Discovery could lead to attack on mosquito-borne disease

April 10 2008

A female Aedes aegypti mosquito obtains a "blood meal." The A. aegypti mosquito is the primary vector for dengue and yellow fevers.

Cornell researchers have identified a mating mechanism that possibly could be adapted to prevent female mosquitoes from spreading the viruses that cause dengue fever, second only to malaria as the most virulent mosquito-borne disease in the tropical world.

Specifically, they have discovered 63 proteins that male mosquitoes transfer to Aedes aegypti females during mating and are thought briefly to change the females' physiology and behavior, in particular suppressing the female's appetite for mammalian blood.

In a study published in the journal *Insect Biochemistry and Molecular*

Biology, the Cornell researchers report that the proteins in the seminal fluid of the males also trigger a loss of sexual appetite in the females, stimulate egg production and influence clotting of the blood she has ingested.

The findings could lead to novel strategies to prevent the spread of dengue as well as mosquito-borne yellow fever viruses. "This is a new angle in our fight against vector-borne disease," said Laura Harrington, Cornell associate professor of entomology and the paper's senior author.

Dengue affects 50 million people annually, and two-thirds of the world's population is at risk. In the past year, it has reached epidemic levels in Asia, South and Central America and Mexico, where the number of dengue cases has increased by more than 300 percent from a year earlier. No dengue vaccine is available, and no treatment exists beyond supportive care.

Laura Sirot, a postdoctoral researcher in molecular biology and genetics, is the paper's lead author, and Mariana Wolfner, Cornell professor of molecular biology and genetics, also is a co-author. The work builds on Wolfner's work on the reproductive biology of fruit flies.

The next step, said Harrington, is to isolate, identify and verify the targets of the mosquito proteins that regulate such key post-mating behaviors as reduced sexual drive or lack of appetite for blood; also, to manipulate such physiological responses as increased egg production. Eventually, the researchers hope that this knowledge will lead to new ways to control mosquitoes that spread disease. This could involve the identification of highly specific chemicals that affect these newly discovered reproductive proteins, or potentially could inform experiments on the use of genetically modified mosquitoes with knocked out (or turned off) genes or modified reproductive behaviors.

Source: Cornell University