Autism-related protein shown to play vital role in addiction

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In a paper published in the latest issue of the neuroscience journal *Neuron*, McLean Hospital investigators report that a gene essential for normal brain development, and previously linked to Autism Spectrum Disorders, also plays a critical role in addiction-related behaviors.

"In our lab, we investigate the brain mechanisms behind drug addiction – a common and devastating disease with limited treatment options," explained Christopher Cowan, PhD, director of the Integrated Neurobiology Laboratory at McLean and an associate professor of Psychiatry at Harvard Medical School. "Chronic exposure to drugs of abuse causes changes in the brain that could underlie the transition from casual drug use to addiction. By discovering the brain molecules that

control the development of drug addiction, we hope to identify new treatment approaches."

The Cowan lab team, led by Laura Smith, PhD, an instructor of Psychiatry at Harvard Medical School, used animal models to show that the fragile X mental retardation protein, or FMRP, plays a critical role in the development of addiction-related behaviors. FMRP is also the protein that is missing in Fragile X Syndrome, the leading single-gene cause of autism and intellectual disability. Consistent with its important role in brain function, the team found that cocaine utilizes FMRP to facilitate brain changes involved in addiction-related behaviors.

Cowan, whose work tends to focus on identifying novel genes related to conditions such as autism and drug addiction, explained that FMRP controls the remodeling and strength of connections in the brain during normal development. Their current findings reveal that FMRP plays a critical role in the changes in brain connections that occur following repeated cocaine exposure.

"We know that experiences are able to modify the brain in important ways. Some of these brain changes help us, by allowing us to learn and remember. Other changes are harmful, such as those that occur in individuals struggling with drug abuse," noted Cowan and Smith. "While FMRP allows individuals to learn and remember things in their environment properly, it also controls how the brain responds to cocaine and ends up strengthening drug behaviors. By better understanding FMRP's role in this process, we may someday be able to suggest effective therapeutic options to prevent or reverse these changes."

Provided by McLean Hospital