Courtship pattern shaped by emergence of a new gene in fruit flies

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When a young gene known as sphinx is inactivated in the common fruit fly, it leads to increased male-male courtship, scientists report in the May 27, 2008, issue of the *Proceedings of the National Academy of Sciences*.

High levels of male-male courtship are widespread in many fly species, but not in Drosophila melanogaster, the tiny insect that has been a mainstay of genetic research for more than a century.

In 2002, the research team of Manyuan Long, professor of ecology and evolution at the University of Chicago, and colleagues discovered that D. melanogaster possessed the sphinx gene--and other fly species did not.

In order to study the function of this two million-year-old gene, Hongzheng Dai and Ying Chen--former graduate students in Long's lab and first authors of this study--created flies with a suppressed version of the sphinx gene, which is expressed in male reproductive glands. Loss of the gene produced no apparent changes.

"The flies looked normal," Long said. But when the researchers put two males that lacked the sphinx gene together, they noticed that the males were "interested in other males."

They repeated the experiment many times, Long said. It consistently produced the same results. Males without sphinx pursued each other more than 10 times longer than did males with a working copy of the

gene. They performed all stages of normal male-female courtship--orienting, tapping, singing, licking, attempting--except for copulating.

"Male-male courtship might have been common in the ancestral D. melanogaster population," Long said. "Sphinx appears to have evolved to reduce this in one single species." By silencing this gene, the researchers may have generated an ancestral genotype that existed before sphinx originated.

D. melanogaster separated from related species about three million years ago, the researchers say. Male-male courtship could have been common among the fly's ancestors before that separation up to at lease 25-30 million years ago.

"Species that don't have this gene show more male-male courtship behavior than those that do have it," Long said. "The absence or presence of the sphinx gene appears to regulate the diversity of male-male courtship behavior among flies. This suggests that the genetic control of male courtship is an evolving system, which can recruit new genetic components and change courtship behaviors."

"This is the genetic interpretation," Long said. "Of course other factors, like the environment, are also likely to have an influence."

The scientists also noticed that groups of males without a working copy of sphinx tended to behave differently, often forming chains of flies positioned behind each other. This is a typical male-male courtship behavior, Long said, not seen in male-female relations.

Female flies without sphinx, on the other hand, did not show any changes in reproductive behavior compared to females with sphinx. This is not surprising, the authors say, since the sphinx gene is not expressed

in female reproductive tissues.

Normal females were not able to attract the attentions of sphinxless males, which were more interested in each other than in females. But when these males could not complete the copulation process with other males, they would return to the females, Long said.

"Sphinx is not a protein-coding gene, but an RNA gene," Long said. "So, the question is: How do RNA genes interact and regulate other genes" We are exploring this in our lab."

Source: University of Chicago

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