

Scientists discover how mosquitoes zero in on our sweat

March 29 2019, by Joann Adkins



The head of an *Aedes aegypti* female mosquito. Credit: Alex Wild

Just like fresh-baked cookies or sizzling bacon is to us, the scent of your sweat is a mouthwatering aroma to mosquitoes. Now, scientists have discovered how these undesirable insects zero in on our delectable odor.

It's actually the odor from [lactic acid](#) and other acidic volatiles found in human sweat that some [mosquitoes](#) are attracted to when seeking a blood meal. A team of researchers from the Laboratory of Tropical Genetics at Florida International University in Miami, has identified a unique olfactory receptor used to detect these odors in *Aedes aegypti* mosquitoes, which are known to transmit dangerous and sometimes deadly diseases including yellow fever, dengue and Zika. The guilty receptor is known to scientists as Ionotropic Receptor 8a, or simply IR8a.

"People have been looking for more than 40 years," said FIU biologist Matthew DeGennaro, who leads the lab where the discovery was made. "Even in the 1960s, scientists knew it was sweat and lactic acid, but no one knew how those were sensed. Back then, mosquito scientists didn't have genetics."

DeGennaro made genetics history in 2013 when he created the first-ever mutant mosquito as a post-doctoral researcher in Leslie Vosshall's laboratory at The Rockefeller University. He was able to remove a gene and investigate how the absence of that gene changed the mosquito's behavior.

Since that time, he has worked with countless mutants in a process of elimination until he and his team landed on IR8a. DeGennaro had a hunch and tasked his Ph.D. student Joshua Raji with investigating the receptor. The scientists mutated the receptor in mosquitoes and, in several experiments, found IR8a mutants struggled to pick up the desired aroma of lactic acid and could not detect other acidic components of human odor. They were still able to detect CO₂ and heat, which people

emit, but their inability to smell a person's acidic volatiles left more than half uninspired to feed.

Raji's first test was on his own arm—first wild-types and then mutants. His scent was popular among the wilds, but not a single mutant took an interest in the first four minutes of exposure.



Ph.D. Student Joshua I. Raji. Credit: Florida International University

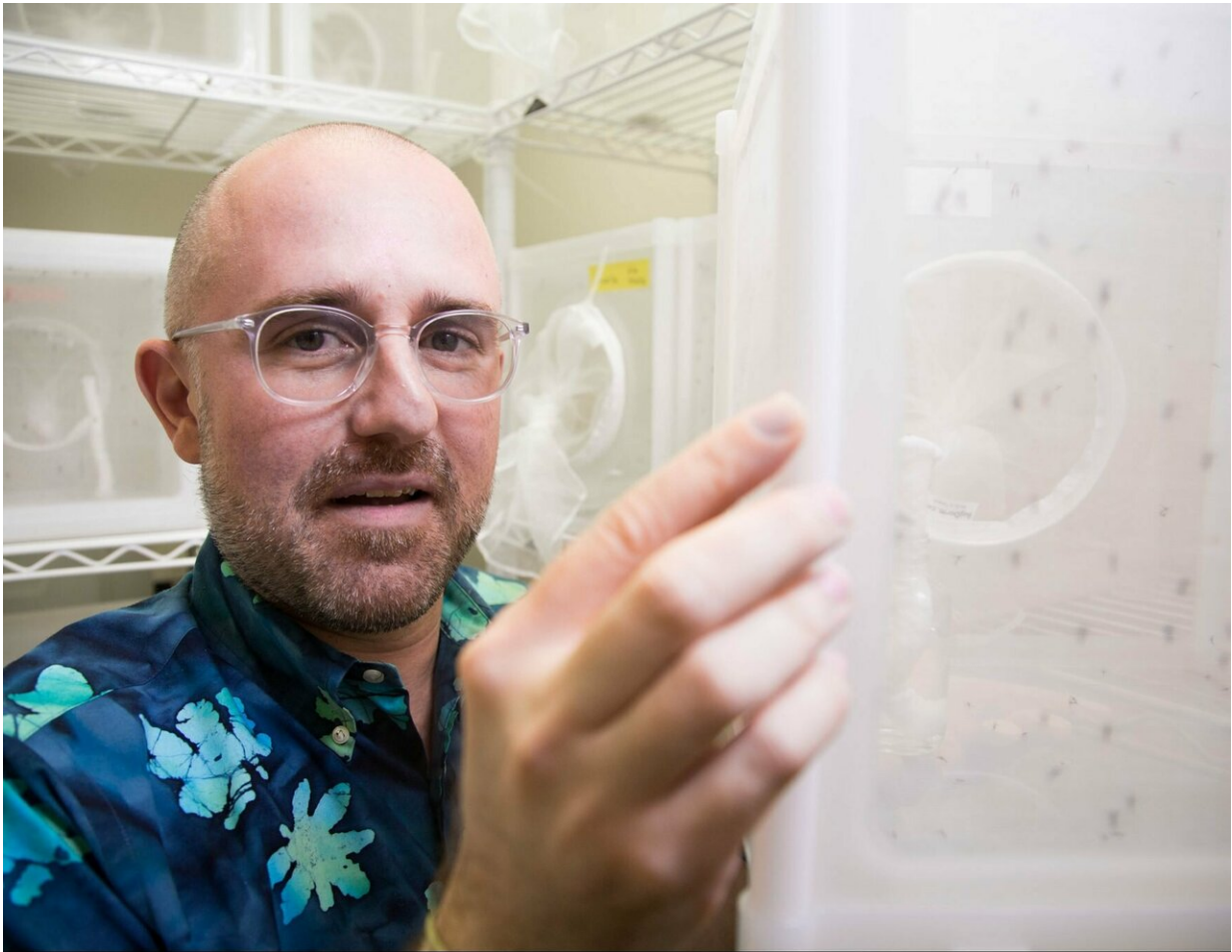
"I knew at that moment, this is it. This is real," said Raji, who has dealt with his own bouts of Malaria while growing up in Nigeria and whose wife recently recovered from the mosquito-borne disease.

He repeated the test on 14 additional subjects. The results were the same. Not only did IR8a play a role in a mosquito's ability to detect a person's acidic volatiles—it is significant and necessary. There are no redundant [receptors](#) that can perform the same function.

The FIU team's discovery could give rise to a new generation of attractants to lure adult mosquitoes to traps for population control. It also offers researchers a roadmap for making people invisible—at least to mosquitoes.

"Blocking the IR8a pathway could be an important strategy for repellent design," DeGennaro said.

"Removing the function of this receptor removes approximately 50 percent of the host-seeking activity. Odors that mask the IR8a pathway could be found to enhance the effectiveness of current repellants like DEET or picaridin."



Biologist Matthew DeGennaro. Credit: Florida International University

The team is beginning chemical screens in an effort to disrupt the IR8a pathway. DeGennaro's ultimate goal is to create a life-saving perfume to protect people from mosquito bites.

The research, which was published today in [*Current Biology*](#), was supported by the National Institute of Allergy and Infectious Diseases of the National Institutes of Health and by the Centers for Disease Control and Prevention's Southeastern Center of Excellence in Vector Borne Diseases.

More information: Joshua I. Raji et al. *Aedes aegypti* Mosquitoes Detect Acidic Volatiles Found in Human Odor Using the IR8a Pathway, *Current Biology* (2019). [DOI: 10.1016/j.cub.2019.02.045](https://doi.org/10.1016/j.cub.2019.02.045)

Provided by Florida International University

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