

Anxious mice make lousy dads: study

13 June 2012

Normally, male California mice are surprisingly doting fathers, but new research published in the journal *Physiological and Biochemical Zoology* suggests that high anxiety can turn these good dads bad.

Unlike most rodents, male and female California [mice](#) pair up for life with males providing extensive parental care, helping deliver the pups, lick them clean, and keep them warm during their first few weeks of life. Experienced fathers are so paternal that they'll even take care of pups that aren't theirs. "If we place a male California mouse in a test cage and present it with an unknown pup, experienced fathers will quickly start to lick and huddle with it," said Trynke de Jong, a post-doctoral researcher at University of California, Riverside.

Inexperienced males, on the other hand, aren't always so loving. "Virgin males show more variability," de Jong explained. "They may behave paternally, or they may ignore the pup, or even attack it. We want to understand what triggers these three [behavioral responses](#) in virgin males."

De Jong and her colleagues thought this variability might have something to do with social status. In other species-including another [rodent](#), Mongolian gerbils-dominant virgin males are more likely than subordinate ones to kill pups. Perhaps social status influences parenting in California mice as well.

To test this, de Jong and her colleagues paired up 12 virgin males in six enclosures, and performed several tests to see which was dominant. First was a food competition. "If a cornflake is dropped in the cage, the more dominant male will manage to eat most of it," de Jong said. The researchers also observed each mouse's urine marking. "Dominant males will make more, smaller, and more widespread marks than subordinate males," said de Jong

After determining the mightier mouse in each pair, the team tested parental behavior by introducing a

pup. Contrary to the hypothesis, scores on the dominance tests did not predict whether a male licked or huddled up to the pup. However, the research did turn up signs that anxiety, not status, plays a role in paternal behavior.

Males who shied away from urinating the middle of a new enclosure-a behavioral signal that a mouse is anxious-were slower to approach a pup. Further tests showed that less paternal males had higher levels of the vasopressin in their brains. Vasopressin is a hormone that is strongly associated with stress and anxiety.

"Our findings support the theory that vasopressin may alter the expression of paternal behavior depending on the emotional state of the animal," de Jong said. She believes these results could shed light on the role of stress in paternal care in other mammals-including humans.

More information: Trynke R. de Jong, Aniko Korosi, Breanna N. Harris, Juan Pablo Perea-Rodriguez, and Wendy Saltzman, "Individual Variation in Paternal Responses of Virgin Male California Mice (*Peromyscus californicus*): Behavioral and Physiological Correlates." *Physiological and Biochemical Zoology* 85:6 (November/December 2012, published online now www.jstor.org/stable/10.1086/665831).

Provided by University of Chicago

APA citation: Anxious mice make lousy dads: study (2012, June 13) retrieved 20 May 2019 from <https://phys.org/news/2012-06-anxious-mice-lousy-dads.html>

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