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UA lab working on new ways to kill mosquitoes

By Dan Sorenson

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It's never too cold to work on new ways of killing mosquitoes in one University of Arizona lab.

Swatting?

Effective, but crude.

The electrostatic zapper, aka "the bug electric chair"?

Disgusting, and of questionable value.

But the bug electric chair sounds like death-by-tickling compared to the termination the UA research team has come up with for the little blood-sucking fiends. Think of it as fatal food poisoning for mosquitoes, and that's pleasant compared to the way UA biochemist Roger Miesfeld describes it.

"Blood meal feeding to the female mosquito is the equivalent of a 135-pound woman drinking a 7-gallon smoothie containing 25 pounds of hamburger meat, a half-pound of butter and two tablespoons of sugar in 10 seconds."

Despite their ravenous appetite for our blood, there's a lot of stuff in there that the little dears have to get rid of before they can enjoy the benefits. Interrupt one of the mechanisms that turn the stuff the skeeters don't use in that blood smoothie into harmless waste and it's mayday, mayday for Ms. Mosquito.

"If mosquitoes cannot detoxify the ammonia (a waste product in the complicated breakdown of blood), they will not survive," said Patricia Scaraffia, an assistant research professor in the Department of Biochemistry & Molecular Biophysics and a member of the Miesfeld Lab.

The female *Aedes aegypti* mosquito, a "vector" — means of transmission — for dengue and yellow fever, is found in Tucson, but there is no pool of infected humans from which it can spread the diseases to other humans, said Scaraffia.

There is a very "small risk" of an outbreak of those diseases in Tucson, but she said the work may be very valuable if an application is found.

"It's important because millions of deaths are caused" every year by mosquito-borne diseases, Scaraffia said.

Scaraffia is the lead author on an article about the work she did with past members and other current members of the Miesfeld Lab for the science journal Proceedings of the National Academy of Sciences.

This isn't just a one-shot deal for the Miesfeld Lab, which continues the work pioneered in the UA lab of Michael A. Wells, a regents professor who died in 2006.

"This was sort of our first big paper since taking over the project" from the Wells Lab group, said Miesfeld.

3 interesting things about mosquitoes

1. Only female mosquitoes suck human blood, using it to produce eggs.
2. A female *Aedes aegypti* mosquito can suck up more than her own weight in blood.
3. Bug zappers may do more harm than good, killing beneficial insects that feed on mosquitoes.

Giving mosquitoes hell is a long-term and highly creative pursuit around Miesfeld's lab, which is operating under a \$1.7 million National Institutes of Health grant.

The goal is to find one or more new ways to end the reproduction of this flying insect delivery system that brings malaria, dengue and yellow fever and West Nile virus, and other diseases, to humans.

But sometimes the work involved sounds downright macabre.

While investigating the triggers that cause a mosquito to deal with the bad stuff in our blood, another group of the lab's researchers discovered there were physiological ways they could make a mosquito express certain genes related to handling blood.

"Surprisingly, we found that abdomen ligation (a technical term for choking or strangling) 30 minutes post-feeding, or decapitation before feeding followed by a protein enema, was sufficient to induce LT gene expression," said a report on that project.

The research on interrupting the mosquito digestive system may be put to use by other researchers and even have commercial applications one day, Miesfeld said.

Among other possibilities that Miesfeld said have been considered for controlling disease-transmitting mosquitoes is producing a line of lab-bred mosquitoes with a special gene that produces a pathogen to kill the viruses.

But, he said, that approach has its problems.

"Do we breed hundreds of millions of these mutant mosquitoes and try to replace (the natural mosquito population) with the Frankenskeeter? It's going to be a long time until they let the U.S. come in and release 100 million mosquitoes," Miesfeld said.

He said one solution employing the UA lab's digestion-interruption work might be a pill that people living in dengue fever or yellow fever areas could take, having no effect on them but poisoning mosquitoes that dined on their blood.

The work is expected to continue through 2011 under the NIH grant, Miesfeld said.

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