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'Drunk' fruit flies could shed light on genetic basis of human alcohol abuse

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Fruit flies get ‘drunk’, just like humans, when exposed to large amounts of alcohol and may in future help to explain why some people are genetically predisposed to alcohol abuse.

Humans and fruit flies respond to alcohol in a very similar way at the gene level, according to a study published today in the open access journal Genome Biology. The researchers show that, in the fruit fly, the expression of many genes is modified by exposure to alcohol, and that mutations in some of these genes affect the flies’ sensitivity to alcohol. Many of the genes analysed are also found in humans and the authors of the study conclude that studies in the fruit fly Drosophila could shed light on the genetic basis of human response to alcohol, including the susceptibility to alcohol abuse.

Tatiana Morozova, Robert Anholt and Trudy Mackay, from North Carolina State Univeristy, USA, analysed the activity of all Drosophila genes after exposure to alcohol. Using microarray analysis, a technique that enables to measure gene expression levels, they compared the gene expression levels in flies before they were exposed to ethanol, directly after exposure and two hours after exposure.

The results of Morozova et al.’s study show that one single exposure to ethanol is enough to modify the expression of some genes in the fruit fly. Morozova et al. identified a total of 582 genes whose expression is modified by exposure to ethanol. Some of these genes are down-regulated, while others are up-regulated, and a different set of genes is

up-regulated as the flies become more tolerant to alcohol. Such genes include genes involved in biosynthesis and the regulation of fatty acid metabolism. “Alcohol-induced fatty acid biosynthesis is well documented in [human] heavy drinkers”, write the authors. “The identification of multiple enzymes associated with intermediary metabolism and fatty acid biosynthesis in the response to alcohol exposure in Drosophila is, therefore, of particular interest.”

Morozova et al. then identified genes that affect sensitivity or tolerance to alcohol, by analysing flies with mutated versions of the genes identified in the microarray experiment. They find that mutations in these genes can induce increased or reduced sensitivity to the effects of ethanol at first exposure, followed by increased or reduced tolerance. Morozova et al. find that the development of tolerance is only partly dependent on initial sensitivity to ethanol.

Source: BioMed Central