Researchers discover brain cells change following close contact with a stressed individual

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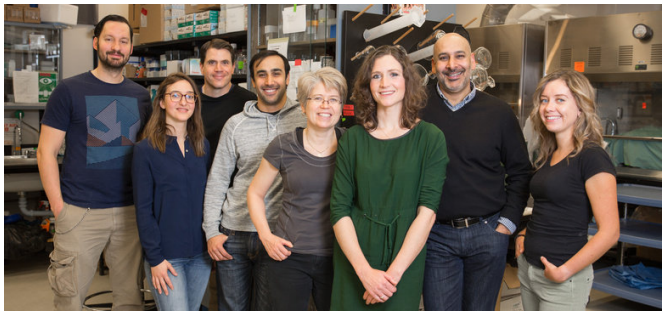

A new study by UCalgary scientists may help explain why people get stressed out just hearing about someone's stressful experience. The paper's authors are, from left: Tamás Füzesi, Nuria Daviu, David Rosenegger, Neilen Rasiah, Dinara Baimoukhametova, Toni-Lee Sterley (lead author), Jaideep Bains (principal investigator), and Agnieszka Zurek.Credit: Adrian Shellard, for the Hotchkiss Brain Institute

Health-care workers treating soldiers with post-traumatic stress disorder (PTSD) report that some soldiers' partners and family members display symptoms of PTSD despite never serving in the military. A research study by scientists at the University of Calgary may help explain how that could happen.

Jaideep Bains, PhD, and his team at the Hotchkiss Brain Institute (HBI) in the Cumming School of Medicine have discovered that stress transmitted from others can change the brain in the same way as a real stress does. The research team studied the effects of stress in pairs of male or female mice. They removed one mouse from each pair and exposed it to a mild stress before returning it to its partner. They then examined the responses of a specific population of brain cells in each mouse, which revealed that networks in the brains of both the stressed mouse and naïve partner were altered in the same way.

"There has been other literature that shows stress can be transferred — and our study is actually showing the brain is changed by that transferred stress," says Toni-Lee Sterley, an Eyes High postdoctoral fellow in Bains's lab and the study's lead author. "The neurons that control the brain's response to stress showed changes in unstressed partners that were identical to those we measured in the stressed mice."

The researchers discovered that the activation of the neurons causes the release of a chemical signal, an "alarm pheromone," from the mouse that alerts the partner. The partner who detects the signal can, in turn, alert additional members of the group.

"What we can begin to think about is whether other people's experiences or stresses may be changing us in a way that we don't fully understand," says Bains, professor in the Department of Physiology and Pharmacology. "The study also demonstrates that traits we think of as uniquely human are evolutionary conserved biological traits."

The study shows that the effects of stress on the brain are reversed only in female mice following a social interaction. The team noticed that, in females, the residual effects of stress on neurons were cut almost in half following time spent with unstressed partners. The same was not true for males.

"If some of the effects of stress are erased through social interactions, but this benefit is limited to females, this may provide insights into how we design personalized approaches for the treatment of stress disorders in people," says Bains.

The findings will be published in the March 2018 edition of *Nature Neuroscience*.

More information: Toni-Lee Sterley et al. Social transmission and buffering of synaptic changes after stress, *Nature Neuroscience* (2017). DOI: 10.1038/s41593-017-0044-6