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Fly eyes help researchers 'see' new proteins involved in memory

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With more than 1,500 eyes, not much escapes the fruit fly's sight. Now, a new research report in the journal *Genetics*, describes how researchers from the United States and Ireland used those eyes to "see" new proteins necessary for memory. In addition to shedding light on this critical neurological process, the study also provides information on a form of mental retardation in humans.

"Understanding translational control mechanisms in the brain teaches us how the brain learns and adapts, and will inform the design of treatments for specific types of neurologic disease," said Dr. Anne-Marie Cziko, at the University of Arizona and co-author of the study.

Specifically, the scientists found that the "fragile X mental retardation protein," which plays a crucial role in the cellular processes involved in learning and memory, needs five other proteins to function normally. The scientists identified these proteins using an artificial system of increasing fragile X mental retardation protein in the eyes of fruit flies. Its high level leads to visible deformities in a fly's eyes. To test the requirement of various candidate proteins for function of the fragile X mental retardation protein, the researchers genetically modified the flies to prevent them from making each candidate protein. They found that loss of any one of the five proteins caused the fruit fly's eye to be significantly less deformed, revealing that each is required for function of the fragile X mental retardation protein.

Because previous work suggested that the fragile X protein regulates

gene expression via an important group of small RNAs called "microRNAs," the scientists tested whether the proteins they identified were required for a specific microRNA named "bantam" to function in fruit flies. The researchers performed these experiments by removing copies of the identified proteins from the fly. Instead of looking at the flies' eyes, the researchers looked inside the flies using a fluorescent protein that indicates how well bantam is functioning. The investigators were surprised to find that none of the five proteins identified in the study had an effect on bantam. Even more surprisingly, neither did the fragile X mental retardation protein.

This finding and the identification of the five new proteins that interact with the fragile X mental retardation protein give new insight into additional and alternative functions of fragile X mental retardation protein. They also indicate the need for more study into the fragile X mental retardation protein's function itself.

"Any college student on the eve of final exams will tell you that truly understanding—and possibly manipulating—how our brains store information is the 'Holy Grail' of neurological research," said Mark Johnston, Editor-in-Chief of the journal *Genetics*. "Although college students are advised to continue hitting the books, this area of research holds tremendous promise for millions or people with neurological diseases and disabilities, as well as for those with learning disorders."

More information: Anne-Marie J. Cziko, Cathal T. McCann, Iris C. Howlett, Scott A. Barbee, Rebecca P. Duncan, Rene Luedemann, Daniela Zarnescu, Konrad E. Zinsmaier, Roy R. Parker, and Mani Ramaswami; Genetic Modifiers of dFMR1 Encode RNA Granule Components in Drosophila *GENETICS* 2009 182: 1051: www.genetics.org/cgi/content/abstract/182/4/1051

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