Fruit flies help scientists uncover genes responsible for human communication

June 26 2014

Drosophila sp fly. Credit: Muhammad Mahdi Karim / Wikipedia. GNU Free Documentation License, Version 1.2

The evolution of language in humans continues to perplex scientists and linguists who study how humans learn to communicate. Considered by some as "operant learning," this multi-tiered trait involves many genes and modification of an individual's behavior by trial and error. Toddlers acquire communication skills by babbling until what they utter is rewarded; however, the genes involved in learning language skills are far from completely understood. Now, using a gene identified in fruit flies by a University of Missouri researcher, scientists involved in a global consortium have discovered a crucial component of the origin of language in humans.

"One effective way of uncovering the root of language development is to study language impairment disorders that are genetically-based," said Troy Zars, associate professor of biological sciences in the College of Arts and Science at MU. "By isolating the genes involved, we can uncover the biological basis of human language. In 2007, our team discovered that a gene in the fruit fly genome was very similar to the human version of the Forkhead Box P (FoxP) gene and in our latest study, we have determined it is a major player in behavior-based, or operant, learning."

In 2010, Zars presented his findings at the Dahlem Colloquium Seminar Series supported by the Freie Universität and the Max Plank Institute for Molecular Genetics in Berlin. There, he met with Bjoern Brembs, professor of neurogenetics at the University of Regensburg; Constance Scharff, professor of biology at the Freie Universität Berlin; and Juergen Rybak, group leader of evolutionary neuroethology at the Max Plank Institute for Chemical Ecology. They formed a consortium together with Ezekiel Mendoza, Julien Colomb, and Hans-Joachim Pflueger to examine operant learning in fruit flies.

The researchers studied flies in which the FoxP gene had been modified. In a learning experiment that comes as close to simulating human language learning as possible, flies had to try different movements with their flight muscles in a custom-built flight simulator to learn where to fly and where not to fly. The flies were trained to avoid flying in one direction, forcing them to try different steering maneuvers.

The team found that flies with a compromised FoxP gene failed in the task, while flies with the uncompromised gene did well and learned their movements. This learning deficit is conceptually similar to human patients with FoxP mutations, where communication is altered. Subsequent tests revealed a change in the structural makeup of the flies' brains indicating that operant learning depends on the function of this gene to develop normally.

These discoveries suggest that one of the roots of language can be placed 500 million years ago to an ancestor who had evolved the ability to learn by trial and error, the team said.

"Identification of this characteristic in flies provides a starting point in understanding the genes involved in trial-and-error-based learning and communication across species," Zars said. "These findings should help in understanding how genetic bases of communication deficits arise in humans."

The study, "*Drosophila* FoxP mutants are deficient in operant self-learning," was published in *PLOS One*.

Provided by University of Missouri-Columbia

Citation: Fruit flies help scientists uncover genes responsible for human communication (2014, June 26) retrieved 24 April 2024 from https://phys.org/news/2014-06-fruit-flies-scientists-uncover-genes.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.