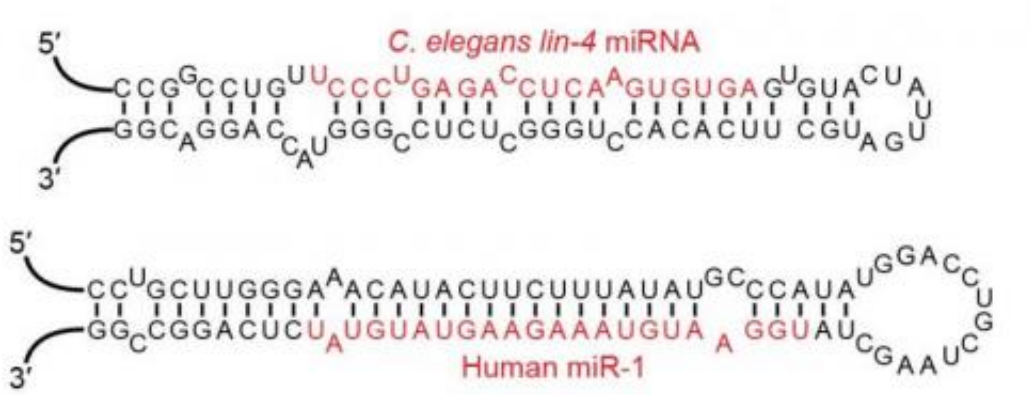
Scientists identify a memory suppressor that may play a role in autism

February 11 2016



Examples of miRNA stem-loops, with the mature miRNAs shown in red. Credit: Wikipedia

Discovered only in the 1990s, microRNAs are short molecules that work within virtually all cells. Typically, each one functions as a "dimmer switch" for the expression of one or more genes, regulating a wide variety of cellular processes, including learning and memory.

In a new study published in the February 11, 2016 issue of the journal *Cell Reports*, scientists from the Florida campus of The Scripps Research Institute (TSRI), working in collaboration with scientists from the University of California, Irvine, show that one specific microRNA has strong links to a number of neuropsychiatric disorders, including autism spectrum disorder.

The microRNA, known miR-980, serves as a memory suppressor in multiple brain regions of *Drosophila*, the common fruit fly, a widely recognized substitute for human memory studies.

"We wanted to know what happens to behavior when we change the levels of these microRNAs," said Ron Davis, chair of TSRI's Department of Neuroscience. "When we reduced the level of miR-980, the flies had better memory—that's something new and surprising."

Davis noted that this specific microRNA regulates neuronal excitability—the nerve's capacity for firing—and inhibiting it increased both memory acquisition and stability.

Next, Davis and his colleagues tried to uncover which genes miR-980 regulates, identifying 95 specific targets that might fit that bill. Intriguingly, they found that miR-980 targets and inhibits a gene known as A2bp1. This gene previously had been shown to be involved in susceptibility to autism. In addition, it works to promote memory.

"A2bp1 has been shown to be associated with autism spectrum disorder in humans," said Research Associate Germain Busto, co-first author of the study with Research Associate Tugba Guven-Ozkan. "We discovered that when A2bp1 was overexpressed, it improved memory and that miR-980 also affected memory when artificially modulated. This offers a powerful model describing the gene network potentially underlying autism spectrum disorder."

"Linking this microRNA to a disease-linked gene may help us to uncover even more nervous system dysfunctions," added Guven-Ozkan.

Davis speculated that the different neuronal networks that form due to varying levels of A2bp1 may account for the range of intellectual abilities observed in autism spectrum disorder in the fly model.

"But the fact that A2bp1 plays an influential role in autism and epilepsy in people brings a real human connection to the study," Davis said. "It's very exciting."

Provided by The Scripps Research Institute