Study implicates dopamine in food restriction, drug abuse

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Scientists today reported a possible basis for why food-restricted animals show increased susceptibility to drugs of abuse. This association has puzzled researchers since it was first observed more than three decades ago.

Senior author Michael Beckstead, Ph.D., from the School of Medicine at The University of Texas Health Science Center San Antonio, said the team found that dopamine neurons in a brain region called the *substantia nigra* fire bursts more than twice as frequently in chronically food-restricted mice. Cocaine significantly enhanced this firing only in mice that were fed less, the team also found.

An overlapping process

"Dopamine neurons are part of what we consider the main reward pathway in the brain," said Dr. Beckstead, assistant professor of physiology. "They play a strong role in motivated behavior. There is an overlapping process between natural rewards and drug rewards that we studied here."

Charles France, Ph.D., professor of pharmacology in the School of Medicine, in 1979 was on the team that first reported the connection between food restriction and behavioral effects from drugs of abuse. He was not associated with the new research, which is in *The Journal of Neuroscience.*

Changing the system

"We've had no idea how this happens in the brain," Dr. Beckstead said. "This study identifies dopamine neurons of the *substantia nigra* as a convergence point for the interaction between feeding state and the effects of drugs of abuse. Food restriction is changing the system." The *substantia nigra* is a structure located in the midbrain.

No approved treatments exist for psychostimulant abuse – drugs such as cocaine, amphetamine and methamphetamine. "We first need to understand how adaptations in the brain contribute to drug use in order to better design drugs," Dr. Beckstead said. "However this finding, by giving us a clue as to how we might 'adjust the gain' on the system, is a very important early step in the development of therapy."

More information: Food Restriction Increases Glutamate Receptor-Mediated Burst Firing of Dopamine Neurons, The *Journal of Neuroscience*, August 21, 2013, 33(34):13861

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