# Proteins from male insects affect female behavior

February 23 2011, By Lauren Gold


Research by Mariana Wolfner and colleagues shows that male and female insects continue to influence each other on molecular, cellular and physiological levels - even after the partners go their separate ways.

(PhysOrg.com) -- For insects, as for humans, mating can involve complicated interactions between males and females, with each partner engaging in rituals or behaviors that influence the other.

Those behaviors often end once the mating is complete. But research by Mariana Wolfner, Cornell professor of molecular biology and genetics, and colleagues shows that male and female insects continue to influence each other on molecular, cellular and physiological levels -- even after the partners go their separate ways.

Wolfner spoke on "Seminal influences: How Proteins Transferred by Mating Males Affect Reproduction and Behavior of Female Fruit Flies," at the annual meeting of the American Association for the Advancement

of Science Feb. 21 in Washington, D.C.

Molecules transferred from male to female fruit flies (*Drosophila melanogaster)* during mating cause a variety of changes in the female long after the male has left the scene, Wolfner said -- in some cases working in a kind of cooperative molecular ballet; and in other ways boosting the male's competitive advantage against rivals in a microscopic battle among the sexes.

Understanding each of those interactions better, she said, could lead to new ways of curtailing reproduction in harmful insects, or boosting it in beneficial ones. The research could also help answer key questions about chemical communication and evolution across species.

After a male and female fruit fly mate, the female undergoes a series of changes that not only improve her chances of reproductive success, but also boost the male's chances of out-propagating his potential competitors. Among these changes: mated females have increased appetites and produce more antimicrobial peptides, which kill microbial and fungal invaders; their reproductive tracts open to allow entry and storage of sperm; and they show more resistance to mating attempts by other males.

To pinpoint the causes, Wolfner and colleagues removed individual elements in the mating process and tested the females' reactions. They first narrowed the cause down to seminal fluid proteins manufactured in the male flies' accessory gland; then removed individual proteins one by one to match specific molecules and responses.

The intermolecular dialogue is vital for reproduction in general; but it also serves functions that benefit the male and female individually, Wolfner said, sometimes at the potential expense of the other. A mated female that resists mating with other males is more likely to propagate

her first partner's genes, for example; but she may lose out by having fewer offspring overall. The same could happen if the interaction causes her to produce more eggs, increasing progeny for the male but potentially shortening the female's lifespan.

Ultimately, Wolfner said, knowledge gained by studying Drosophila could help researchers find ways to control insects that transmit devastating diseases, including dengue fever, West Nile encephalitis or malaria.

"One way to address the spread of these diseases is to impede the ability of their insect vectors to reproduce. By understanding the molecules that enhance or impede reproduction in Drosophila fruit flies, we gain information that can help to do that," she said.

Provided by Cornell University