

New way to control disease-spreading mosquitoes: Make them hold their urine

March 3 2010



This image shows a section of a renal tubule from an adult female mosquito (*Aedes aegypti*). The arrows indicate cells that stain positive for expression of a protein that promotes urination as the mosquitoes feed on blood.

Cornell researchers have found a protein that may lead to a new way to control mosquitoes that spread dengue fever, yellow fever and other diseases when they feed on humans: Prevent them from urinating as they feed on blood.

The work may lead to the development of new [insecticides](#) to disrupt the mosquito's renal system, which contributes to a mosquito's survival after feeding on blood.

Aedes aegypti mosquitoes transmit the virus that causes dengue fever, putting 40 percent of the world's population at risk of catching the

disease, and causing 50 million to 100 million infections (22,000 deaths) annually. They pick up diseases when feeding on infected hosts and can then infect new hosts when they feed again. Currently, no vaccine or treatment protects against dengue, so the only way to stop its spread is by controlling mosquitoes.

But now, a Cornell study published in the March 4, 2010 issue of the [American Journal of Physiology - Regulatory, Integrative and Comparative Physiology](#) has identified a protein from the renal tubules of *Aedes aegypti* mosquitoes that appears to be involved in promoting urination as they feed on blood. When mosquitoes consume and process blood meals, they must urinate to prevent fluid and salt overloads that can kill them.

Also, "they have to undergo rapid urination when feeding, or they can't fly away," said Peter Piermarini, the paper's lead author and a postdoctoral research associate in the lab of Klaus Beyenbach, a professor of biomedical sciences in Cornell's College of Veterinary Medicine and the paper's senior author. "Too much weight will impair the mosquito's flight performance, like an aircraft with too much payload. [If they get too heavy,] they may become more susceptible to being swatted by their host or eaten by a predator," said Piermarini.

The researchers discovered a key protein expressed in the mosquito's renal system that contributes to urination. In lab experiments, Piermarini, Beyenbach and colleagues demonstrated that blocking the protein's function in the renal tubules with a drug reverses the enhanced rates of urination that would occur during blood feeding.

"Thus, blocking the function of this protein in natural populations of [mosquitoes](#) may limit their ability to survive the physiological stresses of a blood meal and to further transmit viruses," said Piermarini.

The *Aedes aegypti* renal system also serves as a valuable model for parts of the mammalian kidney, with similar cells in each system and possibly similar proteins, said the authors.

Provided by Cornell University

Citation: New way to control disease-spreading mosquitoes: Make them hold their urine (2010, March 3) retrieved 2 June 2023 from <https://phys.org/news/2010-03-disease-spreading-mosquitoes-urine.html>

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