



Skeeter Scanner

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www.mimosq.org

President's Message

Now that we are a couple months into the mosquito season, one can start to reflect on what was and where we are headed this mosquito season. This is an exercise mosquito control professionals are faced with each and every year. Analysis and inventory of mosquito populations, arbovirus activity, chemicals, employees, and equipment are underway attempting to make sense of it all. The consensus always seems to be that this year is not an average year.

It is easy to determine monthly/seasonal averages for the number of mosquitoes collected; amount of control product used, and the number of employees needed based on prior years if not decades of archived data. However, these averages are rarely seen within the current season. Past and current weather patterns, water table, past mosquito populations, etc., all come into play in determining current mosquito population and disease activity.

This year our program has realized a wetter (above average) and thus more expensive (product used), yet successful (above average efficacy) spring aerial woodlot program. This overlapped with a wet May that added more water to an already robust (above average) water table generating our first summer widespread floodwater mosquito population of *Aedes vexans* and *Ae. sticticus*. These mosquitoes created an earlier than average need for adulticiding services throughout the majority of the County. However, we were slowed by below average nightly temps and above average winds which limited our normal nightly spray response to a wide-spread nuisance resulting in less product used than average. This early nuisance phenomena also happened to correspond with the training of new technicians whose numbers were above average compared with most years. Oh, and did I mention our first positive mosquito sample was earlier than average- found in early June.

Now the training is complete; nightly temperatures are still cool, but within treatment specs; mosquito populations are near average; arbovirus activity slow as normal; and operations transitioning to arbovirus suppression as in the past – so things are back to normal... and then a five inch rain falls in a portion of our County along with above average rain throughout the rest of the County. I guess this is normal Michigan summer rains, but on the heels of what we already experienced, is it?

Thanks for bearing with me and know that you are not alone in trying to figure things (mosquitoes, weather, and budget) out. I leave you with this, if you find some normal or average in a given season, appreciate it because it is unusual.



William W. Stuyck

West Nile Virus Enhanced by *Wolbachia* in *Culex tarsalis* Mosquito

Wolbachia, a genus of bacteria that infects insects and other arthropods, has been used in the past to control mosquitoes and to hinder their ability to spread diseases such as dengue virus.



However, researchers who wanted to know whether the bacteria could be used as a tool against West Nile virus have found that *Wolbachia* can instead make certain mosquitoes even more likely to become infected with the virus — not less — which also makes them more likely to transmit West Nile to humans.

Expecting to find that *Wolbachia* would block infection by West Nile virus in the same way that it blocks Dengue virus, Jason Rasgon, an associate professor of entomology at Penn State University, and his colleagues injected the *Wolbachia* bacteria into adult female *Culex tarsalis* mosquitoes. They then allowed the *Wolbachia* to replicate inside the mosquitoes and fed the mosquitoes a meal of blood that was infected with West Nile virus.

“We were surprised to find that *Wolbachia* infection did not block West Nile virus in this mosquito,” Rasgon said. “Instead, these mosquitoes had significantly higher West Nile virus infection rates seven days after we fed them the infected blood. In other words, *Wolbachia* infection allowed the mosquitoes to become infected with West Nile virus faster than our controls.”

Their results are published in the journal PLOS Neglected Tropical Diseases. “Our results point to a previously unforeseen complication — the possibility that mosquitoes rendered resistant to one pathogen by *Wolbachia* infection might become better vectors of an alternative pathogen,” Rasgon said. According to Rasgon, the team suspected that *Wolbachia* could enhance some pathogens within mosquitoes.

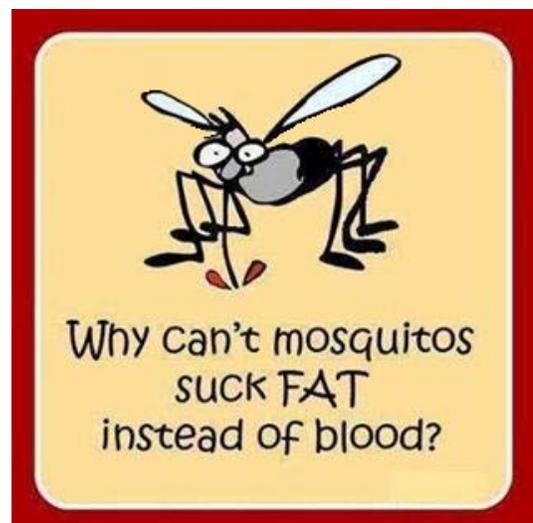
“Multiple studies suggest that *Wolbachia* may enhance some Plasmodium parasites in mosquitoes, thus increasing the frequency of malaria transmission to rodents and birds,” he said. “We recently published a paper in the journal PLOS Pathogens in which we summarized the current literature of *Wolbachia*-mediated pathogen enhancement with particular focus on Plasmodium parasites.”

But, he added, the team did not suspect that *Wolbachia* would enhance mosquito infection with the human pathogen West Nile virus.

“In this study, we were surprised to find that *Wolbachia* infection enhances, rather than suppresses, mosquito infection by West Nile virus,” Rasgon said.

The team also found that West Nile virus enhancement in the *Wolbachia*-infected mosquitoes occurred in conjunction with the suppression of genes associated with the mosquitoes’ anti-viral immune response. According to Rasgon, the researchers plan to conduct additional experiments to determine the exact mechanism of *Wolbachia*-based West Nile virus enhancement in *Culex tarsalis*.

“This is the first study to demonstrate that *Wolbachia* can enhance a human pathogen in a mosquito,” Rasgon said. “The results suggest that caution should be used when releasing *Wolbachia*-infected mosquitoes into nature to control vector-borne diseases of humans.”



GM Mosquitoes Could Eradicate Wild Populations by Only Producing Male Offspring

A team of researchers led by Andrea Crisanti of the Imperial College London managed to genetically modify mosquitoes to produce 95% male offspring, eliminating mosquito populations along with the risk of malaria. The results of the study were published in [Nature Communications](#).

For humans living near mosquitoes carrying the parasite that causes malaria, female mosquitoes present a very real threat. What if the numbers could be skewed so that the sex ratio favors males, who are harmless to humans? This is exactly what Crisanti's team set out to do with *Anopheles gambiae*, a species of mosquito endemic to sub-Saharan Africa, where 95% of malaria deaths occur. The researchers modified the males with the enzyme I-PpoI, which excises the X chromosome during spermatogenesis. This renders sperm that would produce daughters to be non-functional, while the sperm that will create male offspring are unaffected. As a result, about 95% of the resulting offspring are male.

Next, modified males were introduced to five caged wild-type populations. As the males mated with the females, they passed along the same mutation until it dominated the population. For four of the five populations, it took only six generations for the mosquitoes to die out due to a lack of females.

“What is most promising about our results is that they are self-sustaining,” co-author Nikolai Windbichler said in a [press release](#). “Once modified mosquitoes are introduced, males will start to produce mainly sons, and their sons will do the same, so essentially the mosquitoes carry out the work for us.”

This study was the first to successfully manipulate mosquito sex ratios, and it was done in a big way. The researchers hope that this information will be used to develop genetic mutations to be used in the wild, bringing large populations of mosquitoes to their knees.

“The research is still in its early days, but I am really hopeful that this new approach could

ultimately lead to a cheap and effective way to eliminate malaria from entire regions,” added lead author Roberto Galizi. “Our goal is to enable people to live freely without the threat of this deadly disease.”

Of course, while eradicating the mosquitoes would be fantastic for eliminating the threat of malaria, what other effects would it have? Wouldn't there be harsh consequences for the ecosystem? After all, mosquitoes have been on the planet for about 100 million years and represent 3,500 species. As it turns out, mosquitoes wouldn't really be missed if they were to disappear. While mosquitoes can act as pollinators as well as a food source for other animals, their absence would be merely a temporary setback before another species filled the niche. Of course, there is a gamble in assuming the replacement organism would be harmless.

SCMAC Hires New Source Reduction Engineer and Field Foreman

Andrew Agens – Andrew is a graduate of Michigan State University with a Bachelors of Science degree. Andrew is married and has 2 children, and is expecting his third in September. He has taught High School Math for the last 10 years, as well as being a Licensed Builder. SCMAC welcomes Andrew to our family.

Chuck Pearce – Chuck is not a stranger to mosquito control – he comes to SCMAC from Midland Mosquito Control where he worked as a seasonal foreman and biology assistant. We welcome Chuck to Saginaw.

Michigan Mosquito Control Association - Board Meeting Highlights

An updated “Community Mosquito Control” flyer has been posted on the MMCA website. The intent of the informational handout is to promote the MMCA as a source of information for disease updates, current surveillance methods, and control options for local health departments. The flyer was also distributed to public health officials throughout the state.

Total MMCA membership is up to 131 members

after receiving 13 membership renewals in April. Bill Hatfield's name was drawn as the winner of the free conference registration for 2015.

Dengue Cure: Scientists Probe New Techniques, Drug Target for Vaccine Discovered

Scientists have found new information about the virus that causes Dengue fever and other closely related diseases such as West Nile, Japanese encephalitis and yellow fever that may help develop treatments or vaccines against it.

The University of Colorado School Of Medicine and the University of North Carolina published findings and articles that explain how flaviviruses create a unique RNA molecule that causes a disease.

As per scholarly journal *eLife*, the virus that causes Dengue fever, Japanese encephalitis and West Nile use instructions encoded on an RNA strand to capture and reproduce an infected cell. The virus also exploits an enzyme which cells use to break RNA and produce short stretches of RNA instead. RNA helps the virus avoid the immune system by using a structured RNA molecule to resist the said enzyme which is normally adept at destroying RNA.

Meanwhile, the *Science* journal also [published](#) an article that explains how the resistant RNA goes into a "knot-like" structure and thwarts the enzyme that cannot "untangle" it. The researchers reportedly used X-ray crystallography for this study, a technique that allowed them to observe individual molecule structures. This RNA structure is a new, unprecedented discovery and it is being observed further because of its characteristics that may be used for new drugs to treat and develop vaccines for the diseases. This new understanding of how RNA found in various flaviviruses thwarts the enzyme may be of help as well.

University of North Carolina researchers discovered a new drug that might be able to cure the Dengue virus and even prevent the mosquito-borne disease through potential vaccines. The group of scientists revealed a molecular hinge where natural human antibodies attach to the dengue type-3 virus, which

disables it. The finding shows that most human antibodies that neutralize the virus connect to this hinge. The study also explains how these binding hinges, where two regions of a protein connect, can be exchanged genetically without disrupting the integrity of the virus.

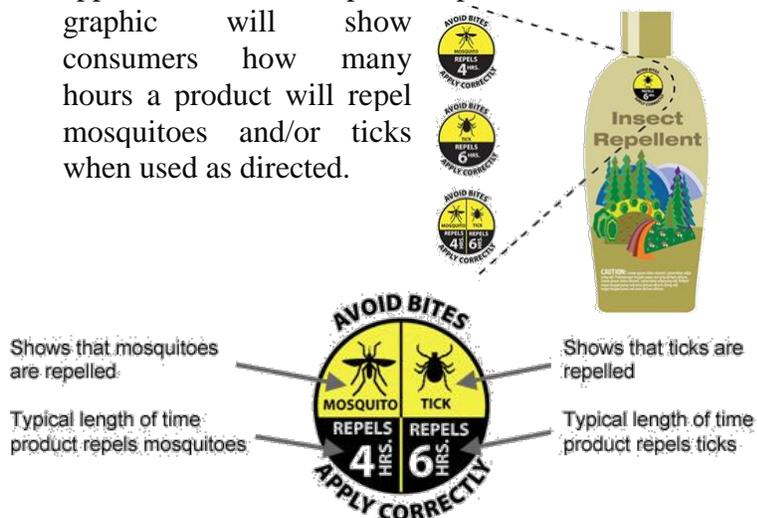
"This gives us a lot of insight into how human antibodies work," UNC School of Medicine professor of microbiology and immunology Aravinda de Silva [said](#). "And there could be a lot of translational aspects to this; it could lead to a new way to create vaccines for other diseases."

De Silva is currently working with Ralph Baric and vaccine developers to try the effectiveness of potential dengue vaccines. Developing an effective Dengue vaccine has been difficult due to the disease phenomenon called antibody dependent enhancement, which enhances a second type of Dengue after a first infection. An enhanced infection may result in a severe, life-threatening Dengue hemorrhagic fever.

Over 40 percent of people around the world are at risk of the Dengue virus while over 100 million are already infected. The disease can cause fever, pain and headache but it can also be a deadly condition where tiny blood vessels start to leak. Flaviviruses are said to be dangerous emerging pathogens.

EPA Introduces New Graphic to Help Consumers Make Informed Choices about Insect Repellents

The U.S. Environmental Protection Agency unveiled a new graphic that will be available to appear on insect repellent product labels. The graphic will show consumers how many hours a product will repel mosquitoes and/or ticks when used as directed.



Chikungunya: A New Virus to Avoid

Chikungunya is the latest virus you probably have never heard of. Carried by a couple of species of mosquito (both of which are found in the United States) and first described in Africa in 1952, the virus causes an abrupt onset of fever and severe joint pain (arthralgia) that may become chronic. Since that time, chikungunya has been found to be widespread in both Africa and Asia, and has now spread to the Caribbean islands and a few states in the U.S.

According to the Pan American Health Organization (PAHO), since 2004 the virus has infected more than two million people in Africa alone. Last year PAHO/WHO reported confirmation of the first cases of chikungunya in the Americas that were not caused by travelers returning from infected areas. This means that the virus has become established in those areas.

And not only has it become established, it appears to be flourishing, if the number of cases is any indication. Again, according to PAHO, in May 2014 there were nearly 56,000 confirmed and suspected cases in the Caribbean. But as of this week, the agency reports nearly 4,600 confirmed and 165,990 suspected cases of the virus — nearly 171,000 cases in all. This represents a three-fold increase in less than a month.

In addition to those reports, cases have also been reported in Puerto Rico, Florida and Virginia — some from local transmissions. As noted above, this virus is carried by mosquitoes which are found in the United States, so it is likely that more cases will be reported.

Get Used to a New Word: Chikungunya

If the rioters don't get you, the mosquitoes will. In a "no good deed goes unpunished" kind of drama, Cassandra Freds of Alma came back from a volunteer mission in Haiti - which she paid for - with a raging case of chikungunya. (This case hasn't been confirmed, as yet.)

"We had mosquito nets, we routinely sprayed (mosquito repellent) morning and night," Freds said.

Two other state residents from Midland and Wexford counties have become infected with chikungunya virus, after traveling to the Caribbean. These cases have been confirmed by the Michigan Department of Community Health.



*7-17-14 - The first case of chikungunya virus infection acquired within the continental U.S. has been reported by the CDC, in a Florida man.

Justin Krick Receives Master Mechanic Certification

Bay County Mosquito Control Mechanic Justin Krick has recently earned Master Mechanic status through the State of Michigan. A Master Mechanic has completed testing to become certified in 8 specialized categories of automobile and light truck repair including: engine repair,



automatic transmission, manual transmission-front and rear drive axle, front end suspension and steering systems, electrical systems, heating and air conditioning, and engine tune-up/performance.

Justin also received Specialty Mechanic certification in the Heavy Duty Truck/Diesel category and will be working to obtain Master status in this category within the next month.

Justin has been employed with Bay County since 2001.



News From Around The Districts

TUSCOLA

Treatment of spring flooded woodlots began on April 14th this year with a few warm days that finally melted the snow and ice. Tuscola County received 7.25 inches of rain in the month of May resulting in a large hatch of floodwater mosquitoes over Memorial Day weekend. Crews have since that time been working overtime and weekends to bring relief. We have made progress as our trap counts are declining. Roadside ditch treatment and treatment of catch basins and sewage lagoons will continue throughout the summer.

The biology department will again submit mosquito pools to MSU for testing. Birds will be tested in house.

So far this season five townships have hosted scrap tire drives with seven more scheduled. TCMA will be hosting a trailer on July 12th. We are very pleased with the Pioneer backpack ULV sprayer that was purchased in June. We plan to use this model going forward as we replace aging equipment.

On May 15th tragedy struck our family here at TCMA as our long time biology technician Len Terbush, was critically injured on his way to work. Len was hit by an SUV while riding his motorcycle on that morning just a quarter mile from our building. Flight care transported him to Hurley hospital where he underwent surgery to remove his left leg. He also had many broken ribs and other injuries. Gratefully he has made progress and is now home with a nurse. He is healing well and will be fitted with a prosthesis as soon as possible. He is greatly missed by all the staff here; we look forward to his return next season.

MIDLAND

Wow, this past wet spring sure is evident when you get outside any of the aerial treatment blocks as high numbers of spring mosquitoes make their presence known. As we try to reduce the numbers it is extremely apparent that Midland County contains a lot of State land with huge breeding potential. Negotiations continue with the Michigan DNR to allow for some aduaticiding of the edges of these State Forest lands to help reduce their impact upon our residents. Special effort will be made to keep you informed of the outcome of these negotiations.

On a cheerier yet sad note Dr. Tom has retired. He will serve as a contracted interim director until Dr. Carl Doud starts August 4, 2014. As many of you know, we had a retirement party at the Midland Brewing Company and had a great turnout. It was great to see many of Tom's friends show up and wish him well. Thank you to all those individuals who made this retirement party very special. Tom will be sorely missed but never forgotten.

As to information about Dr. Doud - he comes to Midland County from the Navy where he served as a Medical Entomologist in the Medical Service Corps and was last stationed in Jacksonville, Florida where he has been doing mosquito research. He was raised in Missouri and received his Ph.D. from Kansas State University. Dr. Doud and his wife have five children. When you get a chance please welcome him to the state of Michigan (he has never lived this far north and experienced a winter like this last one).

The Season has started off with a substantial mosquito nuisance comprised of both spring and summer floodwater mosquitoes resulting from a high water table and substantial rain in May. Heavy nuisance in over two-thirds of the County led to the temporary suspension of personalized yard spraying so our nightly spray operations could focus on community-wide control. Cool and windy nights hindered our nightly control operations disrupting our spray time and additional spray shifts.

Our mosquito-borne disease monitoring program is ongoing with one WNV positive mosquito pool detected in Tittabawassee Township. The variable weather, cool one day, hot the next along with rainfall is hopefully inhibiting West Nile virus amplification. Our annual West Nile virus testing of dead corvids is underway, and trap collected disease vectoring mosquitoes are once again being tested at Michigan State University for a variety of arboviruses. This surveillance along with our urban/suburban larviciding of catch basins and abandoned swimming pools continues to promote Saginaw County's public health.

Our third and final tire drive of the season will be held the week of July 21-25. The hours for this drive will be 1:00pm – 7:30pm to provide the convenience of evening tire drop off. In order to keep our citizens updated about our spray schedule and trapping data they can visit our website at www.scmac.org or follow us on Facebook.

The annual spring woodland-pool treatment program marked the beginning of BCMC's mosquito control season, beginning about a week behind "normal" on April 21. Control efforts included aerial larviciding (42,900 acres) using 2 fixed-wing aircraft (Earl's Spraying Service, Inc.), with the focus on areas near cities, towns and large developments. Based on successful trials conducted in 2012 and 2013, woodlots were treated this year at a 3 lb/acre dosage with an overall average mortality of 93.3%. Spring mosquito species emerged as adults by May 15, but were not much of a problem except for untreated areas in the northernmost portions of the county.

The MDARD inspected our facility in April and deemed the chemical storage building a "bulk storage facility", which means we now have to apply for an annual State permit - at no cost. A detailed drawing was also submitted to show the bulk storage area including drains and capacity to contain a spill.

Most areas of the county have seen average or below-average rainfall for the month of June so we have not had any spikes in floodwater mosquitoes – we know we should not put this on paper as we've probably just jinxed ourselves! We had pockets of *Anopheles* surges along the Saginaw Bay and *Coquillettidia perturbans* numbers are rising as we near the Independence Day holiday.

Throughout the warm weather months, BCMC will continue to treat larval or adult mosquitoes originating from woodlots, floodplains, freshwater wetlands, grassy fields, wet meadows, roadside ditches, ponds, catch basins, as well as containers. We've treated ditches in townships that have received enough rain to trigger a mosquito hatch and been back in woodlots and floodplains treating larvae. The number of complaint calls has been pretty low for the month of June, too.

Two training sessions were held for both new and returning seasonal staff members to prepare them to test with the MDA as certified technicians. MDA staff offered testing at our facility on June 19 so staff that started late would be able to take the test locally, which we appreciated.

Public education efforts continued with information distributed regarding artificial containers and basic homeowner control techniques and presentations were given at Auburn Elementary School.

We continue to monitor for West Nile virus this season by testing American Crows and Blue Jays using the Vector Test kit and by submitting mosquitoes to MSU. Through June 30, we have tested 2 crows that were both negative. Thirty-six mosquito pools containing 891 adult females were also submitted to MSU; the first 22 were negative and the rest are pending.

A few other items of interest: a scrap tire drive was held May 31 with 1,269 tires collected. This tire drive was held concurrently at the Bay County Fairgrounds and Fraser Township Park and the cost of holding the drive will be off-set by a MDEQ \$3,750 Scrap Tire Grant.

Mosquito Surveillance 101

MMCA Hosts Health Departments

MDCH Public Health Training was held in Saginaw in early May. MMCA members assisted the MDCH in training Wayne, Washtenaw, and Macomb County Health Department members on surveillance methods and also provided some traps and disease testing kits. MMCA hopes to be updated on the surveillance results at the end of the season.



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Summer