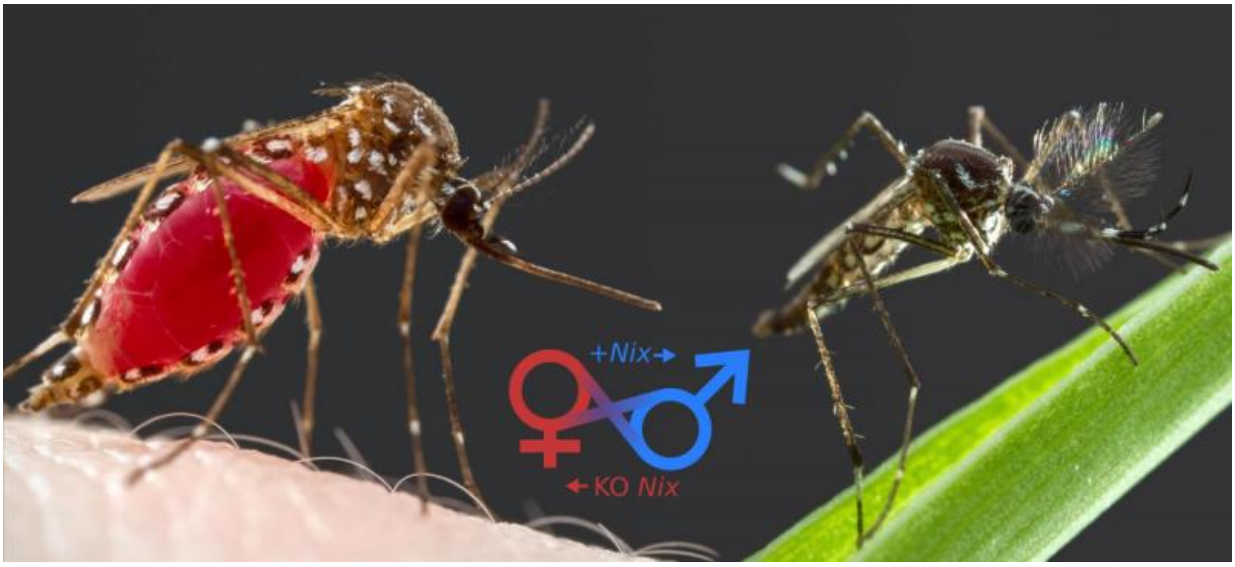
Mosquito sex-determining gene could help fight dengue fever

May 21 2015



Virginia Tech scientists identify a genetic switch called Nix in Aedes aegypti mosquitoes that underlies the difference between males and females. Credit: Alexander Wild

Males aren't relevant—at least when it comes to disease transmission by mosquitoes.

Researchers with the Fralin Life Science Institute at Virginia Tech have identified a gene responsible for sex determination in mosquitoes that can transmit yellow fever, dengue, and chikungunya viruses.

Only female mosquitoes bite because they need blood for developing eggs, and researchers believe that a higher ratio of males could reduce disease transmission.

In a study published in the *Science Express* today, the scientists identify a genetic switch called Nix in *Aedes aegypti* mosquitoes that underlies the difference between males and females.

These master switches often reside in genomic black holes, which is why none had been found in mosquitoes or other insects before.

"Nix provides us with exciting opportunities to harness mosquito sex in the fight against infectious diseases because maleness is the ultimate disease-refractory trait," said Zhijian Jake Tu, a professor of biochemistry in the College of Agriculture and Life Sciences and a Fralin Life Science Institute affiliate.

The scientists injected Nix into mosquito embryos and found more than two-thirds of the female mosquitoes developed male genitals and testes.

When they removed Nix using a genome-editing method known as CRISPR-Cas9, male mosquitoes developed female genitals.

The study provides the foundation for developing mosquito control strategies by converting females into harmless males or selectively eliminating deadly females.

"We're not there yet, but the ultimate goal is to be able to establish transgenic lines that express Nix in genetic females to convert them to harmless males," said Zach Adelman, an associate professor of entomology in the College of Agriculture and Life Sciences and a Fralin Life Science affiliate.

Aedes aegypti is an invasive species originally from Africa that first began to spread around the world by ship in the 1700s. This species is a major health problem because it is highly adapted to human environments. *Aedes aegypti* is among the small fraction of mosquito species that transmit pathogens to humans.

"Targeted reduction of *Aedes aegypti* populations in areas where they are non-native could have little environmental impact, and drastically improve human health," said Brantley Hall, a Ph.D. student in Tu's lab and co-first author on the paper, together with Sanjay Basu, a postdoctoral associate in Adelman's lab.

More information: A male determining factor in the mosquito *Aedes aegypti*, www.sciencemag.org/lookup/doi/ … 1126/science.aaa2850

Provided by Virginia Tech

Citation: Mosquito sex-determining gene could help fight dengue fever (2015, May 21) retrieved 1 May 2024 from https://phys.org/news/2015-05-mosquito-sex-determining-gene-dengue-fever.html