Study shines light on how stress circuits learn

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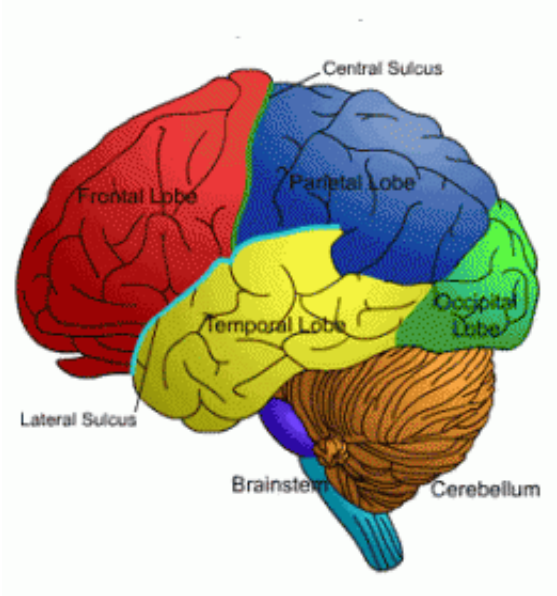

Brain diagram. Credit: dwp.gov.uk

Researchers at the University of Calgary's Hotchkiss Brain Institute have discovered that stress circuits in the brain undergo profound learning early in life. Using a number of cutting edge approaches, including optogenetics, Jaideep Bains, PhD, and colleagues have shown stress circuits are capable of self-tuning following a single stress. These findings demonstrate that the brain uses stress experience during early life to prepare and optimize for subsequent challenges.

The team was able to show the existence of unique time windows following brief stress challenges during which learning is either

increased or decreased. By manipulating specific cellular pathways, they uncovered the key players responsible for learning in stress circuits in an animal model. These discoveries culminated in the publication of two back-to-back studies in the April 7 online edition of *Nature Neuroscience*.

"These new findings demonstrate that systems thought to be 'hardwired' in the brain, are in fact flexible, particularly early in life," says Bains, a professor in the Department of Physiology and Pharmacology. "Using this information, researchers can now ask questions about the precise cellular and molecular links between early life stress and stress vulnerability or resilience later in life."

Stress vulnerability, or increased sensitivity to stress, has been implicated in numerous health conditions including cardiovascular disease, obesity, diabetes and depression. Although these studies used animal models, similar mechanisms mediate disease progression in humans.

"Our observations provide an important foundation for designing more effective preventative and therapeutic strategies that mitigate the effects of stress and meet society's health challenges," he says.

Provided by University of Calgary