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Cocaine Alters Brain Cells, Impairs Impulse Control

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NEW YORK—A number of studies presented at the 36th annual meeting of the Society for Neuroscience, being held this week in Atlanta, show that cocaine use negatively affects the functioning of neurons (cells located in the brain and spinal cord), primarily in the prefrontal cortex, but also in a number of other areas in the brain.

The result is a reduced ability to weigh benefits versus drawbacks, and to control behavior.

The prefrontal cortex is located in the frontal lobe of the brain. It is thought to play a role in neuropsychological processes, such as orchestrating thoughts in accordance with actions, as well as other processes.

Dr. Rita Goldstein, of Brookhaven Laboratory in Upton, New York, and colleagues used functional magnetic resonance imaging (fMRI) to assess neuronal signaling in 16 cocaine addicts and 16 healthy subjects.

During fMRI, the subjects were asked to identify various amounts of money and rank them in order of value, or "reward."

"More than half of the addicts could not differentiate between values," Goldstein told Reuters Health in an interview before her presentation. The brain images showed a "disconnect," or a "conflict pattern in response to monetary rewards," she explained.

"There was a decreased response overall... in the prefrontal cortex," Goldstein added.

She noted that the prefrontal cortex is also the region in which impulse control occurs. An inability to distinguish between different values of money "means that this reward system can not be used to change behavior" in cocaine addiction.

"Although there is some improvement in function (in the prefrontal cortex) once the drug is removed, it never completely returns to normal," Goldstein said.

Goldstein plans to study what happens in the prefrontal cortex using non-drug reward systems, and whether the value of non-drug reward systems can be amplified to change addictive behavior. She acknowledges that it remains to be determined if it is even possible to use cognitive behavioral training to increase behavioral control and decrease impulsivity in these individuals.



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