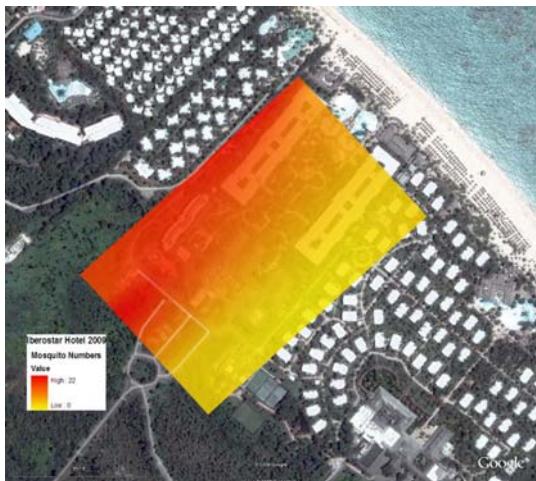
FIELD and COMMUNITY TRIALS

ProVector Bt effectively reduced the mosquito population in a simulated village (photo below) in a wet forested area in southern Georgia, USA (Research conducted by PI). The mosquito population in the control site doubled during the same period (Figure below).

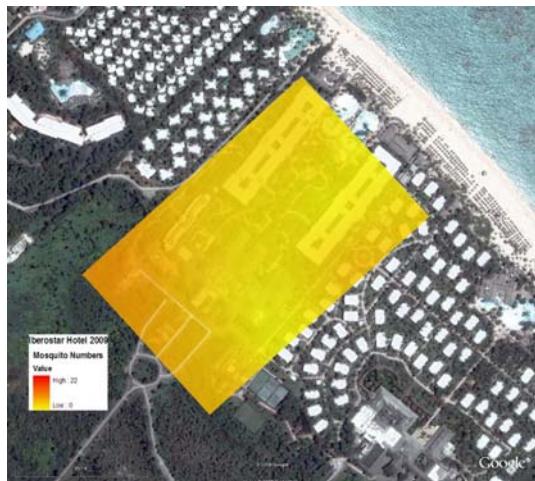


In the Dominican Republic, preliminary results show a substantial reduction of expected mosquito numbers in and around a community in the northeast end of the island. The analysis was performed using Geographic Information Sciences (GIS) with kriging. The one month intense reduction matches the information received by community projects in Africa, including Uganda.

Spatial Pattern of Mosquitoes July, 2009
before ProVector Bt was used.



Spatial Pattern of Mosquitoes August,
2009 after one month of ProVector Bt being
deployed.



Iberostar Hotel 2009
Mosquito Numbers
Value
High : 22
Low : 0

We have been collaborating with a number of organizations to provide the ProVector Bt at the community level since Jun of 2009. With 25 ongoing community projects from around the world, usability surveys have played a critical role in getting feedback from individuals and public health workers in the community. The principle concern relayed to our team has been the necessity of replacing the refills every three months. To address this feedback from workers in the field, we went back to the laboratory and developed a refill that will have an extended field expectancy of six months up from the original three months. Another positive outcome from this reformulation is the 25% cost reduction. We are now implementing a strategy for the spatial elimination of mosquitoes that transmit malaria and other mosquito-borne diseases.

The ProVector Bt is already having a tremendous beneficial impact by eliminating mosquitoes in homes, schools and hospitals in Africa.

Site	Researcher	Organization	< 1 month for control of mosquitoes
Entebbe, Uganda	Dr. L. Mukwaya	Uganda Virus Institute, Ministry of Health	95%
Kisumu, Kenya	Dr. C. Barasa	Kisumu District Hospital	90%
Kibera 1, Kenya	Cl. C. Mwangi	Ushirika Maternity Clinic	100%
Kibera 2, Kenya	Mr. K. Kethambi	Riziki Foundation	100%
Nairobi, Kenya	Rev. J. Kithinji	Tusaidie Watoto Elementary School	100%



50 ProVectors were placed in this Entebbe Community with 95% elimination of mosquitoes within a month

Photo by: Dr. Louis Mukwaya, Uganda Virus Institute, 2009

Women with Infants Receiving Instruction on Assembly and Use of ProVector Bt in Kenya

--only 14% of families have at least one bed net--



Photo by: Argonauta Communications 2009

ProVector Bt is an effective method of eliminating mosquitoes and interrupting malaria transmission

Each ProVector Bt helps an average of 7 people at once, making it very cost effective

It is non-toxic to people and pets and controls mosquitoes indoors: including homes, schools, hospitals, churches, hotels and restaurants

Helps protect family members who:

- Do not have or cannot afford bed nets
- When bed nets are damaged or
- Pesticide is degraded
- During the day and evening when family is not under bed nets
- When indoor residual spraying is not used etc.

Whenever possible the ProVector should be used in conjunction with treated bed nets and indoor residual spraying.

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