Keeping our Customers Mosquito & Disease Free World Wide for over 40 years!

Our line of defense

18-20
High output ULV machine. Most popular ULV aerosol generator in the world.

XKE
Large area coverage ULV. Very simple to operate from truck or trailer.

MAG
Medium area ULV. Indoor and outdoor coverage from ATV or cart.

COLT
Portable ULV for indoor and outdoor application.

LONDON FOGGERS
505 Brimhall Avenue - Long Lake, MN 55356
Tf. 800-448-8525 - P. 952-473-5366 - F. 952-473-5302

www.londonfoggers.com
Mosquito, Vector, Pest, and Odor Control
© Copyright London Foggers 2011. All Rights Reserved
Dengue and Zika Control:
Stop the Spread with Trap-N-Kill® Lethal Ovitraps .................. 5
by Elizabeth Schaafsma, Alyssa Branca, Emilie Bess and Michael Banfield

The BG-Counter: A New Surveillance Trap that Remotely
Measures Mosquito Density in Real-Time ......................... 13
by Catherine Pruszynski

The Invasive Mosquito Project: A Public Education Tool .......... 23
by Ashley Thackrah, Natalia Cernicchiaro and Lee W Cohnstaedt

Benefits and Accomplishments Gained from Outside
Collaborations at Anastasia Mosquito Control District ............ 29
by Rui-De Xue, Ali Fulcher, Jodi Scott, Whitney Qualls and Mike Smith

From Where I Sit: Notes from the AMCA Technical Advisor ...... 37
by Joe Conlon

About the Cover: The original “Lethal Mosquito Breeding Container,” an ovitrap designed by
US Army scientists Michael Perich and Brian Zeichner, and further developed commercially
by SpringStar Inc, was deployed in the Florida Keys in 2010 to collect Aedes aegypti eggs and
adults, after an outbreak of dengue fever. Photo by Brian Zeichner.
The recent outbreak of dengue fever in Hawai‘i and the spread of the Zika virus across Central and South America have once again highlighted the need for effective new weapons in the mosquito control arsenal against the container-inhabiting species *Aedes aegypti* and *Ae albopictus*. Since September 2015, 263 cases of dengue have been confirmed on the Big Island of Hawai‘i; see Figures 1 and 2. Concerned residents are clamoring for something they can do in addition to the vector control programs put in place by the state Department of Health. This problem is not restricted to Hawai‘i, as *Ae aegypti* and * Ae albopictus* are expanding their ranges with the changing climate, and traditional methods of vector control like adulticidal and larvicidal spraying are usually inadequate against these species. Therefore, new tools are needed to fight the spread of dengue, to stop container *Aedes* mosquitoes from feeding and breeding.

Enter the lethal ovitrap. While based on established mosquito monitoring technology, the use of lethal ovitraps in integrated vector control management is brand new. Developed in the 1990s by two US Army scientists, Brian C Zeichner and Michael J Perich, the lethal ovitrap mimics an ideal larval site for *Ae aegypti* and *Ae albopictus*, attracting them for oviposition and killing them with pesticide before any further feeding, thereby preventing those adults from continuing to spread diseases like dengue and chikungunya.

Zeichner and Perich’s original lethal ovitrap, patented in 1999, was constructed of a black plastic cup with a pesticide-treated oviposition paper. The trap attracts gravid mosquitoes with its dark color, standing water source, and added olfactory attractant, and encourages oviposition on the textured paper. Following extensive field
testing of their prototypes, the US Army licensed the technology to Spring-Star, Inc in 2008, for further product development and commercialization.

SpringStar continued to refine and field-test the concept, using evaluations and recommendations to develop the Trap-N-Kill® lethal ovitrap; see Figure 3. The Trap-N-Kill includes a black plastic jar with drain hole, a screw-on lid, and an oviposition strip, and uses a minute amount of slow-release dichlorvos (DDVP) pesticide, making it highly effective against container mosquitoes, but safe for humans, pets and other non-target organisms. The ovitraps complement a conventional vector control program, and should reduce the need for other types of pesticide application, such as the use of interior residual spraying in tropical regions.

By targeting gravid adult container-inhabiting *Aedes* mosquitoes, mass trapping with ovitraps specifically eliminates mosquitoes seeking oviposition sites, a stage in their adult lifespan when CO₂ baits are minimally attractive and neither ground nor aerial spraying may reach their favored cryptic resting spots. Multiple field trials of the Trap-N-Kill and other lethal ovitraps have shown success in several locations. Perich and Zeichner evaluated their technology in large scale trials in Brazil and Thailand, and showed significant reductions in the densities of *Aedes* mosquitoes following trap deployment (Perich et al 2003; Sithiprasasna et al 2003). Recent studies in Puerto Rico have shown that lethal ovitraps can reduce mosquito populations across entire communities and reduce the likelihood of annual dengue outbreaks during rainy seasons (Barrera et al 2014). Additionally, mass-trapping studies where attractant-baited traps were used to create a barrier around a given location have shown significant reductions in the numbers of mosquitoes within the barrier (Kline 2007). This strategy could be deployed around areas ranging from a single home to an entire golf course, and could potentially reduce the density of mosquito vectors. In combination with public education and outreach materials about trap use and mosquito oviposition site reduction, such as those we prepared for communities in Hawai’i, lethal ovitraps can be used to increase community awareness about mosquito biology and control efforts; see Figure 4. Our recent experience in Hawai’i emphasized that community-level use of lethal ovitraps led to very high engagement and a better public understanding of this aspect of mosquito control. Additionally, engaging communities in mosquito source reduction, trap setup, and monitoring efforts allowed vector management to focus on mosquito management strategies, not trap deployment.

Ovitrap programs benefit when employed concurrently with source reduction efforts, as the reduction in potential egg-laying sites will make the ovitrap even more attractive to gravid mosquitoes. When the number of alternate larval sites remains high – for example, in junkyards, cemeteries or other locations with large numbers of flowerpots, urns and vases – the number of ovitraps deployed must be increased to maintain efficacy. Spring-Star recommendations for Trap-N-Kill deployment are based on reported studies, many of which took place in tropical locations with high numbers of alternate oviposition sites, as well as Australian studies on ovitrap mass-trapping programs (Ritchie 2005;
Figure 4: This public outreach comic was written by R Heinig and E Bess, with art by David Lasky, for use in Hawai‘i.
Protocol: Use of Trap-N-Kill® lethal ovitrap for control of Zika, Dengue and Chikungunya

General guidelines

Trap-N-Kill traps should be deployed in a ratio of 1:10 to existing larval habitat sites. The recommended number of traps will increase with the number of alternate container sites: 4 to 10 traps for homes; 20 to 40 traps per acre for non-residential areas.

Trap-N-Kill should be deployed for a minimum of 4 weeks, or until local virus transmission has ended, but may be left out longer. Proper maintenance is essential to prevent the traps from becoming larval habitat, by replacing the pesticide and oviposition strip every 10 weeks and checking the water level and trap integrity at least every 2 weeks.

Prevention: When neighboring communities, geographic regions and/or islands have a known arbovirus outbreak, Trap-N-Kill may be deployed in high-risk areas where infectious people are likely to enter the community, such as ports of entry including airports or seaports, tourist attractions, and hotels and resorts.

Routine, widespread usage of Trap-N-Kill should be avoided when disease is not present, so that traps do not become larval habitat. If using Trap-N-Kill for an extended period of time, as with any chemical pesticide, implement a plan to counter potential resistance in the local mosquito population.

Outbreak response and control

As soon as dengue is found in your jurisdiction, Trap-N-Kill should be deployed in a 100 to 200 meter radius around locations where known infected individuals have spent significant time while viremic, such as home or work.

For widespread cases, continue the containment strategy to the extent feasible. Should resources – money, supplies, and/or personnel – be limited, then the Trap-N-Kill deployment should target higher-risk areas: a) areas frequently visited by infected individuals; b) areas with the highest mosquito population densities; and c) locations where many cases are tightly clustered.

Zeichner and Debboun 2011). Lethal ovitrap technology has been proven in the field, and offers a promising new tool for vector control. Trap-N-Kill offers a solution that can reduce pesticide use and exposure to humans and domestic animals. For the full technical dengue protocol, please contact SpringStar at info@springstar.net.

Acknowledgments

We would like to thank Andrea Leal and Larry Hribar at the Florida Keys Mosquito Control District, and Mary Echols and her team at the Palm Beach County Health Department, for their support during field trials.

References Cited


The larvicide you know from the company you trust

Summit

B.t.i. BRIQUETS

AMVAC now offers Summit B.t.i. Briquets™

For over 25 years, fast-acting Summit B.t.i. Briquets have been the industry standard in extended release B.t.i. formulations. Few products match their record of reliable and environmentally compliant performance. Now Summit B.t.i. Briquets are available through your AMVAC distributor as part of our balanced product line which includes the adulticides; Dibrom® Concentrate and Trumpet® EC.

Contact your AMVAC/AEP distributor today or AMVAC at 1-888-GO AMVAC (1-888-462-6822) and visit www.amvac-chemical.com for more information.
Let’s clear the air...
...with an ever-growing lineup of mosquito control products.

For over 35 years, Central Life Sciences has been focused on mosquito control, providing reliable products with environmental care and trustworthy service. We will continue to uncover alternatives that meet the ever-changing needs of our industry.

We're here today with a wide range of effective products:

• Altosid®
• Zenivex®
• FourStar®
• Pyronyl™
• Perm-X™

We will continue to look and work for quality and performance enhancements, as well as search for new ways to service our customers with effective control options.

Stay tuned...

Continuing mosquito control. Visit us at CentralMosquitoControl.com.
Central Life Sciences has gone granular to optimize the performance of our FourStar® Bti CRG. The sand-based larvicide has a dual-action controlled release to remain powerful through wet and dry periods. Effective in salt water habitats and dense enough to penetrate the thickest canopy, FourStar® Bti CRG features:

- A heavy, high-density spherical sand carrier
- 10% Bti active ingredient
- Residual for up to 40 days and 4 floodings
- Application to pre-flood areas
- Effectiveness in a variety of aquatic habitats
- High bulk density for more coverage per application
- Approval for ground and aerial application

Learn more about FourStar® Bti CRG and Central Life Sciences at CentralMosquitoControl.com or call 1.800.248.7763
Anyone who has ever done mosquito surveillance knows how labor intensive it can be. Whether it’s landing rate counts (LRC) or setting CDC light traps, the most time-consuming aspect is having someone physically go out to site to survey for mosquitoes in the area. When you finally get the collection information to operations you may have already missed your window for control. In this modern technologically advanced era of self-driving cars and Jeopardy champion robots, is it too much to ask for some of that rapid-response automation to trickle down into this tedious sector of mosquito science?

Consider our dilemma: the Florida Keys Mosquito Control District (FKMCD) has 266 human landing rate count stations throughout Monroe County, FL, and each station is visited daily by one of our sixteen field inspectors. We estimate they each spend approximately 2 hours per day just driving to landing rate count sites where they count for one minute the number of mosquitoes that land on them. They’ll check a rain gauge while they’re there, then get back into the truck to drive to the next count station. Some of our furthest stations are on offshore islands that require a boat to visit, or a 45-minute walk into the hardwood hammocks of the Florida Keys Wildlife Refuges. We conduct this daily surveillance to comply with the Chapter 5E-13.036 Mosquito Control Program Administration rules of the Florida Department of Agriculture and Consumer Services (FDACS); in order to send a spray truck or schedule an aerial adulticide mission, we need proof of a quantifiable increase in the number of mosquitoes. The rule permits mosquito control districts to use various standardized trapping methods, but that can become even more burdensome when factoring in the acquisition of an attractant like carbon dioxide in dry ice, replacing batteries, and identifying and counting trap contents.

After analyzing the cost of labor spent on daily landing rate counts, it was clear to FKMCD administration that an alternative was necessary. Eliminating LRC stations altogether was out of the question, and replacing them with conventional trapping methods was not a practical solution. We needed a trap that could be remotely operated, was self-powered, and could transmit catch data back to our office computers. This meant it would have to be able to differentiate between mosquitoes and other insects. Our director, Michael Doyle, composed a Request for Bid to find a tech-savvy group that could produce this cutting edge mosquito technology.

Figure 1: First prototype of the BG-Counter, with CO2 tank and battery.
Biogents AG (Regensburg, Germany) and onVector Technology (Sunnyvale, CA) jointly took up the challenge of designing the trap and delivered the first prototype to our office in March 2015. The trap’s base was a BG-Sentinel trap®, the attractant was carbon dioxide (CO₂) gas with a programmable release, and the ventilator was powered by a 12-volt car battery recharged by solar panel; see Figure 1. These met the first two bid requirements of attracting mosquitoes similar to conventional methods and being self-powered. The real magic lay in the trap’s ability to count objects as they entered the trap. A strip of infrared LED lights line the inside of the entrance of the trap, creating a barrier across the surface of the trap entrance. When an insect nears the trap, it gets sucked into the entrance by the ventilator, breaks the infrared barrier and is counted as an event. The trap’s internal software measures the amount of light displaced, which equates to insect size. Over several collections, a classification algorithm can be devised based on the significantly differentiated signature wavelengths produced by insect types as they enter the trap; see Figure 2. For instance, all medium-sized mosquitoes produce the same signature light disruption when they pass through the infrared barrier. The same goes with larger lepidopterans. Small insects like no-see-ums will produce the same wavelengths as small droplets of rainwater, which makes them indistinguishable from one another to the software. But since this is a mosquito trap and not a Culicoides trap, this wasn’t terribly inconvenient for us.

We field tested the first prototype in a variety of locations in order to calibrate the mosquito algorithm. The first few trials collected some mosquitoes, but to really put the counting software to the test, we needed a location that was producing thousands. That was easy to find in June on Rockland Key, a small neighborhood 3 miles east of Key West, which abuts US Navy property that is off limits to FKMCD. One of our regularly set CDC light traps had collected over 5,000 mosquitoes in one night, with 98% being Aedes taeniorhynchus. The following morning, the area inspector had a LRC of 42 mosquitoes per minute. We sent a spray truck through the neighborhood that night, and the next day the inspector still had a LRC of 21 mosquitoes per minute. It was time to put the BG-Counter to the test.

The trap has no manual ‘on’ switch, as it is controlled through a webpage maintained by Biogents. The main page details the location of the trap and the trap identification code, and enables changes to the trap schedule; see Figure 3. The trap schedule can be programmed differently for every day of the week in half-hour intervals to enable the operation of CO₂ release, the ventilator, and the counter itself. The page also displays the trap’s collection in real time with a bar graph depicting the number of large events, small events, and medium mosquito-probable events occurring over time. The page will also give you the option of downloading the data in an Excel spreadsheet. This spreadsheet includes even more information collected by the trap, including temperature, humidity, ambient light, battery voltage, and cell reception.
The trap was programmed on location from an iPhone to start the ventilator and counter and continuously release CO₂ a half-hour after it was set to avoid a dilution effect from human presence. From then on, the trap collection was monitored from the webpage because it was possible and exciting, so why not? The following morning after the CO₂ had been programmed to turn off (the ventilator stayed on to keep the catch inside the net), the trap collection bag was retrieved from the location and stored in a freezer until identification.

The trap software counted 717 medium-sized mosquito events that night, with the highest collection (102 mosquitoes) occurring between the interval of 8:50 and 9:00 pm; see Figure 4. This is typical for *Ae. taeniorhynchus* activity. Painfully monotonous truck trapping has shown that the height of *Ae. taeniorhynchus* flight activity occurs between 45 and 75 minutes after sunset (Pruszynski 2014). When the collection was counted by hand, 827 total mosquitoes were counted, giving the trap an 86.7% accuracy. The trap was set again the following night with the same parameters. The same trend emerged, with most activity occurring an hour after sunset, except there was an unusual spike in activity between 7:00 and 7:30 pm (sunset was at 8:18 pm); see Figure 5. The graph shows a bell curve of 68 mosquito events in that half-hour period, with a steep decline to single digit collections again until after sunset. A short interview with the homeowner revealed that he had come out around that time to check out the ‘TV and satellite dish’ left in his yard. It will be a fascinating future study to measure the influence of a human attractant next to one of these BG-Counter traps.

More trials were conducted to evaluate the accuracy of Prototype 1, including a few specifically surveying for *Ae. aegypti*. After all, the BG-Sentinel trap is now the standard for container species mosquitoes like *Ae. aegypti* and *Ae. albopictus* (Williams et al 2006; Wright et al 2015; Krockel et al 2006). The trap was set in a Key Largo boat yard that is a known hotspot for *Ae. aegypti*; see Figure 6. It was programmed to run for 22 hours, releasing CO₂ in half-hour intervals. The trap was also affixed with a brand new BG human lure that contains a mixture of odors designed to attract anthropophagic mosquitoes. About 30 ft away from the BG-Counter, a BG-Sentinel 1.0 trap, with a cooler of 3 lbs of dry ice as the attractant, was also set. The BG-Sentinel 1.0 collected 87 female and 131 male *Ae aegypti* (55%) and 175 female *Ae. taeniorhynchus* (45%). The BG-Counter collected 112 females and 135 male *Ae aegypti* with only 4 female *Ae. taeniorhynchus* and 1 female *Culex quinquefasciatus*. That means 98% of the mosquitoes collected in the BG-Counter were *Ae aegypti*, compared to 55% collected in the BG-Sentinel 1.0 trap. We are not exactly sure why there was a greater draw for *Ae. taeniorhynchus* to the BG-Sentinel trap compared to the BG-Counter, but we suspect the dry ice (because of its higher CO₂ emission rate) or the new BG human lure influenced mosquito behavior. Future experiments will explore these
hypotheses, but it is very interesting to speculate that while the BG-Counter cannot yet identify mosquitoes to species, perhaps it could be manipulated to attract and repel different species.

The accuracy for our experiments using Prototype 1 showed 79% (SE=3.92%, n=5) when compared to hand counts, and most were underestimations of the number of mosquitoes collected in the trap. This counting error was due to the frequent data transmissions occurring every 10 minutes. As the software collects data, it spends 45 seconds every 10 minutes sending data to the webpage. However, during transmission, the trap is unable to count the events that transpire during those 45 seconds. Therefore, 45 seconds worth of data was lost every 10 minutes. That adds up to a lot of missing data over a trap night. Luckily for us, Biogents and onVector Technology were just putting the finishing touches on Prototype 2, which promised to eliminate this problem.

We received Prototype 2 in October 2015, and began field testing. The trap was more streamlined, with fewer wires and clunky hardware pieces than the first version, and accuracy...
was much improved. We found it had a 93% (SE=2.23%, n=13) accuracy compared to hand counts. This improvement was due to changes in the transmission interval and refinement of the identification algorithm. The user can now determine when the data is be transmitted to the webpage. If the user wanted it every 15 minutes that was still a possibility, but they would incur a loss of data during transmission. However, if they’d rather have it on the hour or every 2 hours, the more time between transmission intervals the fewer data are lost. The data still appear in 15-minute resolution, so the counter can still produce specific mosquito activity throughout the trapping period. There was one trap night with heavy rain that resulted in an outlier of 65% accuracy. It was a very rainy evening culminating in only 8 total mosquitoes, while the trap only counted 5. As someone who has had difficulty herself in identifying insects from rain-soaked trap bags, I think this one outlier can be dismissed.

Other improvements to the prototype centered on powering the trap for extended periods of time. It now has the capability of running on house current as well as solar charged battery. The trap can be put into ‘hibernation mode’ so it uses less power throughout non-trapping periods. The solar panel has an extended cable that will facilitate panel placement for maximum sunlight exposure. These enhancements allow the trap to move towards the ‘set it and forget it’ solution desired to free the inspectors from laborious landing rate counts. Even FDACS is on board; they consider the BG-Counter an acceptable trapping method for mosquito surveillance!

After field-testing and discussing improvements and changes to Prototypes 1 and 2, we are eager to see the final product from Biogents AG and onVector Technologies in April 2016. It will be equipped with software that can read an attachable rain gauge. While determining accuracy will be our first endeavor, we look forward to finally calibrating the trap for its designated purpose, which will require comparisons to human LRCs and counts from CDC light traps. The trap certainly has potential for other research and operational projects, and we at FKMC are excited to have been a part of the creation and design of this innovative and state-of-the-art mosquito surveillance trap.

REFERENCES CITED


Catherine Pruszynski
Research Biologist
cpruz@keysmosquito.org
Florida Keys Mosquito
Control District
5224 College Road
Key West, FL 33040
305-292-7190

Figure 6: Prolific Aedes aegypti mosquito habitat at a Key Largo boat yard.
MOSQUITO TRAC

GPS Tracking - Logging - Reporting

The Low Cost Solution for collecting the data you need to run your operation and for NPDES Reporting

iPhone, IPad, iPod for field work with Offline Maps

Adulticide
Larvicide
Surveillance

Web Based Cloud Data Storage

AIRWOLF AEROSPACE • info@airwolfaerospace.com • 440-632-1687
www.mosquitotrac.com
We are continuously striving to do something new, different and most importantly, something better.
Having choices that can lessen environmental impact without compromising performance is not only a good thing, but a right thing to do. That’s what’s possible when you combine science with sustainability.

- Natular®
- CocoBear™
- Merus™
- AquaAnvil™
- AquaHalt™
- AquaDuet™

Recipient of the 2012 Illinois Governor’s Sustainability Award
Recipient of the 2010 U.S. EPA Presidential Green Chemistry Award

www.clarke.com

or visit us on Facebook
Always read and follow all label directions and use precautions.

Dibrom® Concentrate and Trumpet® EC are registered trademarks of AMVAC Chemical Corporation.

©2012 AMVAC Chemical Corporation.

DIBROM® CONCENTRATE
TRUMPET® EC

Protecting public health for more than 50 years.

Used all season long where serious mosquito control is required.

For decades, Dibrom® Concentrate and Trumpet® EC have been the known as the premier aerial adulticides after disastrous hurricanes occur. The fact is that these products effectively control nuisance and disease vectoring mosquitoes all season long. Contact your AMVAC/AEP distributor today or AMVAC at 1-888-GO AMVAC (1-888-462-6822) and visit www.amvac-chemical.com.
Mosquito control agencies stress the adoption of personal protective measures aimed at reducing contact with mosquitoes and their associated pathogens, such as wearing long sleeve shirts and pants, using insect repellent, avoiding outdoor activities during peak mosquito biting times, and removing larval habitat around one’s home. These basic messages are repeated throughout the world in disease endemic areas, as well as in the United States during recent outbreaks of West Nile virus, dengue, and the potential spread of chikungunya and Zika viruses. Various public education programs throughout the country have advocated that people need to take action and be part of initiatives towards reducing mosquito habitat and pathogen transmission in their local communities. For instance, the area-wide management of the Asian tiger mosquito project (AW-ATM) is a mosquito control agency program that teaches New Jersey homeowners about container mosquito species habitats and their associated risks; see http://www.rci.rutgers.edu/~AWATM/. Another example is the North American Mosquito Project, which successfully collected mosquitoes throughout the continental United States (Maki and Cohnstaedt 2015). Successful programs can be difficult to implement and maintain, even locally, and are not always applicable on a national scale because they are customized to the community and require significant resources and labor to ensure continued participation. Another challenge consists of directing efforts towards modifying attitudes and comportment of adults, the most commonly targeted audience of these programs, as they already have ingrained behaviors. Alternatively, educating children or teenagers in a classroom setting may be a more effective way to reach more individuals at a susceptible age and make a real impact in their own future and surrounding adult behavior.

The Invasive Mosquito Project (IMP) was launched recently as an initiative that pairs high school teachers and students with mosquito control and public health professionals. This partnered citizen science classroom project helps high school teachers meet national education requirements (next generation science standards), and students learn about mosquitoes, public health, and safety.

One of the main goals of the project is to transform teachers and students (non-professionals) into citizen scientists. The IMP provides educational materials in the form of lesson plans, PowerPoint® presentations, and protocols for teachers and students, which can be downloaded from the IMP website. For instance, the first IMP lesson pertains to collection of mosquito eggs. This lesson provides students with background information, introduction to various scientific methods and teaches them to gather data and practice proper record keeping. As background information, they learn about recent mosquito introductions, such as Aedes notoscriptus in California (GLACVCD 2014), Ae japonicus in the Northeastern United States (Peyton et al 1999) and the range expansion of Ae aegypti and Ae albopictus (Rochlin et al 2013). Also see https://www.cdph.ca.gov/HealthInfo/discond/Documents/AedesDistributionMap.pdf for a current map of Ae aegypti and Ae albopictus detection sites in California. The lesson also discusses potential pathogens these mosquitoes may transmit, such as yellow fever, dengue, Zika, and chikungunya viruses or Dirofilaria immitis, the parasitic roundworm that causes heartworm in dogs and cats.

Students collect mosquito eggs around their homes – as part of data gathering and without the risk of exposure to potential bites – by placing oviposition cups with germination paper to allow container mosquitoes to lay their eggs; see Figure 1. Students then take notes on a collection form available on the project’s website. After 7 to 10 days, upon the presence of eggs, students bring the collection cups to class and select to raise 25% of the eggs to adults, following the protocol and safety measures provided in the lesson plan.

These lessons require students to gather real data outside of the classroom environment, by collecting mosquito eggs, larvae, and/or pupae. Subsequently upon return to the classroom, students examine and interpret the collected data, compare and contrast results with peers, and report findings. The data submitted by science classes are consolidated and stored by the website administrator in USDA archives and are readily available for classes to examine. Classes then have the opportunity to assess local, regional, and national mosquito distribution data and to determine if there is an increased risk of particular pathogens in their community based on the presence of certain mosquito vector species.

The Invasive Mosquito Project: A Public Education Tool

by Ashley Thackrah, Natalia Cernicchiaro and Lee W Cohnstaedt

Mosquito control agencies stress the adoption of personal protective measures aimed at reducing contact with mosquitoes and their associated pathogens, such as wearing long sleeve shirts and pants, using insect repellent, avoiding outdoor activities during peak mosquito biting times, and removing larval habitat around one’s home. These basic messages are repeated throughout the world in disease endemic areas, as well as in the United States during recent outbreaks of West Nile virus, dengue, and the potential spread of chikungunya and Zika viruses. Various public education programs throughout the country have advocated that people need to take action and be part of initiatives towards reducing mosquito habitat and pathogen transmission in their local communities. For instance, the area-wide management of the Asian tiger mosquito project (AW-ATM) is a mosquito control agency program that teaches New Jersey homeowners about container mosquito species habitats and their associated risks; see http://www.rci.rutgers.edu/~AWATM/. Another example is the North American Mosquito Project, which successfully collected mosquitoes throughout the continental United States (Maki and Cohnstaedt 2015). Successful programs can be difficult to implement and maintain, even locally, and are not always applicable on a national scale because they are customized to the community and require significant resources and labor to ensure continued participation. Another challenge consists of directing efforts towards modifying attitudes and comportment of adults, the most commonly targeted audience of these programs, as they already have ingrained behaviors. Alternatively, educating children or teenagers in a classroom setting may be a more effective way to reach more individuals at a susceptible age and make a real impact in their own future and surrounding adult behavior.

The Invasive Mosquito Project (IMP) was launched recently as an initiative that pairs high school teachers and students with mosquito control and public health professionals. This partnered citizen science classroom project helps high school teachers meet national education requirements (next generation science standards), and students learn about mosquitoes, public health, and safety.

One of the main goals of the project is to transform teachers and students (non-professionals) into citizen scientists. The IMP provides educational materials in the form of lesson plans, PowerPoint® presentations, and protocols for teachers and students, which can be downloaded from the IMP website. For instance, the first IMP lesson pertains to collection of mosquito eggs. This lesson provides students with background information, introduction to various scientific methods and teaches them to gather data and practice proper record keeping. As background information, they learn about recent mosquito introductions, such as Aedes notoscriptus in California (GLACVCD 2014), Ae japonicus in the Northeastern United States (Peyton et al 1999) and the range expansion of Ae aegypti and Ae albopictus (Rochlin et al 2013). Also see https://www.cdph.ca.gov/HealthInfo/discond/Documents/AedesDistributionMap.pdf for a current map of Ae aegypti and Ae albopictus detection sites in California. The lesson also discusses potential pathogens these mosquitoes may transmit, such as yellow fever, dengue, Zika, and chikungunya viruses or Dirofilaria immitis, the parasitic roundworm that causes heartworm in dogs and cats.

Students collect mosquito eggs around their homes – as part of data gathering and without the risk of exposure to potential bites – by placing oviposition cups with germination paper to allow container mosquitoes to lay their eggs; see Figure 1. Students then take notes on a collection form available on the project’s website. After 7 to 10 days, upon the presence of eggs, students bring the collection cups to class and select to raise 25% of the eggs to adults, following the protocol and safety measures provided in the lesson plan.

These lessons require students to gather real data outside of the classroom environment, by collecting mosquito eggs, larvae, and/or pupae. Subsequently upon return to the classroom, students examine and interpret the collected data, compare and contrast results with peers, and report findings. The data submitted by science classes are consolidated and stored by the website administrator in USDA archives and are readily available for classes to examine. Classes then have the opportunity to assess local, regional, and national mosquito distribution data and to determine if there is an increased risk of particular pathogens in their community based on the presence of certain mosquito vector species.
The IMP will be an ongoing project for fall and spring quarters each year. The project continuity provides each class with the opportunity to compare data within and between classes and across years by using retrospective data sets. Current and historic data will be available on the IMP website. Students become informed about the impact they can make in their families and community by removing mosquito larval habitat and implementing other preventative measures.

Another goal of the IMP project, in addition to the public education component, is to monitor invasive mosquito species throughout the United States. The project uses a partnered approach to citizen science, as each classroom is paired with mosquito and public health professionals who reinforce the lesson plans and data gathering by, for instance, confirming the students’ mosquito identifications; correct species identification is critical for obtaining accurate mosquito species distribution data. For professional mosquito agencies, the IMP provides nationwide container mosquito surveillance, species distribution, and range expansion data that are collected by supervised students in multiple high school classrooms across the country and confirmed by experts in the entomology field. Local professionals benefit by networking with local educators to explain strategies to control mosquito populations and raise awareness of the individual’s role in mosquito bite prevention. The educator social network will also serve the local professionals as means to communicate information in the event of a disease outbreak, rather than simply posting a bulletin and hoping the news agencies interpret it correctly.

By participating in IMP, high school teachers and students contribute to a nationwide study that, while gaining experience in collecting data in their own backyard, teaches them to understand their role in protecting themselves, their family, pets, and the community from mosquito-borne illness. For mosquito control and other professional groups, project participation contributes to the education of the public regarding prevention and control measures for invasive mosquito species as well as an effective and widespread source reduction of mosquito larval habitat sites.

If you are a teacher or a professional biologist, or associated with a mosquito control unit or public health agency, and you are interested in public education or introducing the IMP to your local area, please consult the IMP website www.citizenscience.us for more information. To apply to be listed as a project contributor, e-mail us at: invasive.mosquito.project@gmail.com.

REFERENCES CITED


Ashley Thackrah  
Master’s student  
athomackrah12@gmail.com

Natalia Cernicchiaro  
Assistant Professor, Epidemiology  
ncernic@vet.k-state.edu

College of Veterinary Medicine  
Kansas State University  
Manhattan, KS 66506  
785-532-4241

Lee W Cohnstaedt  
Research Entomologist  
lee.cohnstaedt@ars.usda.gov  
Arthropod-Borne Animal Disease Research Unit, USDA-ARS  
Center for Grain and Animal Health Research  
Manhattan, KS 66502  
785-537-5592

Figure 1: An oviposition cup with germination paper attracts container mosquitoes to lay eggs.
National distributor or local partner?
Turns out you don’t have to choose.

Public health professionals come to Univar Environmental Sciences because of our reputation for efficient logistics and extensive product selection.

But they trust us because, with a presence in every region of the country, our experts understand the unique needs and environments of the local communities they serve.

Univar carries a full line of products from the best brands including our exclusive MasterLine Kontrol series. Shop today at Store.UnivarES.com

- Kontrol 4-4
- Kontrol 30-30
- Kontrol 31-67
- Aqua-Kontrol
- Aqua-Kontrol 30-30
- Kontrol Mosquito Larvicide Oil

Meet your local Univar representative today.
Visit UnivarES.com/public-health
or call us at 800.609.9414
Innovative Mosquito Solutions
Your experienced partner

ADAPCO has been serving the Mosquito Control community since 1985. Throughout the last 31 years, ADAPCO has secured sole distribution from the nation’s leading manufacturers of Mosquito Control products.

www.azelisamericas.com
www.MyADAPCO.com · (800) 367-0659 · info@MyADAPCO.com
from ADAPCO in mosquito control

Now, ADAPCO is part of Azelis Americas. Azelis Americas is dedicated to providing leading-edge products, services, equipment and technologies for the Mosquito Control industry.

Product offering

- Adulticides
- Larvicides
- Barrier Sprays
- Oils
- Equipment
- Technology

ADAPCO product portfolio

Adulticides
- Aqua-Reslin®
- Dibrom®
- DeltaGard®
- Evergreen®
- Fyfanon®
- Permanone®
- Pyrocide®
- Pyronyl®
- Scourge®
- Trumpet®
- Zenivex®

Larvicides
- Altosid®
- Aquabac®
- BVA®
- FourStar®
- Spheratax®
- Summit Bti®
- Teknar®
- Vectobac®
- Vectolex®
- Vectomax®

Miscellaneous
- ATSB®
- BVA®
- Mavrik®
- Maxforce®
- Nuvan®
- Suspend®
- Wisdom®

Equipment
- AIMMS-20®
- DC IV™
- GeoPro™
- Guardian™
- Hudson®
- Maruyama®
- Monitor™
- Pioneer Backpack®
- Ramp®
- Wingman™

Creating value, growing together
When only the best will do. Innovation, Quality & Service defines the new Curtis Dyna-Fog.

Serving the Vector Control Industry since 1954

As the leader in vector technology, Curtis Dyna-Fog offers over 100 models to choose from. Quality assured with a 2-year limited warranty, and backed by reputable worldwide distribution and specialized technical support.

Featuring a wide variety of models:
- cold foggers
- backpack
- thermal fogggers
- electric AC/DC powered
- gasoline/diesel powered

Twister XL3
Motorized knapsack ULV sprayer with single high output Microtech™ nozzle

Dyna-Fog Superhawk XP
- portable thermal fogger
- petroleum-based
- pulse-jet powered

Dyna-Jet L30
The world’s most technologically advanced ULV applicator

Maxi-Pro and Typhoon 1,2, and 4 Nozzle
ULV cold fog applicator, high power with maximum efficiency

B&G CURTIS DYN-A-FOG

Sales and Technical Support
135 Region South Dr • Jackson GA 30233
678-588-5501 • www.bgequip.com

Manufacturing Facility
525 Park St • Westfield, IN 46074 www.dynafig.com
Anastasia Mosquito Control District (AMCD) of St Johns County, Florida formally began collaborating with private agencies and domestic and international institutes and universities in 2003; see Table 1. Through these collaborations, the integration of outside expertise, ideas and methodologies has led to the improvement of operations and advancements in research at AMCD. These collaborations have provided diverse skill sets for beginning and continuing scientists through these hands-on learning experiences.

Over the past thirteen years, multiple organizations have been continuously collaborating with AMCD to help us accomplish our mission goals. One of our earliest collaborators was the Guana Tolomato Matanzas National Estuarine (GTM), located some 10 miles north of our facility. This estuarine research reserve has provided the opportunity for AMCD to conduct field experiments with personal protection devices and chemical applications, to aid in mosquito and tick prevention in areas where the area-wide application of pesticides is prohibited and people are unprotected. After multiple citizen complaints in 2011 and 2012 about mosquitoes and ticks, AMCD conducted field evaluations at GTM using commercially available mosquito and tick repellent devices. This research answered the community’s questions as to the efficacy of the devices under sitting and walking situations, leading to greater knowledge of the efficacy of personal protective measures such as the OFF! Clip-on Device (Xue et al 2016).

Further collaborations in 2012 have included the sharing of field biologist John M Henzler, who was able to develop techniques to aid in surveillance and mosquito control in chemical-free areas (Henzler et al 2013).

The University of Florida’s Entomology and Nematology Department has been a major collaborator, with graduate students conducting their PhD research through AMCD’s established connections within the community of St Johns County. AMCD also aids graduate students by allowing visiting scientists access to years of surveillance data and to a mosaic of habitats throughout the county as sites for testing mosquito control application techniques.

Graduate student collaborations have led to evaluations of: a) misting fan-mediated applications of citronella for control of Ae albopictus...
<table>
<thead>
<tr>
<th>Collaboration Type</th>
<th>Organization Name</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Federal Agencies</td>
<td>US Department of Agriculture, Agricultural Research Service Center for Medical, Agricultural and Veterinary Entomology</td>
<td>Gainesville, FL</td>
</tr>
<tr>
<td></td>
<td>US Navy, Navy Entomology Center of Excellence</td>
<td>Jacksonville, FL</td>
</tr>
<tr>
<td>State Agencies</td>
<td>Florida Department of Environmental Protection</td>
<td>Jacksonville, FL</td>
</tr>
<tr>
<td></td>
<td>Florida Fish and Wildlife Conservation Commission</td>
<td>Ponte Vedra Beach, FL</td>
</tr>
<tr>
<td></td>
<td>Guana Tolomato Matanzas National Estuarine Research Reserve</td>
<td>Ponte Vedra Beach, FL</td>
</tr>
<tr>
<td>International Agencies</td>
<td>Chinese Center for Disease Control and Prevention</td>
<td>Beijing, China</td>
</tr>
<tr>
<td></td>
<td>Hainan Provincial Center for Disease Control and Prevention</td>
<td>Haikou, China</td>
</tr>
<tr>
<td>Domestic Universities</td>
<td>Florida A&amp;M University Public Health Entomology Research and Education Center</td>
<td>Panama City, FL</td>
</tr>
<tr>
<td></td>
<td>Rutgers University</td>
<td>New Brunswick, NJ</td>
</tr>
<tr>
<td></td>
<td>University of Florida, Department of Electrical and Computer Engineering</td>
<td>Gainesville, FL</td>
</tr>
<tr>
<td></td>
<td>University of Florida, Department of Entomology and Nematology</td>
<td>Gainesville, FL</td>
</tr>
<tr>
<td></td>
<td>University of Florida, Florida Medical Entomological Laboratory</td>
<td>Vero Beach, FL</td>
</tr>
<tr>
<td></td>
<td>University of Florida, Whitney Laboratory</td>
<td>St Augustine, FL</td>
</tr>
<tr>
<td></td>
<td>University of Miami, Miller School of Medicine, College of Public Health</td>
<td>Miami, FL</td>
</tr>
<tr>
<td></td>
<td>University of North Florida, Department of Biology</td>
<td>Jacksonville, FL</td>
</tr>
<tr>
<td></td>
<td>University of South Florida, College of Public Health</td>
<td>Tampa, FL</td>
</tr>
<tr>
<td>International Universities</td>
<td>The Hebrew University of Jerusalem</td>
<td>Jerusalem, Israel</td>
</tr>
<tr>
<td></td>
<td>Beijing Institute of Microbiology and Epidemiology, Department of Vector Biology and Control</td>
<td>Beijing, China</td>
</tr>
<tr>
<td></td>
<td>Kasetsart University, Department of Entomology</td>
<td>Bangkok, Thailand</td>
</tr>
<tr>
<td></td>
<td>Technion - Israel Institute of Technology, Ruth and Bruce Rappaport Faculty of Medicine</td>
<td>Haifa, Israel</td>
</tr>
<tr>
<td>Private Companies</td>
<td>ADAPCO Inc</td>
<td>Sanford, FL</td>
</tr>
<tr>
<td></td>
<td>AllPro Vector Group</td>
<td>Northville, MI</td>
</tr>
<tr>
<td></td>
<td>American Longray LLC</td>
<td>Hayward, CA</td>
</tr>
<tr>
<td></td>
<td>Clarke</td>
<td>Philadelphia, PA</td>
</tr>
<tr>
<td></td>
<td>FMC Corporation</td>
<td>St Charles, IL</td>
</tr>
<tr>
<td></td>
<td>New Mountain Innovations Inc</td>
<td>Old Lyme, CT</td>
</tr>
<tr>
<td></td>
<td>SpringStar Inc</td>
<td>Woodinville, WA</td>
</tr>
</tbody>
</table>

Table 1: Anastasia Mosquito Control District’s collaborators by organization type, name and location.
(Thompson et al. 2016), determining that sports misting fans, such as the Power Breezer misting fan, do not alleviate biting pressures of *Ae albopictus* under a controlled setting; b) the rain-wash properties of toxic sugar baits for mosquito control (Fulcher et al. 2014), demonstrating that toxic sugar baits can have potential larvicidal effects; and c) indoor mosquito trapping devices and toxic insect stickers, for better understanding of indoor mosquito control. Visiting scientist collaborations have led to:

- a) developments in disease modeling techniques to establish better mosquito control (Sallam et al. 2016);
- b) evaluations of mosquito surveillance devices and their effects on non-target insects (Li et al. 2015); and c) assessments of novel spraying machines for barrier applications for adult mosquito control (Fulcher et al. 2015).

Collaborations with the Hebrew University of Jerusalem, Israel, have led to associations with mosquito control agencies in California, facilitating our district to aid in the on-going research to eliminate the disease burden of malaria through novel mosquito control techniques, such as attractive toxic sugar baits (ATSB). Traditional adult mosquito control uses contact toxicants from a few chemical classes to kill mosquitoes. ATSB take advantage of a mosquito’s requirement for carbohydrates by incorporating an attractant and toxicants from low-toxicity chemical classes into a liquid bait that mosquitoes consume. This novel adult mosquito control method can be used in conjunction with other mosquito control methods such as space
Figure 4: AMCD Biologist Alice Fulcher (left) and Dr Muhammad Farooq and Christy Waits, Navy Entomology Center of Excellence, conduct leaf surface area analysis during barrier application of mosquito adulticide studies.

Figure 5: Dr Chun-Xiao Li, visiting scientist from Beijing Institute of Microbiology and Epidemiology, Fengtai, People’s Republic of China, compared 3 novel mosquito light traps to traditional light traps.
DeltaGard® Insecticide outperforms the competition at lower application rates while providing the superior efficacy you need to help protect your community from mosquitoes.

- EPA – Reduced Risk Classification for wide area mosquito control
- Fast, effective, economical control of all mosquito species
- Labeled for application over any and all crops

Make DeltaGard part of your integrated mosquito control program by calling ADAPCO today – 800-367-0659. For more information visit BackedByBayer.com.
sprays and bed nets. International scientists from countries with arid environments have had the opportunity to conduct their research in new sub-tropical environments. This research has led to a better understanding of ATSB and their effects on non-target insects (Qualls et al 2014; Revay et al 2014), and helped to develop a commercially available ATSB.

Collaborations benefit everyone involved, not just mosquito control districts. They have the potential to provide funding for research that a mosquito control district may not have budgeted for, they allow multiple entities access to equipment and new field habitats, and they encourage new and established scientists to develop technologies to enhance mosquito surveillance and control. Most importantly, these collaborations have allowed for rapid dissemination of methodologies and control practices through shared research at meetings hosted by AMCD, the American Mosquito Control Association, Society of Vector Ecology, and Florida Mosquito Control Association.

REFERENCES CITED


Müller GC, A Junnila, WA Qualls, EE Revay, DL Kline, S Allan, Y Schlein, RD Xue. 2010. Control of Culex quinquefasciatus in a storm drain system in Florida using attractive toxic sugar bait.

Med Vet Entomol 24: 346-351.


With the Elite fish rearing system, that’s all it takes for one technician to maintain a quality fish rearing program for your district.

Designed for Efficiency

Gambusia Solutions has developed the Elite modular mosquito fish rearing system. This system is designed to help you raise and overwinter large quantities of fish for use in mosquito control.

Each system comes standard with a built in vacuum system and an extremely efficient, easy-to-clean filter. When you add the optional Elite auto-feeders to this two tank system, it becomes so easy to operate that one technician can maintain it in as little as 15 minutes a day. No service is required on weekends.

To view the daily recommended schedule, see our website.

- Overwinter gambusia for a full supply in spring
- Grow out your own gambusia
- Grow “certified clean” fish
- Customize your system to your own needs
- Easily expand in the future

GambusiaSolutions.com
1-916-899-3220
From Where I Sit: Notes from the AMCA Technical Advisor
by Joe Conlon

From where I sit... The emergence and spread of Zika virus throughout the Caribbean, Central and South America, has generated a media firestorm the likes of which I’ve never witnessed during my tenure as American Mosquito Control Association Technical Advisor (AMCA TA). During the last 3 weeks I’ve conducted 263 interviews with print and broadcast media interested in the control of this virus. To date, I’ve had somewhere north of 375 million media “impressions.” Frankly, it’s been exhausting, leaving me little to no time to do anything else in my position as AMCA TA. Nevertheless, it has afforded me the opportunity to educate the public about Zika virus transmission and mosquito control strategies and that’s an opportunity that I can’t pass up. It’s been particularly gratifying to deal with a press that genuinely wants reliable information to pass on to their readers/listeners/viewers. Surprisingly, I’ve seen very little evidence of hidden agendas in these interviews and I’ve been able to steer the conversations to the need for building robust, sustainable surveillance capabilities in addition to spinning up more control capacity.

My talking points involve this need for robust, sustainable prevention/control proficiencies in light of not just Zika, but the many other exotic diseases arriving at US points of entry from global commerce, tourism, refugee influx. The fact that this is a relatively recent epidemiological phenomenon makes predictions regarding its potential establishment in the continental United States exceedingly problematic, so I couch my answers to this line of inquiry with “we simply do not know at this time.” I also emphasize the unique biology of the peri-domestic Aedines, which, when coupled with certain socio-economic conditions, sets up the “perfect storm” for disease transmission. The absolute necessity for public education regarding the elimination of containers figures prominently in my answers to reporters questions about control, but I further emphasize that education is not enough – action on elimination of containers is the true arbiter of public education’s worth as a mosquito control strategy. In addressing questions regarding what the public can do, I always refer to the 3 “Ds”:

**DUMP & DRAIN:** Eliminate standing water, particularly containers, where these mosquitoes can breed. Scrub the sides of containers to remove eggs.

**DRESS:** Wear loose-fitting clothing with long sleeves and long pants. Another option is to wear factory-treated permethrin-impregnated clothing, such as InsectShield®.

**DEFEND:** Prevent mosquito bites by properly applying EPA-registered repellents.

**ZIKA TASK FORCE**

Beyond the public education aspect of this emergence and spread of Zika virus in the western hemisphere on the heels of dengue, West Nile and chikungunya, it would appear prudent to institute programs leveraging the considerable expertise that the AMCA can bring to bear in their prevention and control. Indeed, in the absence of vaccines for these diseases, vector control becomes the first line of defense and increasing a sustainable nationwide capacity for the survey and control of their mosquito vectors is imperative to meet these public health challenges. For this reason, Dr Stan Cope, the new AMCA President, has formed a “Zika Task Force” (ZTF), comprised of AMCA members with special areas of expertise in mosquito-borne disease control. The members are Ken Linthicum (Chair), Joe Conlon, Ary Faraji, Roxanne Connelly, Kenn Fujioka, Paula Macedo, Wayne Gale and Larry Smith.

One of the first orders of business has been to explore means to increase our profession’s capacity across the board to identify and respond to introductions of foreign mosquito-borne pathogens to our shores.

Given the federal commitment to ensuring the health of its citizenry, subsequent treatment for victims of mosquito-borne disease, keeping mosquito-borne disease outbreaks to a minimum will save enormous health care costs, often in millions of dollars per case. Establishing sustainable training and research programs for vector-borne disease surveillance and control will ensure a robust capacity to identify and contain outbreaks of Zika and other arthropod-borne viruses yet to reach our shores. These diseases can exert enormous impacts on the federal tax benefits to be accrued through tourism and trade. These impacts, in turn, may profoundly influence the comity of our government’s relations with countries suffering economic stresses from decreases in tourism and trade due to these diseases. Thus, it’s in the federal government’s interest to support increased vector control capability.

To this end, the AMCA has recommended instituting a national strategy involving training, research and public education components and has requested that the US Centers for Disease Control and Prevention (CDC) provide requisite funding for their implementation. These would be developed and carried out under the auspices of the AMCA in partnership with CDC.
Training - $1.75 million

- *Aedes (Stegomyia)* Surveillance and Control Certification Program for Mosquito Control Technicians - $1 million
  - Development of online (downloadable) training modules
  - Webinar development and promotion
  - Hands on workshops at centralized locations with known vector species
  - Insecticide resistance monitoring - $750K

Research - $1.25 million

- Operational Surveillance and Control for *Aedes (Stegomyia)*
- Purchase/distribution and field efficacy data collection
- Lethal ovitraps/AutoDissemination Stations (ADS)
- Attractive Toxic Sugar Baits (ATSB)
- Attractants/Pheromones, “Spatial Repellents”/Vapor phase bite protection
- Genetic manipulation: Sterile Insect Technique (SIT), Release of Insects with Dominant Lethality (RIDL) or Wolbachia-infected males

These are suggested components only and provide the framework upon which we can build research and training initiatives that leverage our unique expertise. We may eventually modify the program elements. Fortunately, it appears that the funding of these initiatives is receiving favorable consideration and may be forthcoming once the ZTF forwards scoping documents outlining how we intend to distribute funds. Our next step is to tell CDC precisely what we intend to do with said funds so as to allow the allocation to proceed. The costs need to be specific and involve deliverables – a difficult, but not insurmountable task.

The ZTF may be contacting AMCA members across the country to request support for the training component involving *Stegomyia* biology, ecology, and surveillance/control measures. This may involve locating centralized locations where train-the-trainer workshops can be held. We'll also be looking for personnel to do the training, requisite training props, etc. I’ll keep you posted as information as to timelines and makeup of expenditures becomes available. Any particulars at this juncture are speculative. There will also be a significant resistance-monitoring component involving training and provision of monitoring kits. A great deal of thought will need to be put into this particular component to ensure that it’s sustainable for the foreseeable future. Lots of work to do!

The research component will be addressed by the ZTF and, in all likelihood, involve requests for research projects directly employable within a *Stegomyia* surveillance/control framework. While currently germane to Zika now, we may look for applied research applicable to future invasive species. The ZTF will be working out the particulars in the weeks ahead, so stay tuned.

Be advised that we have not received the funding yet and the particulars of what comes next have yet to be formalized with CDC. There’s always the possibility that funding may be withdrawn for any number of reasons, so let’s not go to general quarters just yet – a great deal has to happen before these initiatives see the light of day. However, this funding, should it come to pass, represents a windfall for vector control and we should optimize our use of it.

---

Joseph M Conlon
AMCA Technical Advisor
conlonamcata@gmail.com
1500 Millbrook Court
Fleming Island, FL 32003
904-215-9660

---

*A female Aedes aegypti, a vector of Zika virus, takes a blood meal from a human host, CDC biomedical photographer James Gathany.*
Ask how we can help incorporate Esri ArcGIS Online status maps, operation dashboards, and service request geoforms into your current workflows.

Electronic Data Solutions provides complete solutions for recording, mapping, managing, and reporting activities that meet budget and permitting requirements for all sizes of mosquito and vector control operations.

208-324-8006 | Call for a demo today | www.elecdata.com

In partnership with: Juniper Systems® Inc., Field Computers, Esri® GIS Software and Trimble® GPS Receivers

Sales Representative for Sentinel GIS and FieldSeeker GIS: Clarke
Emergency or routine . . . Responsiveness and safety count.

How do you measure responsiveness and safety when you put a plane in the air for routine or emergency mosquito control? Whether it’s 5,000 acres or 2 million, your confidence shouldn’t come with tradeoffs.

No other organization exceeds the aerial experience, craft, protocols and support of the Dynamic / Clarke team. Price per acre doesn’t tell the full story. For a complimentary Competency & Capabilities Guide to Aerial Application contact a Clarke representative.

Call 800/323-5727 or email your request to Clarke@clarke.com