Study finds courtship affects gene expression in flies

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Biologists at Texas A&M University have made an important step toward understanding human mating behavior by showing that certain genes become activated in fruit flies when they interact with the opposite sex.

Their research, published in the January 2011 issue of the journal *Genetics*, shows that courtship behaviors may be far more influenced by genetics than previously thought. In addition, this new understanding as to why and how these genes become activated within social contexts may also lead to insight into disorders such as autism.

"Be careful who you interact with," said Dr. Ginger E. Carney, associate professor of biology and co-author of the study. "The choice may affect your physiology, behavior and health in unexpected ways."

To make this discovery, Carney and a student in her laboratory, Lisa L. Ellis, compared gene expression profiles in males that courted females, males that interacted with other males and males that did not interact with other flies. The investigators identified a common set of genes that respond to the presence of either sex. They also discovered that there are other genes which are only affected by being placed with members of a particular sex, either male or female. The researchers then tested mutant flies that were missing some of these socially responsive genes and confirmed that these particular genes are important for behavior.

Carney and Ellis predict that analyzing additional similar genes will give

further insight into genes and neural signaling pathways that influence reproductive and other behavioral interactions.

"This study shows that we're closing in on the complex genetic machinery that affects social interactions," said Mark Johnston, editor-in-chief of *Genetics*. "Once similar genes are identified in humans, the implications will be enormous, as it could bring new understanding of, and perhaps even treatments for, a vast range of disorders related to social behavior."

Carney, who joined the Texas A&M Department of Biology faculty in 2004, earned her Ph.D. in genetics from the University of Georgia in 1998. She held positions as a postdoctoral researcher at Oregon State University (1998-2002) and as a faculty research scientist at Georgia Institute of Technology (2002-2004) prior to coming to Texas A&M, where her research focuses on the fruit fly Drosophila melanogaster and its genetic control of behavior and nervous system development.

Ellis earned her doctorate in biology from Texas A&M in August and now works as a research assistant in the Texas A&M Department of Entomology affiliated with Texas AgriLife Research.

Because fruit flies undergo many of the same developmental processes as larger creatures, including humans, Carney said they serve as model organisms, allowing researchers to observe details that can't necessarily be seen in more complex animals. Through this study and her future research, she hopes to learn more about how individual genes regulate behaviors from mating to central nervous system function in humans.

More information: Lisa L. Ellis and Ginger E. Carney, Socially-Responsive Gene Expression in Male Drosophila melanogaster Is Influenced by the Sex of the Interacting Partner, *Genetics* 2011 187: 157, January 2011. www.genetics.org/cgi/content/abstract/187/1/157

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