MedicalXpress

Research reveals molecular fingerprint of cocaine addiction

May 27 2008

The first large-scale analysis of proteins in the brains of monkeys addicted to cocaine reveals new information on how long-term cocaine use changes the amount and activity of various proteins affecting brain function.

The identified changes are more numerous and long-lasting than previously thought, which may provide a biological explanation for why cocaine addiction is so difficult to overcome, according to Scott E. Hemby, Ph.D. of Wake Forest University School of Medicine, senior author of the study.

Results from the study are reported online today (May 27) in the journal *Molecular Psychiatry* and detail the effect of long-term cocaine intake on the amount and activity of thousands of proteins in monkeys. Monkeys are an ideal animal for studying addiction because they share considerable behavioral, anatomical and biochemical similarities with humans. About 2.4 million Americans currently use cocaine, according to estimates.

The researchers used state-of-the-art “proteomic” technology, which enables the simultaneous analysis of thousands of proteins, to compare the “proteome” (all proteins expressed at a given time) between a group of monkeys that self-administered cocaine and a group that did not receive the drug. Leonard Howell, Ph.D., with Emory University School of Medicine, who conducted the monkey studies, was a co-researcher. The study provides a comprehensive assessment of biochemical changes

occurring in the cocaine addicted brain, Hemby said.

“The changes we identified are profound and affect the structure, metabolism and signaling of neurons,” said lead author Nilesh Tannu, M.D. “It is unlikely that these types of changes are easily reversible after drug use is discontinued, which may explain why relapse occurs.”

Hemby said that the development of medications to treat addictive disorders is guided in large part by our understanding of the brain mechanisms that produce the euphoric effects of the drugs. It is equally important to understand the damage that long-term drug use causes to brain cells so medications can be developed to reverse those effects and restore normal cell function in the brain.

The changes identified in the current study point to significant and likely long-lasting damage to brain cells as a result of cocaine abuse. “The duration of use and the amount of drug consumed that lead to such damage is currently not known, but is critical for understanding the long-term health consequences of cocaine abuse and determining the necessary modes of treatment,” said Hemby. “We hope that the information generated from the study will also serve an educational purpose as a deterrent to cocaine use.”

Source: Wake Forest University Baptist Medical Center