

Research Links Change in Brain with Addiction

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A researcher at the University at Buffalo's Research Institute on Addictions (RIA) has found a change in the brain that occurs after drug use and that may contribute to drug addiction.

The finding, reported in the January 2007 issue of the journal *Biological Psychiatry*, demonstrates that repeated exposure to different types of drugs of abuse such as cocaine, nicotine, amphetamine, and alcohol lead to a persistent or long-term reduction in the electrical activity of dopamine neurons in the brain.

Dopamine neurons are the origin of the reward pathway responsible for the "feel good" experience that is such a strong component of drug use and abuse.

"A persistent reduction in dopamine neuron electrical activity after repeated exposure to different types of drugs appears to be the result of excessive excitation of dopamine neurons," according to Roh-Yu Shen, Ph.D., a neuroscientist and the lead investigator on the study. "This represents a new and potentially critical neural mechanism for addiction and provides a working model that suggests how the reward pathway function is altered and how these changes can be responsible for triggering intense craving and compulsive drug-seeking."

Initial exposure to drugs of abuse causes dopamine neurons to release dopamine in target areas of the brain that provide the reward effect of using drugs. Repeated abuse of drugs results in long-lasting changes in

the function of the reward pathway that leads to craving for drugs and the compulsion for more drugs.

Shen is a senior research scientist at RIA and holds adjunct appointments in the Department of Pathology and Anatomical Sciences in the UB School of Medicine and Biomedical Sciences and Department of Psychology in the UB College of Arts and Sciences. Her colleagues on this study include Kar-Chan Choong, RIA research assistant, who performed the experiments, and Alexis C. Thompson, Ph.D., RIA research scientist and research associate professor in UB's Department of Psychology.

Shen said the persistent or long-lasting nature (3-6 weeks in animal models equivalent to approximately two years in humans) of this effect helps to explain why it is so difficult to abstain from

using cocaine, nicotine, amphetamine and alcohol. In addition, she added, it is a time-dependent effect that is not seen immediately after drug use, but rather manifests over a period of time following drug use and intensifies over time.

Shen and colleagues have concluded that the persistent reduction in dopamine activity parallels the long-lasting nature of addictive behaviors, including intensified craving and compulsive drug-seeking behavior. A next step is for treatment researchers to develop treatment protocols that build on this biological finding.

Source: University at Buffalo

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