New and unexpected mechanism identified how the brain responds to stress

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Chronic stress takes a physical and emotional toll on our bodies and scientists are working on piecing together a medical puzzle to understand how we respond to stress at the cellular level in the brain. Being able to quickly and successfully respond to stress is essential for survival.

Using a rat model, Jaideep Bains, PhD, a University of Calgary scientist and his team of researchers at the Hotchkiss Brain Institute have discovered that neurons in the hypothalamus, the brain's command centre for stress responses, interpret 'off' chemical signals as 'on' chemical signals when stress is perceived. "It's as if the brakes in your car are now acting to speed up the vehicle, rather than slow it down." says Bains. This unexpected finding is being published in the March 1st online edition of *Nature Neuroscience*.

Normally, neurons receive different chemical signals that tell them to either switch on or switch off. The off signal or brake only works if the levels of chloride ion in the cells are maintained at a low level. This is accomplished by a protein, known as KCC2. What Bains and colleagues have shown is that stress turns down the activity of KCC2, thus removing the ability of the brake, a chemical known as GABA, to work properly. A loss of the brain's ability to slow down may explain some of the harmful, emotional consequences of stress.

While the findings provide a new mechanistic explanation of how the brain interprets stress signals, "there is still much work needed in the basic science of this phenomenon before there are any new advances in

the medical treatment of stress," says Bains

"This opens entirely new and quite unexpected avenues for controlling stress responses" says Yves De Koninck, PhD, president-elect of the Canadian Association for Neuroscience and professor of Psychiatry at Laval University.

"I was fascinated when I learned of this work. It has not been clear till now how the neuroendocrine stress response was activated by external stressors. Bains' work shows a complex, yet elegant solution, involving a switch from inhibition to excitation." says Jane Stewart, PhD a behavioural neuroscientist from Concordia University, "these findings may lead to a better understanding of the changes in sensitivity to stress that result from chronic exposure."

More information: www.nature.com/neuro/journal/v … nt/full/nn.2274.html

Source: University of Calgary