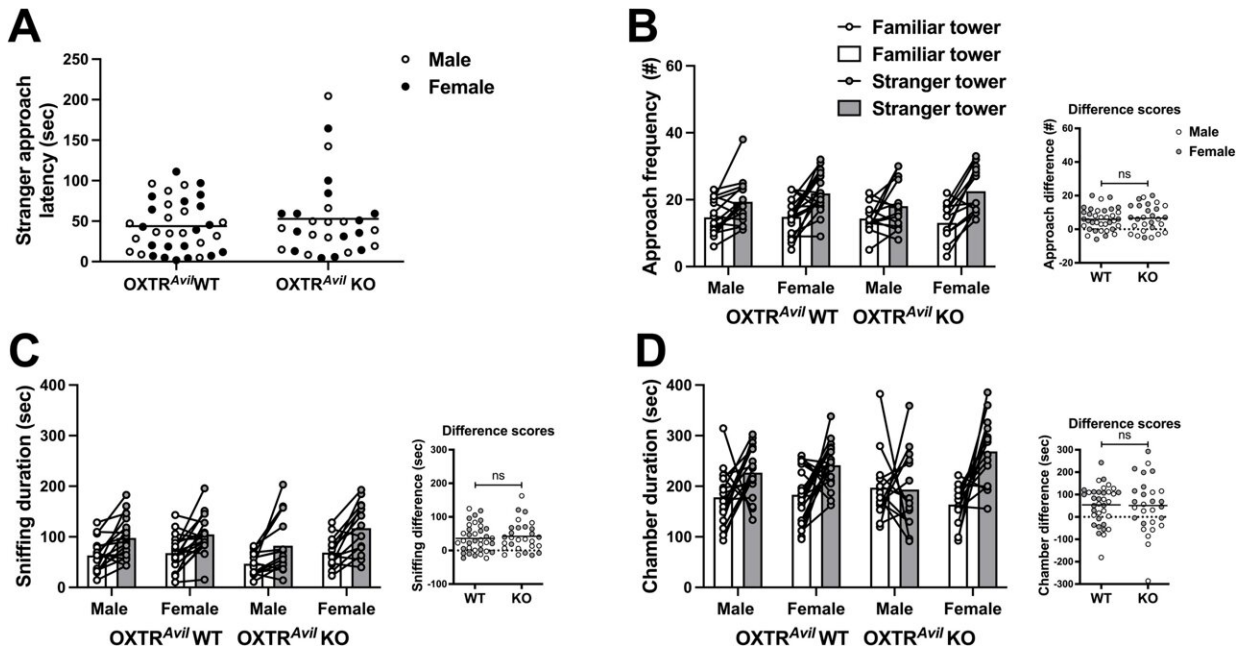
Key hormone influences social behavior from areas outside the brain

January 10 2022, by Mark Blackwell Thomas



Preference for social novelty behaviors were similar in OXTR^{Avil} WT and KO males and females. OXTR^{Avil} mice displayed a preference for social novelty—a preference for a tower holding a novel stranger mouse (stranger tower; gray markers) over a tower holding a familiar mouse (familiar tower; white markers)—as evident by increased approach frequencies (B; F1, 60 = 51.23, p ^{Avi}l KO mice (no significant genotype x tower type interaction). Data are graphed as individual data points and group averages. Difference scores were calculated by subtracting approach frequency and sniffing/chamber duration towards the familiar conspecific from the stranger conspecific. ns = not significant. See also S3 Fig in S1 File, S1 Table in S1 File. Credit: DOI: 10.1371/journal.pone.0260199

Oxytocin's role in regulating and influencing social behavior is well known. Numerous ongoing clinical trials are focusing on the levels of the hormone in the brain but now a Florida State University research team has found evidence that oxytocin receptors outside of the brain may play an important role in shaping social behavior.

Elizabeth Hammock, associate professor of psychology and neuroscience, and her team, including graduate student Manal Tabbaa and undergraduate student Ashley Moses, observed the behavior of mice lacking oxytocin receptors in cells outside of the brain. They found that receptors outside of the brain in other areas of the body could be keys to how oxytocin shapes interactions between animals.

Their study was published in the journal *PLOS ONE*.

"This study shows there is a population of cells outside of the brain that have oxytocin receptors and when that population of cells is missing those receptors, it impacts social behavior," Hammock said. "A key takeaway is that to understand oxytocin's role in social behavior we need to look at the whole organism. We can't assume the brain is doing all the work."

Hammock said her team removed gene coding for the oxytocin receptor from some cells during pre-natal development.

"We left the developing brain alone and instead, specifically removed oxytocin receptors from a population of cells outside of the brain," she said. "We let the mice grow to adulthood and then we tested these genetically altered mice and 'typical' mice on some standard social behavior tests routinely used for lab mice."

Hammock said the genetically altered mice in the study exhibited reduced social interest, and males were quicker to show aggression

compared to mice that were not genetically altered.

Hammock noted that there are already a number of drugs aimed at regulating oxytocin levels in the brain, with additional clinical trials underway pursuing the same goal. The results of this study suggest scientists may need to broaden their scope.

"There are a number of clinical trials attempting to use oxytocin to modulate human behavior and there are research efforts to improve drug delivery to get oxytocin to the brain," she said. "Our data suggest we might not need to target the brain if it can regulate behavior through more drug-accessible sites outside of the brain."

She added: "We still need to determine if the lack of oxytocin receptors in those specific cells outside of the brain alters the development of the mice causing changes to their adult behavior. If so, it makes drug treatment in adulthood after development more challenging. Also, our study is in mice, not humans, which is important to remember. We have more work to do."

Hammock added: "We focus on the brain so much—and rightfully so—but the brain is an integrated part of a larger system."

More information: Manal Tabbaa et al, Oxytocin receptor disruption in Avil-expressing cells results in blunted sociability and increased inter-male aggression, *PLOS ONE* (2021). DOI: 10.1371/journal.pone.0260199

Provided by Florida State University

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