Fruit fly 'hibernation' linked to single important gene

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University of Toronto at Mississauga scientists have isolated a gene responsible for whether or not fruit flies ‘overwinter’ – that is, whether they will stop reproducing and go into a rest state as days get shorter – uncovering new data that could impact research in fields ranging from agriculture to medicine. Their work was published today in the *Proceedings of the National Academy of Sciences*.

Karen D. Williams, a Ph.D student in biology at the University of Toronto at Mississauga, with professor Marla Sokolowski, Canada Research Chair in Genetics and her team, crossed overwintering fruit flies from the Windsor, Ontario area to flies from the southern states, and found a gene responsible for the arrested development trait. The same gene is also involved in insulin-signalling, a process linked to diabetes and obesity in humans.

Fly overwintering is also known as diapause, a temporary halt in reproduction or development, and is also found in other insects, animals and plants. During diapause the organism goes into ‘sleep mode’ in biochemical reaction to a change in surroundings.

“Arrests in development are widespread – insects enter diapause, animals hibernate, some worms form dauer larvae,” says Sokolowski, “but little is known about the genes and cellular mechanisms involved.”

The discovery is particularly important because it is another example in a growing body of literature that suggests that individual genes can be

responsible for major variations in adaptive traits. This data, showing the large effect of a single gene, counters a popular early genetic model that suggests that all naturally varying traits in populations exist due to the accumulation of the small effects of hundreds of genes over time.

“The genetic analysis that’s done in the paper is actually very difficult to do because we didn’t break the DNA and make mutants, we looked at normal differences in animals found in nature. That’s part of the reason it’s an exciting paper,” says Sokolowski. “We’re finding a gene for normal individual differences that are out there in the real world.”

The team’s finding is also exciting for its potential to help develop new agricultural or medical techniques. Understanding of insect diapause is important for the use of biological control agents in farming, for the genetic modification of plant crops to resist infestation, and for manipulation of arrested cells in mammals. The genetic discovery may also be a doorway to new understandings of human seasonal disorders involving metabolism and food intake.

Source: University of Toronto