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# Mosquitoes fatally attracted to deadly, sweet-smelling potion

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Anopheles gambiae mosquito, feeding on blood. Credit: James Gathany, Centers for Disease Control and Prevention

Mosquitoes aren't just blood thirsty. They also have a sweet tooth, relying on plant nectar to get the sugar they need to survive. Exploiting

this weakness, scientists have developed an environmentally friendly eradication method. The new, inexpensive technique tricks these annoying pests into gorging themselves on insecticides laced with a concoction that mimics the sweet-smelling scents and aromas that they find irresistible. It could bolster efforts to suppress malaria, Zika and other mosquito-borne diseases worldwide.

The researchers are presenting their work today at the 254th National Meeting & Exposition of the American Chemical Society (ACS). ACS, the world's largest scientific society, is holding the meeting here through Thursday. It features nearly 9,400 presentations on a wide range of science topics.

"The blend of chemicals that we use to attract mosquitoes is so powerful that they will ignore natural plant odors and attractants in order to get to our formulation," says Agenor Mafra-Neto, Ph.D. "From a mosquito's point of view, it's like having an irresistible chocolate shop on every corner. The product is so seductive that they will feed on it almost exclusively, even when it contains lethal doses of insecticide."

Conventional chemical insecticides used to control mosquitoes are used as cover sprays, frequently dispersed over wide areas. But this blanket spray approach exposes people and animals to potentially harmful compounds and can kill bees and other beneficial insects. In addition, residues of these sprays can contaminate soils and streams, as well as promote increased pesticide resistance. To overcome these issues, Mafra-Neto of ISCA Technologies and colleagues at several universities sought to create a more targeted approach using an insecticide potion spiked with a blend of semiochemicals, or chemical signals, that mosquitoes can't resist.

They collected the scent of flowers and other plants that produce nectar. Then, they used gas chromatography-electroantennographic detection

(GC-EAD) to separate and identify the odorous compounds within them. They exposed mosquito antennae to thousands of these compounds to determine which ones might have a biological effect. They also carefully eliminated any scents or aromas that also might attract bees. Ultimately, they used a semiochemical blend in a matrix containing sugars and proteins to mimic 20 common chemical signals that attract mosquitoes to nectar-producing flowers and induce them to feed. Combining these compounds with insecticides such as pyrethroids or spinosad led to highly effective formulations.

The resulting product, which is called Vectrax®, is a slow-release formula for use indoors or outdoors. It can be applied as a spray, which produces 1- to 5-millimeter dollops on vegetation or building eaves, or as a semi-solid, caulk-like gel on cracks or holes in outdoor structures. Because the mosquitoes visit and manipulate the dollops, they receive precise doses of the insecticide, and thus are more effectively controlled. Unlike with traditional blanket sprays, nearby surfaces can remain insecticide free.

The researchers are conducting field tests in Tanzania, an African nation where 93 percent of the population is at risk for malaria. In preliminary results, they found that mosquito populations plunged by two-thirds in just two weeks in Vetrax-treated communities compared to untreated ones.

"If the trend continues like this, we expect that the *Anopheles* malaria mosquito population will soon be collapsing down to nearly zero in the treated villages," Mafra-Neto says. He hopes to have more data available from these trials soon.

While Mafra-Neto acknowledges that mosquitoes play a small role in the food chain, helping sustain small animals like fish and spiders, he would like to see fewer of them around, particularly in disease-ravaged

countries. The same goes for ticks, which like mosquitoes, transmit deadly diseases. He also hopes to corral them using a similar attract-and-kill technique.

"I truly hate mosquitoes and ticks," he says. "Imagine: Maybe one day we will be able to go into our backyards or parks and not have to worry about being bothered by either of them."

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