

'Love hormone' oxytocin, possible anxiety drug, shows different effects in male and female mice

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Male and female California mice show different responses to oxytocin, a possible treatment for anxiety and stress. Credit: Mark Chappell/UC Riverside

Clinical trials are testing whether oxytocin, sometimes called the "love hormone" for its role in intimacy and social bonding, has potential as a treatment for anxiety, depression and post-traumatic stress disorder. New research by behavioral neuroscientists Michael Steinman, Brian Trainor and colleagues at the University of California, Davis, suggests

oxytocin may have different effects in men and women—and in certain circumstances the hormone may actually trigger anxiety.

In a series of experiments at the UC Davis Department of Psychology, the team administered doses of oxytocin with a nasal spray to male and female mice. Some of the mice were bullied by an aggressive mouse, an experience that reduces motivation to associate with unfamiliar mice. Consistent with previous studies, oxytocin increased the motivation for social interaction in stressed males.

However, in stressed [females](#), oxytocin had no effect. When non-stressed females received oxytocin, social motivation was reduced. This effect of oxytocin is similar to the effect of social stress.

"Reduced social motivation can be part of a depression-like syndrome," said Trainor, an associate professor of psychology.

Trainor and colleagues found important differences in how stress affected the production of oxytocin. After stress, nerve cells in the brain produced more oxytocin in females but not in males. Steinman used a molecular marker to show that these oxytocin-producing cells were also more active in females that experienced stress. Steinman suggests, "This may help explain why oxytocin [nasal spray](#) makes females avoid social contact even though they did not experience [social stress](#)."

Clinical studies have found that women with depression or PTSD have elevated oxytocin levels. Usually this result has been thought to reflect an increased drive for social support. The results of Trainor and colleagues suggest an alternate possibility.

"Our results show that stressed females have both reduced [social motivation](#) and increased oxytocin. It's possible that oxytocin might contribute to a depression-like syndrome in females," Trainor said. "If

correct, inhibiting oxytocin action might have unanticipated benefits."

The surrounding environment also influenced the effects of oxytocin. If mice were tested in a familiar home cage instead of a new environment, oxytocin reduced stress-related behaviors in males and females. This finding shows that the effects of oxytocin depend whether the environment is familiar or unfamiliar.

Trainor said his lab's findings have implications for studies investigating the utility of oxytocin as a therapeutic.

"Most [clinical studies](#) investigating oxytocin as a treatment for depression or anxiety include only males," he said. "It's important to include both men and women in these studies. The effect of [oxytocin](#) may be different if administered by an unfamiliar person or by a person with whom the patient has a personal relationship."

The results are to be published in *Biological Psychiatry*.

More information: Michael Q. Steinman et al. Sex-Specific Effects of Stress on Oxytocin Neurons Correspond With Responses to Intranasal Oxytocin, *Biological Psychiatry* (2015). [DOI: 10.1016/j.biopsych.2015.10.007](#)

Provided by UC Davis

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