Research shows emotional stress can change brain function

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Research conducted by Iaroslav Savtchouk, a graduate student, and S. June Liu, PhD, Associate Professor of Cell Biology and Anatomy at LSU Health Sciences Center New Orleans, has shown that a single exposure to acute stress affected information processing in the cerebellum – the area of the brain responsible for motor control and movement coordination and also involved in learning and memory formation. The work is published in the January 12, 2011 issue of The *Journal of Neuroscience*.

The researchers found that a five-minute exposure to the odor of a predator produced the insertion of receptors containing GluR2 at the connections (synapses) between nerve cells in the brain. GluR2 is a subunit of a receptor in the central nervous system that regulates the transfer of electrical impulses between nerve cells, or neurons. The presence of GluR2 changed electrical currents in the cerebellum in a way that increased activity and altered the output of the cerebellar circuit in the brains of mice.

Our ability to learn from experience and to adapt to our environment depends upon synaptic plasticity – the ability of a neuron or synapse to change its internal parameters in response to its history. A change in the GluR2 receptor subunit has been observed both during normal learning and memory as well as during many pathological processes, including drug addiction, stress, epilepsy, and ischemic stroke. However, the effect of this change on neuronal function is not fully understood.

"Our results lead to the testable prediction that emotional stress could affect motor coordination and other cerebellum-dependent cognitive functions," notes Dr. Liu. "These results are also applicable to communication in other brain regions and circuits. A long term goal is to alleviate the burden of neurological disorders such as motor dysfunctions, drug addiction, PTSD, and stroke."

Next steps include further research to improve our understanding of the role GluR2 insertion plays in normal learning and functioning of the brain, why some neurons contain GluR2-lacking receptors, but not others, and how that affects their role in brain function.

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