COCAINE HIGHS AND LOWS

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Are fruit flies the key to solving human's addiction to cocaine? Scientists at Howard Hughes Medical Institute have found that the fruit fly, mostly known as the nemesis of California fruit farmers, possesses a protein in its nervous system that mirrors the effect of cocaine in human beings.

The Drosophila flies have a dopamine neurotransmitter that scientists can study to learn more about the biology of cocaine addition, said Dr. Susan Amara, a senior scientist with the Oregon Health Sciences University in Portland and an investigator for the Howard Hughes Medical Institute.

According to Amara, geneticists discovered that fruit flies have reactions to cocaine and many antidepressants that are similar to those of mice and humans.

"In future studies, we can select flies more sensitive to cocaine and study what was altered in them, which may tell us more about addiction," Amara said.

Flies and humans have much in common, particularly from the viewpoint of genes and proteins.

"They may be similarities in neural pathways," said Dr. David Bonovich, assistant professor in the Clinic of Neurology at the University of California at San Francisco. "If you discover a direct link, you can use an animal like these flies to help build models for study. Conducting studies on an animal like a fly is easier because you can use a lot of them and at a low cost."

These discoveries were made possible by the mapping of the fruit fly genome. Once the map of the Drosophila genome was completed, researchers could conduct experiments entirely on computer.

"Computer modeling is amazing. You can analyze a genome and identify a sequence of genes extremely quickly," Bonovich said.

A simple organism such as the fly makes this research much easier. Not only is the entire genome available, the potential for new discoveries is increased by the speed of reproduction, and as a result, trait selection. The benefits aren't present with studies using mammals, Bonovich said.

"There is fair interest in fruit fly genome as a key model organism for similar studies. The behavior of these flies when exposed to cocaine is analogous to humans," Amara said.

Neurotransmitters are the mailmen of the chemical instructions that the brain sends from neuron to neuron. Dopamine is the chemical that cocaine and many antidepressants affect. When these drugs are used, they attach themselves to the dopamine molecules, rendering them useless to the brain as instruction carriers.

With constant production of the neurotransmitter, the brain is unable to use it properly. Dopamine builds up in the nervous system, producing the euphoria associated with cocaine use.

Specifically, dopamine possesses one transport protein that aids its movement, which researchers have dubbed the Drosophila dopamine transporter, or dDAT. The discovery of this chemical assistant in Drosophila, which in itself is similar to the human version, only adds to the relevance of the study of the chemical effects of cocaine in the fly.