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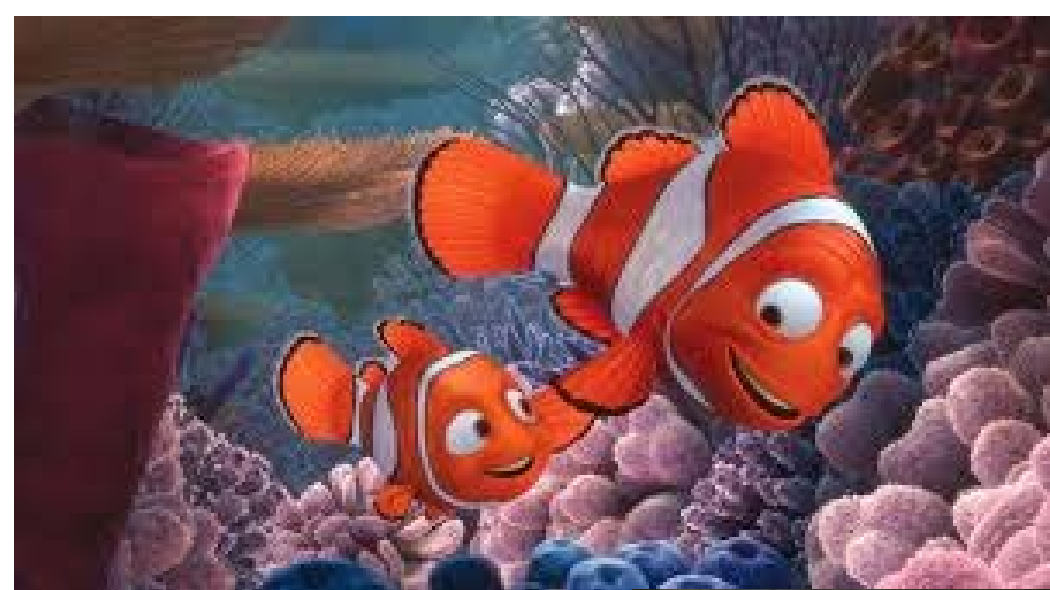
# Biological Basis of Paternal Behavior



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# Which animals display paternal care?

- Usually, but not always associated with social monogamy
- Birds – 90% of species
- Mammals – 3% of species
- Including 12% of primate species







Photo: J. Dietz

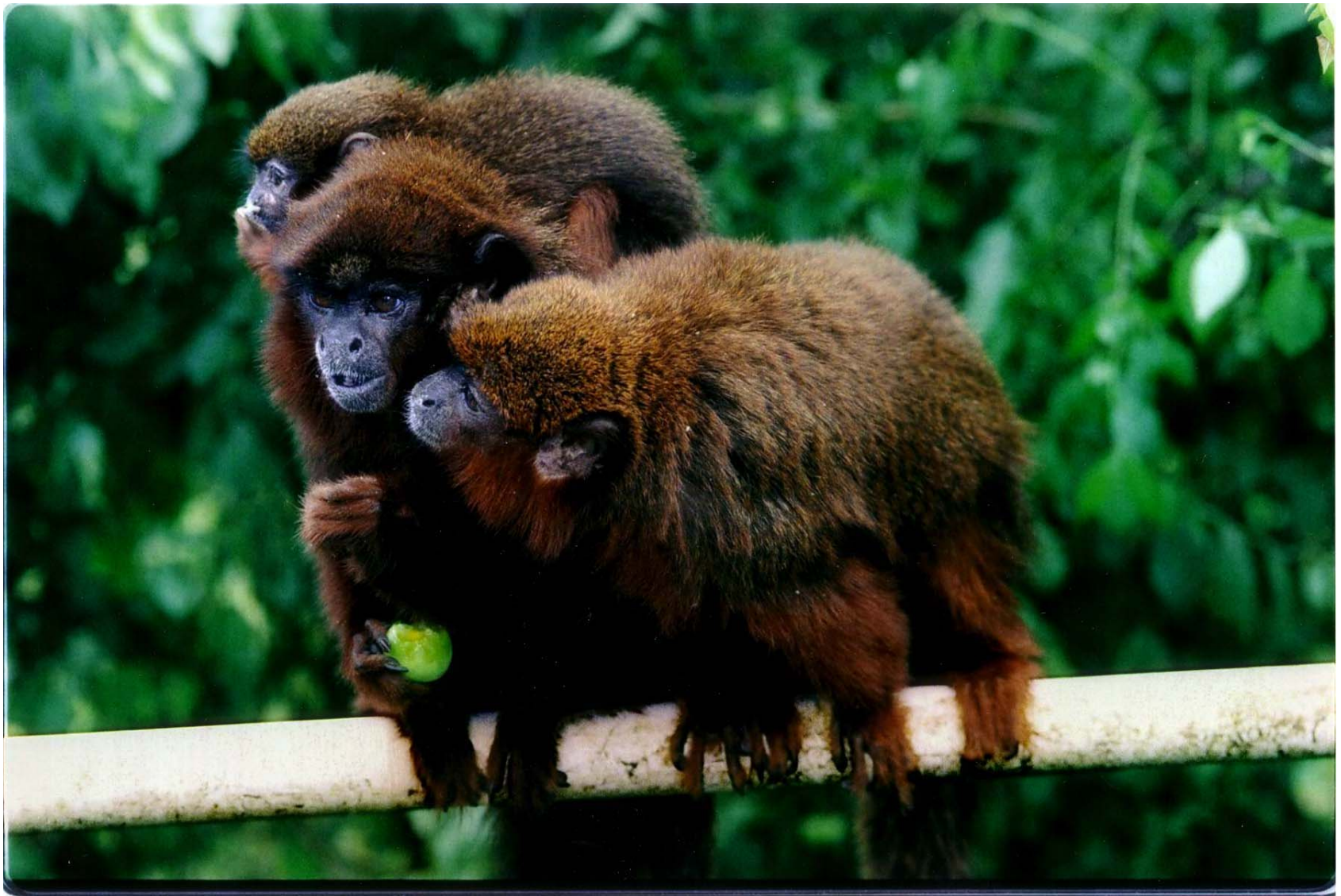


Photo: A. Williams/Sacramento Bee





Photo: K. Bales



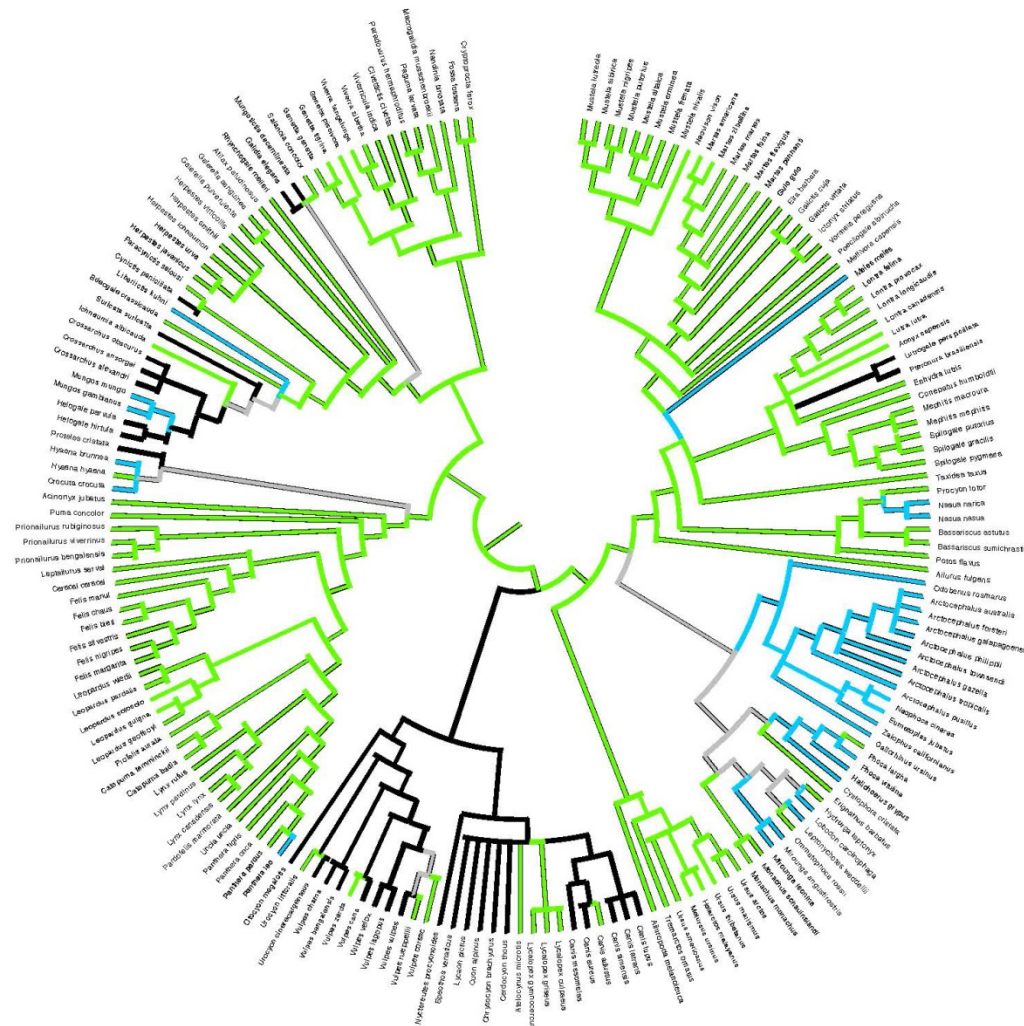


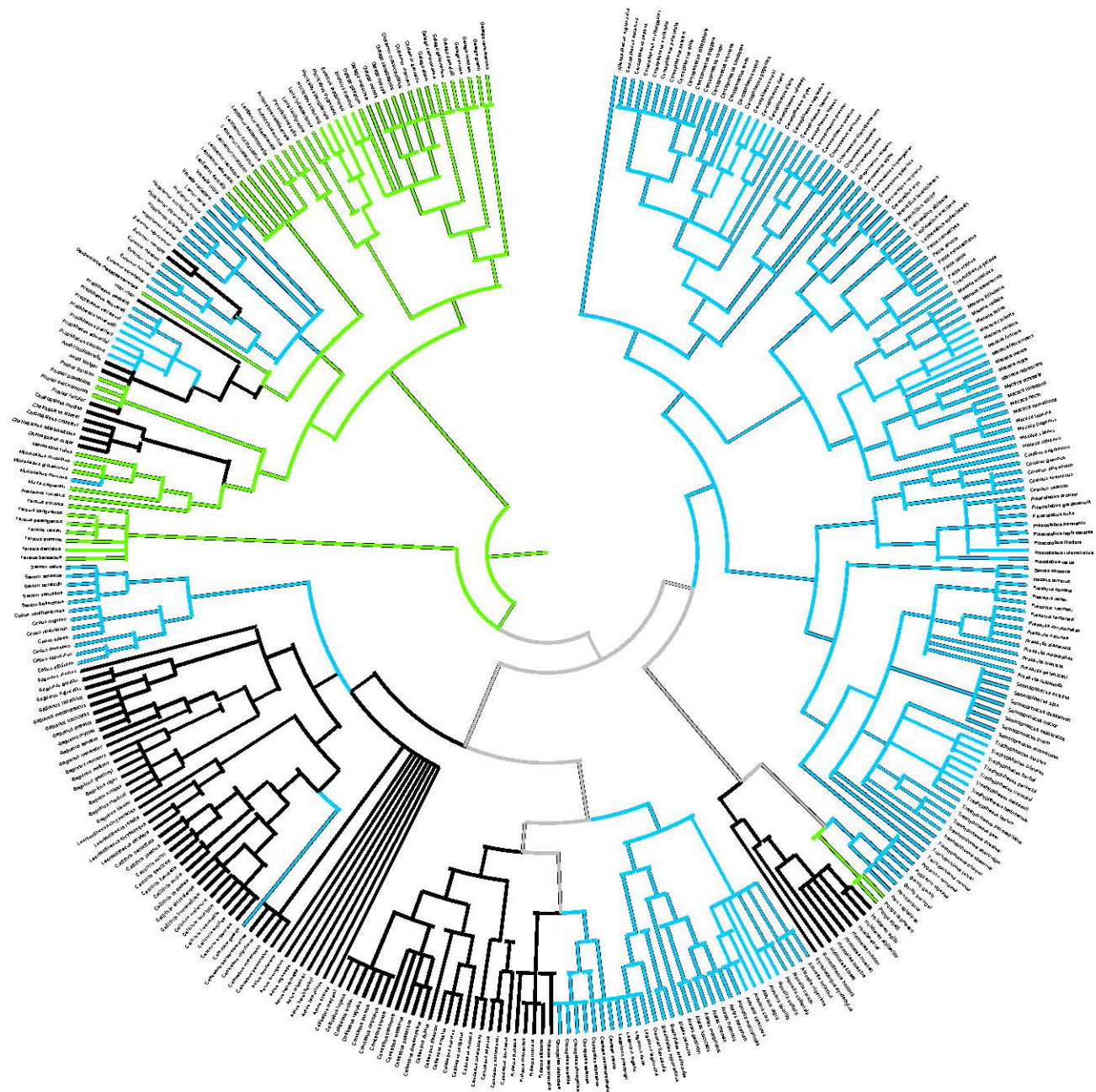
# Which animals display paternal care?

## a) Carnivores

Legend: green = solitary, blue = group living, black = social monogamy

Figure is scalable, species names will become visible with higher zoom



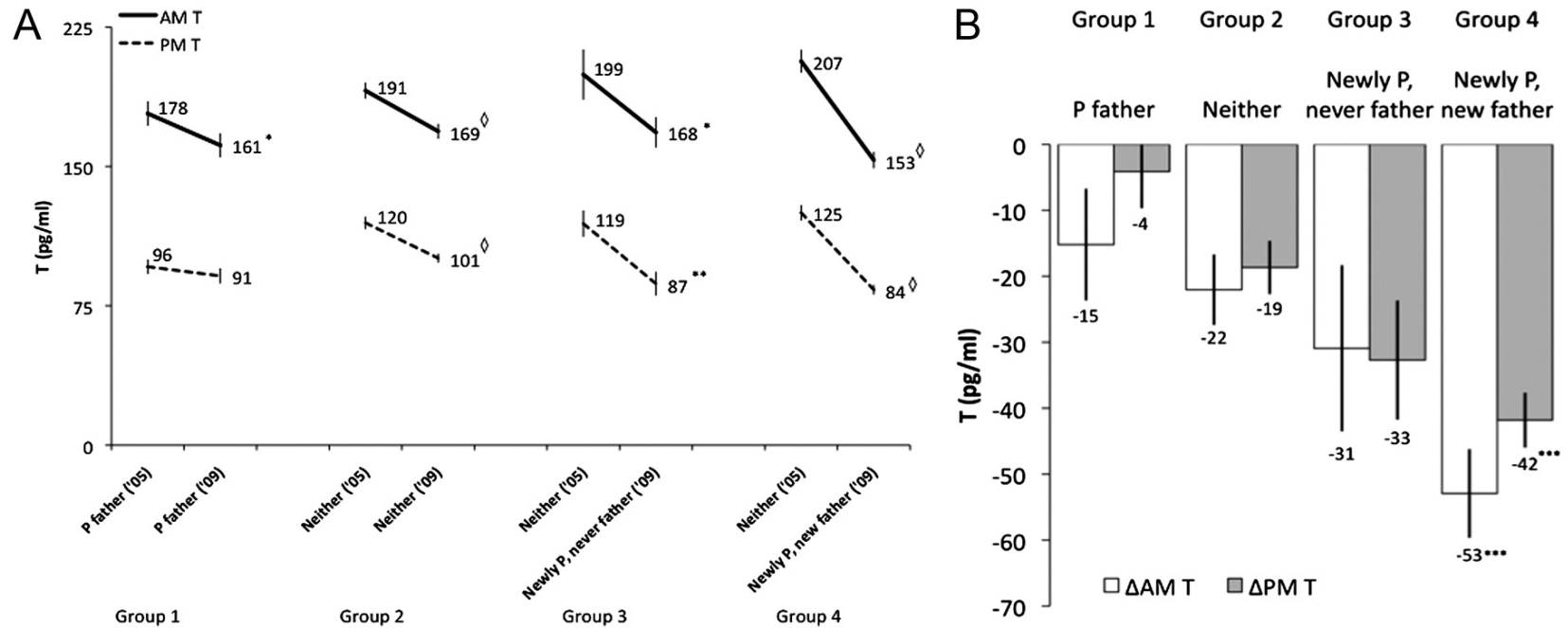


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- Testosterone is usually, but not always, bad for paternal behavior.

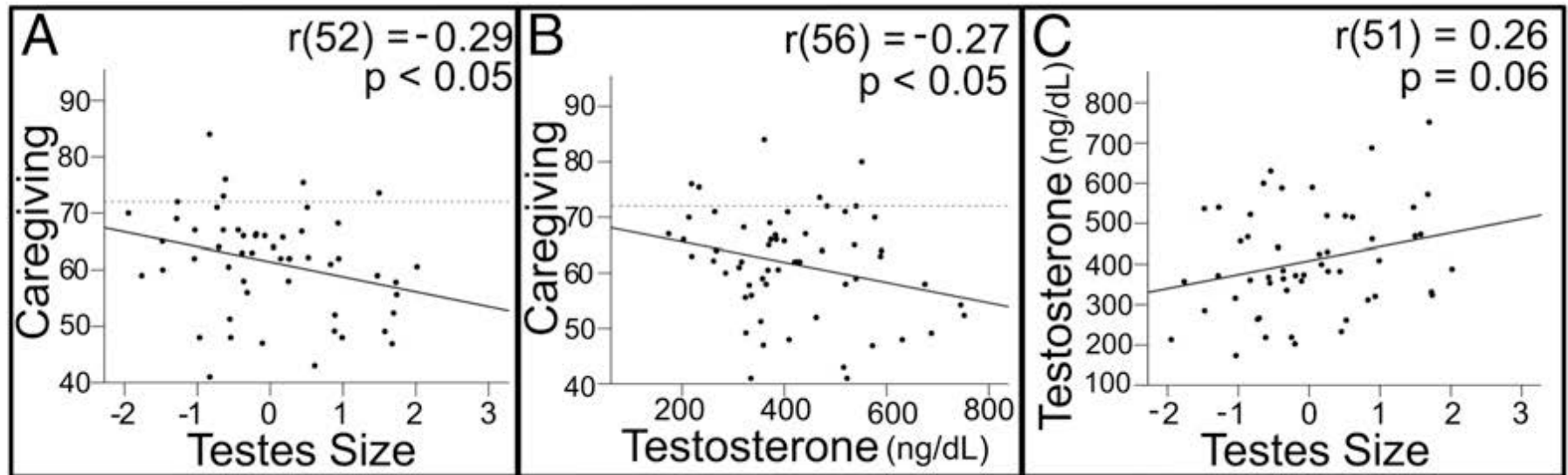


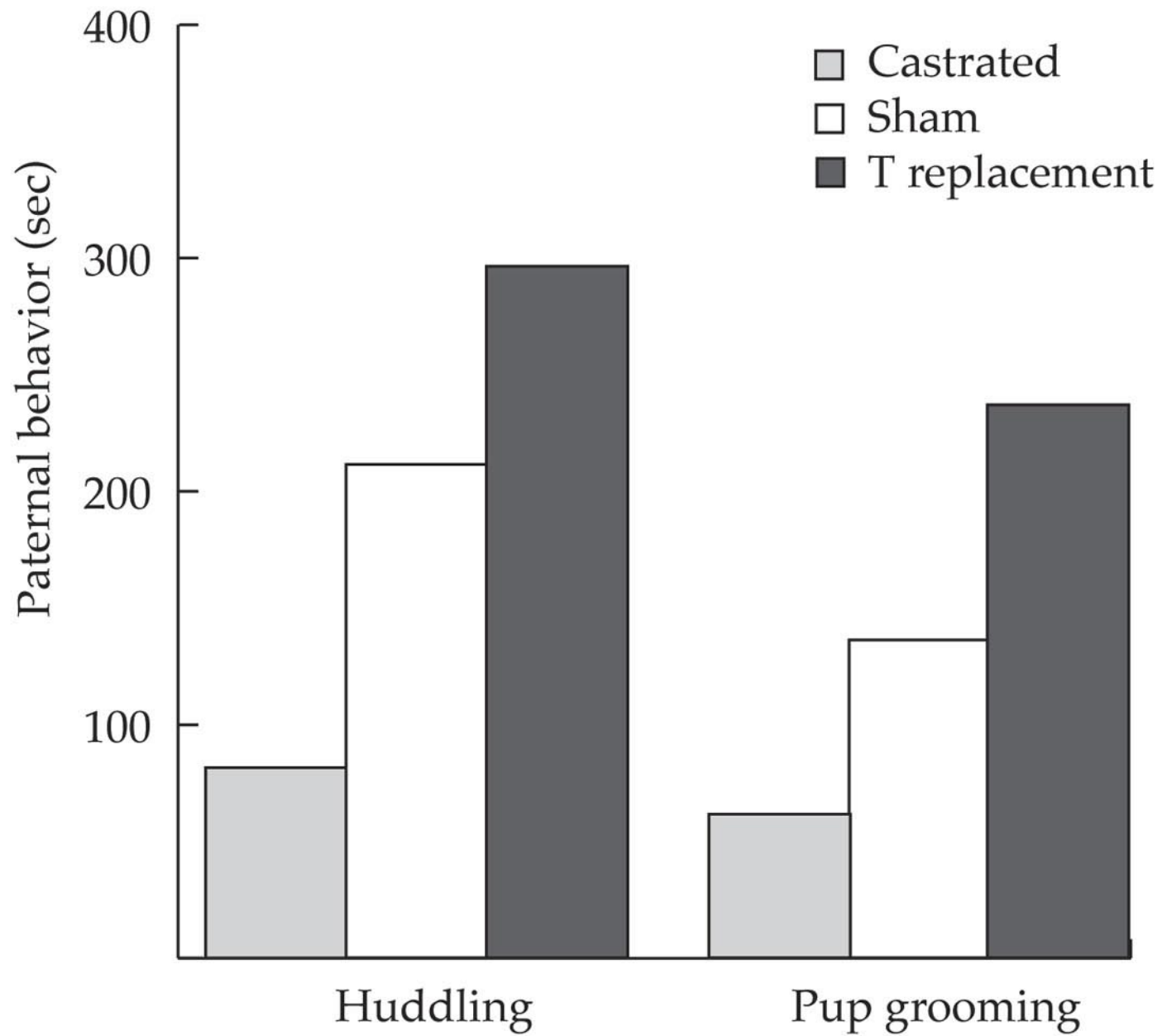


# (A) Within-group changes in AM and PM T values between 2005 and 2009.



Gettler L T et al. PNAS 2011;108:16194-16199



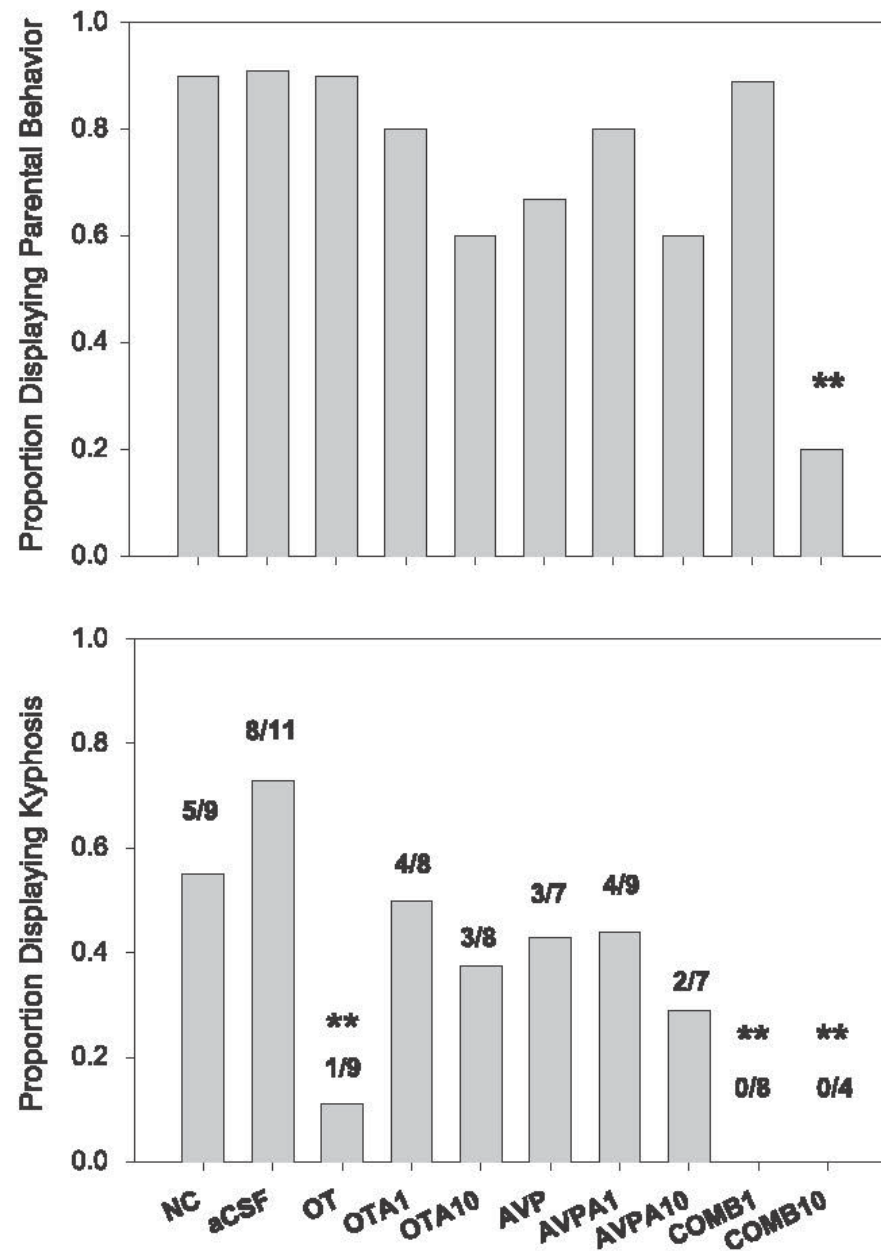




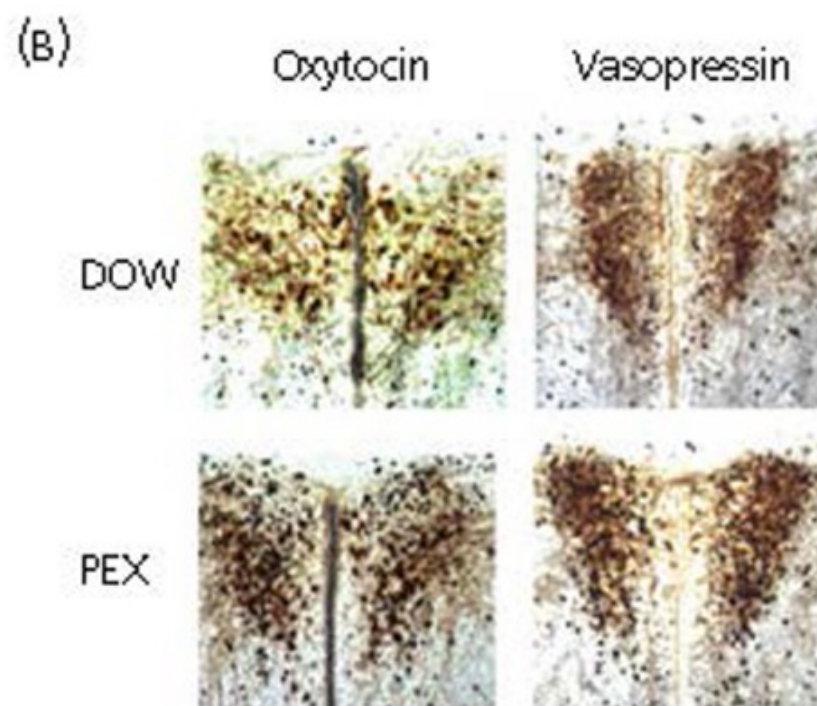
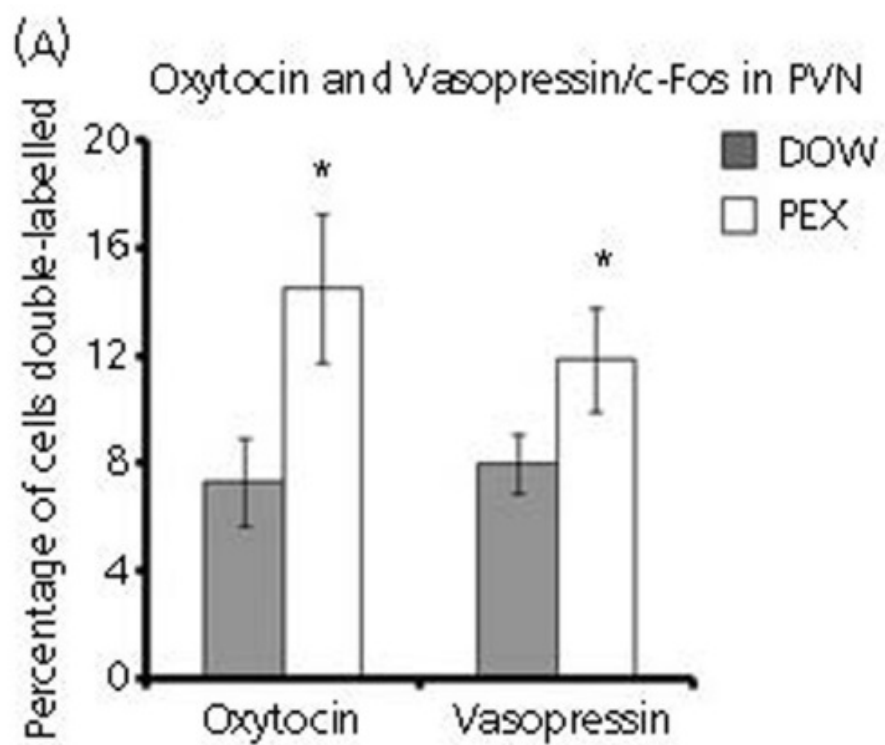
- 
- Paternal care is probably regulated by oxytocin and vasopressin in many species.
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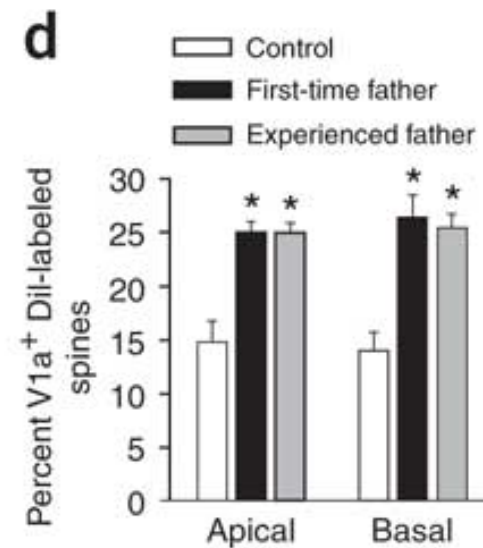
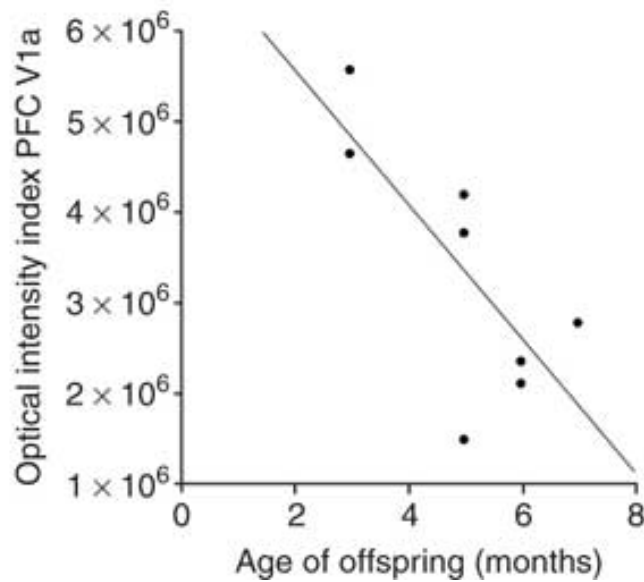
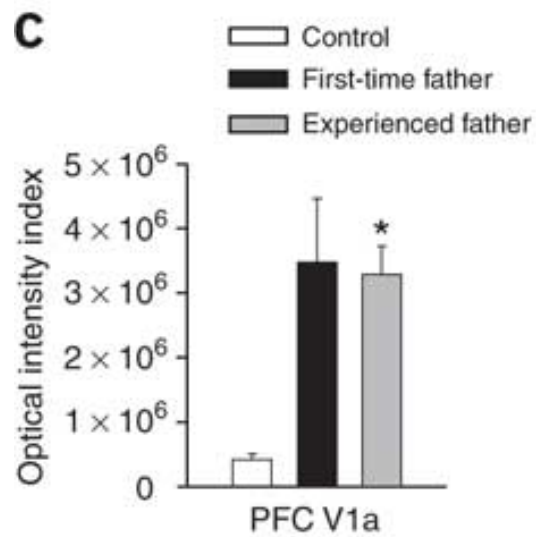
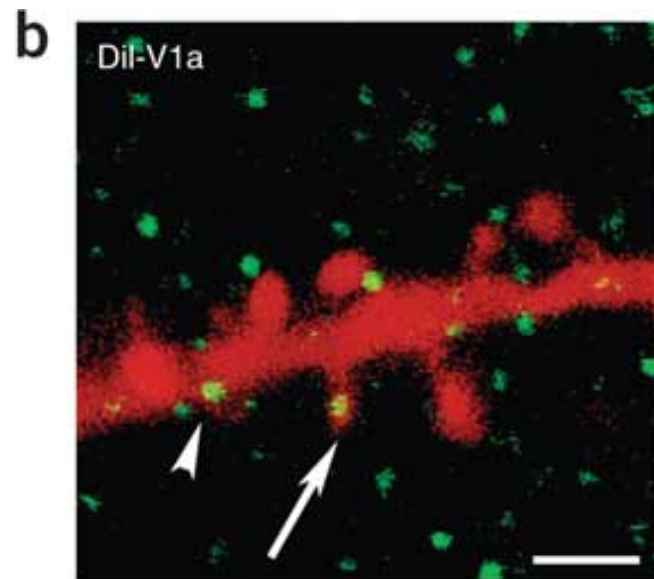
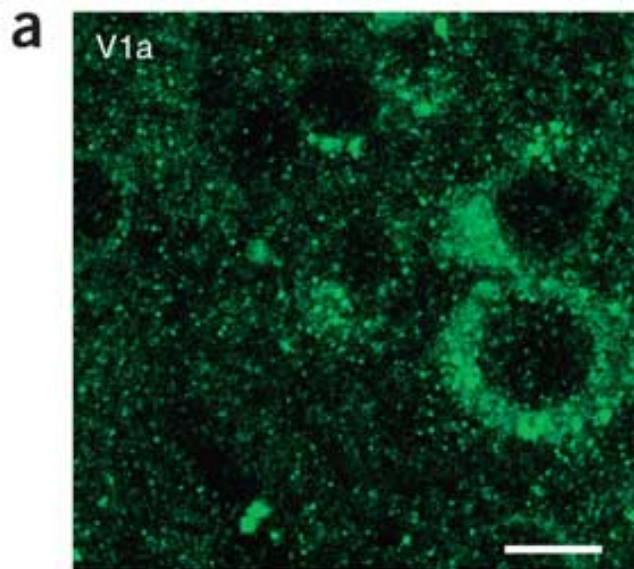
# Oxytocin and Vasopressin

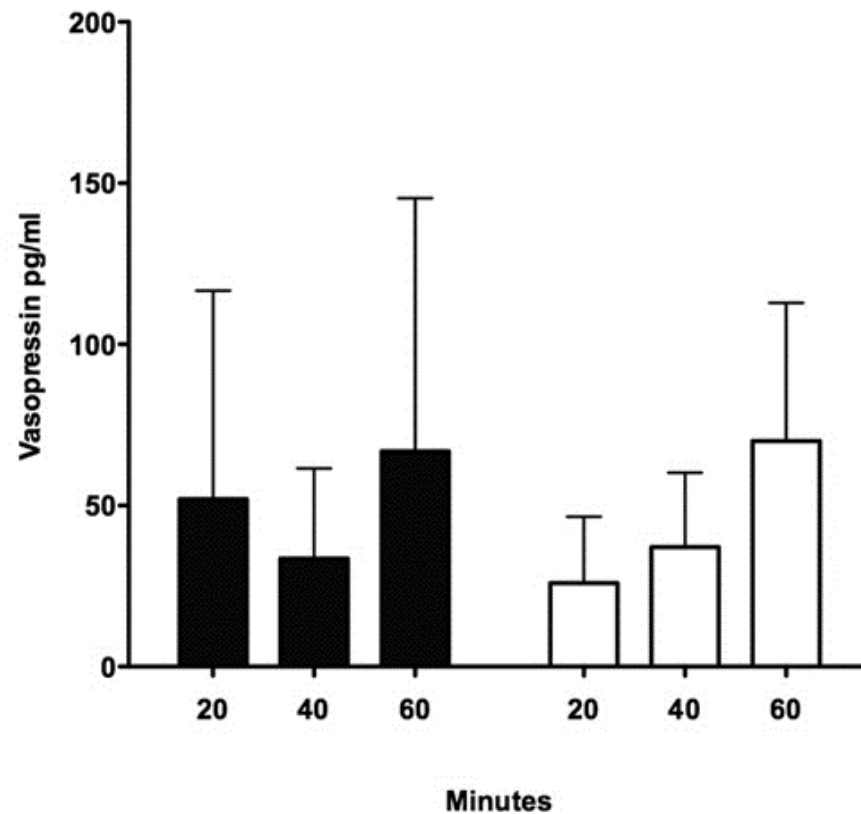
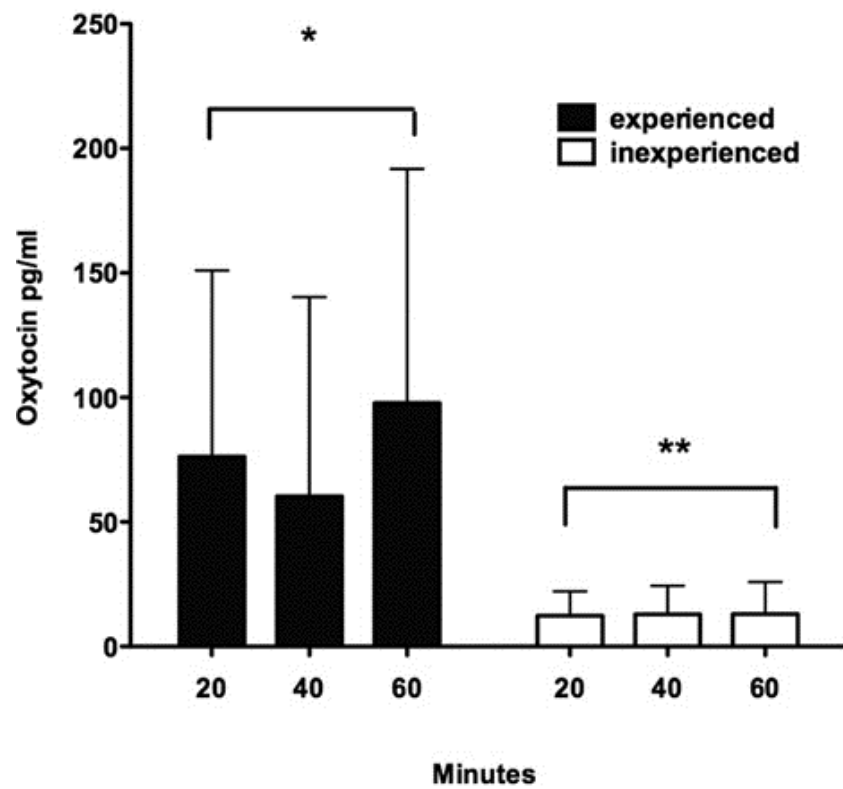












Adapted from Woller et al, 2012

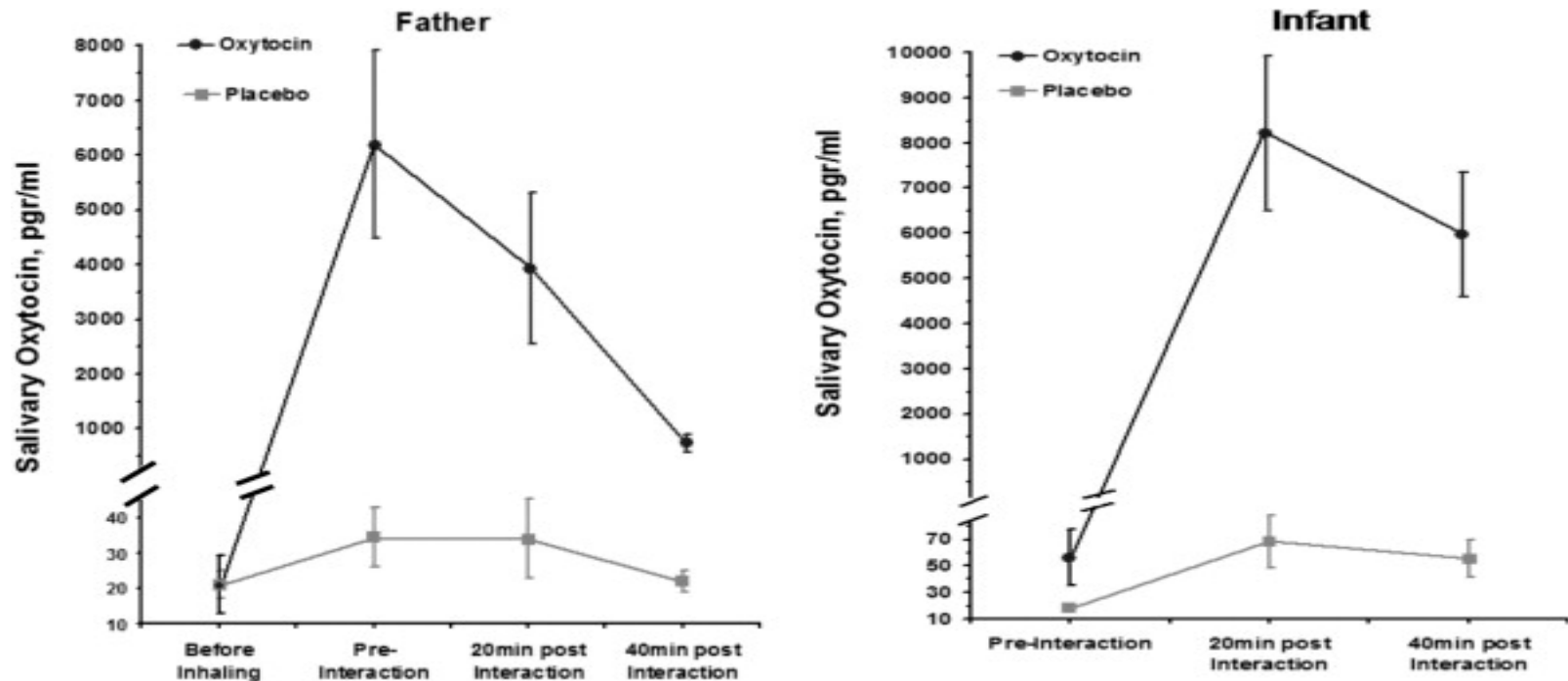


Figure 1 Father and infant salivary oxytocin (OT) levels (pg/mL) in the oxytocin and placebo conditions. Following OT administration to father, father and infant salivary OT levels are markedly increased compared with baseline assessment. In the placebo co...

Omri Weisman , Orna Zagoory-Sharon , Ruth Feldman

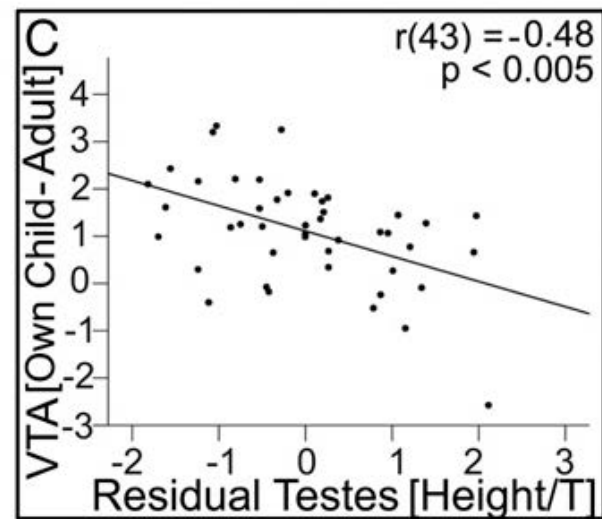
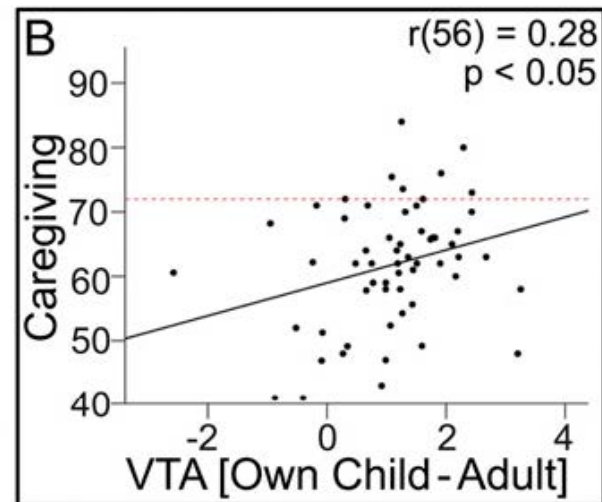
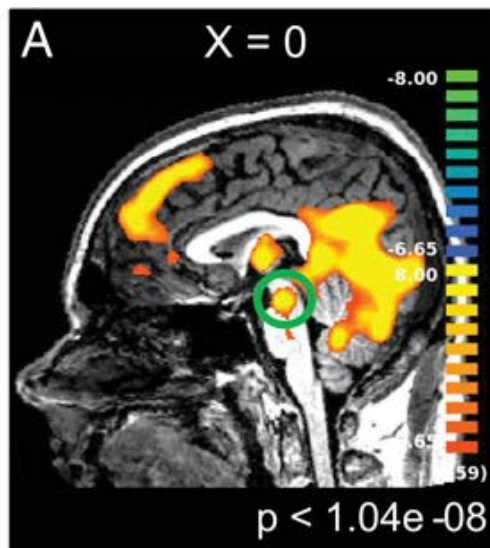
### Oxytocin Administration to Parent Enhances Infant Physiological and Behavioral Readiness for Social Engagement

Biological Psychiatry Volume 72, Issue 12 2012 982 - 989

<http://dx.doi.org/10.1016/j.biopsych.2012.06.011>



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- The dopamine system is probably also involved in male parenting.
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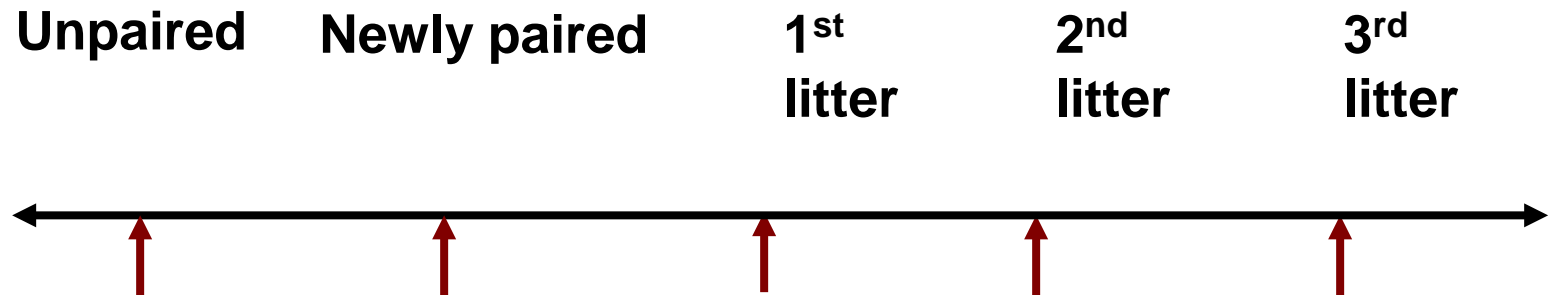


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- Paternal care, like maternal care, can be costly.

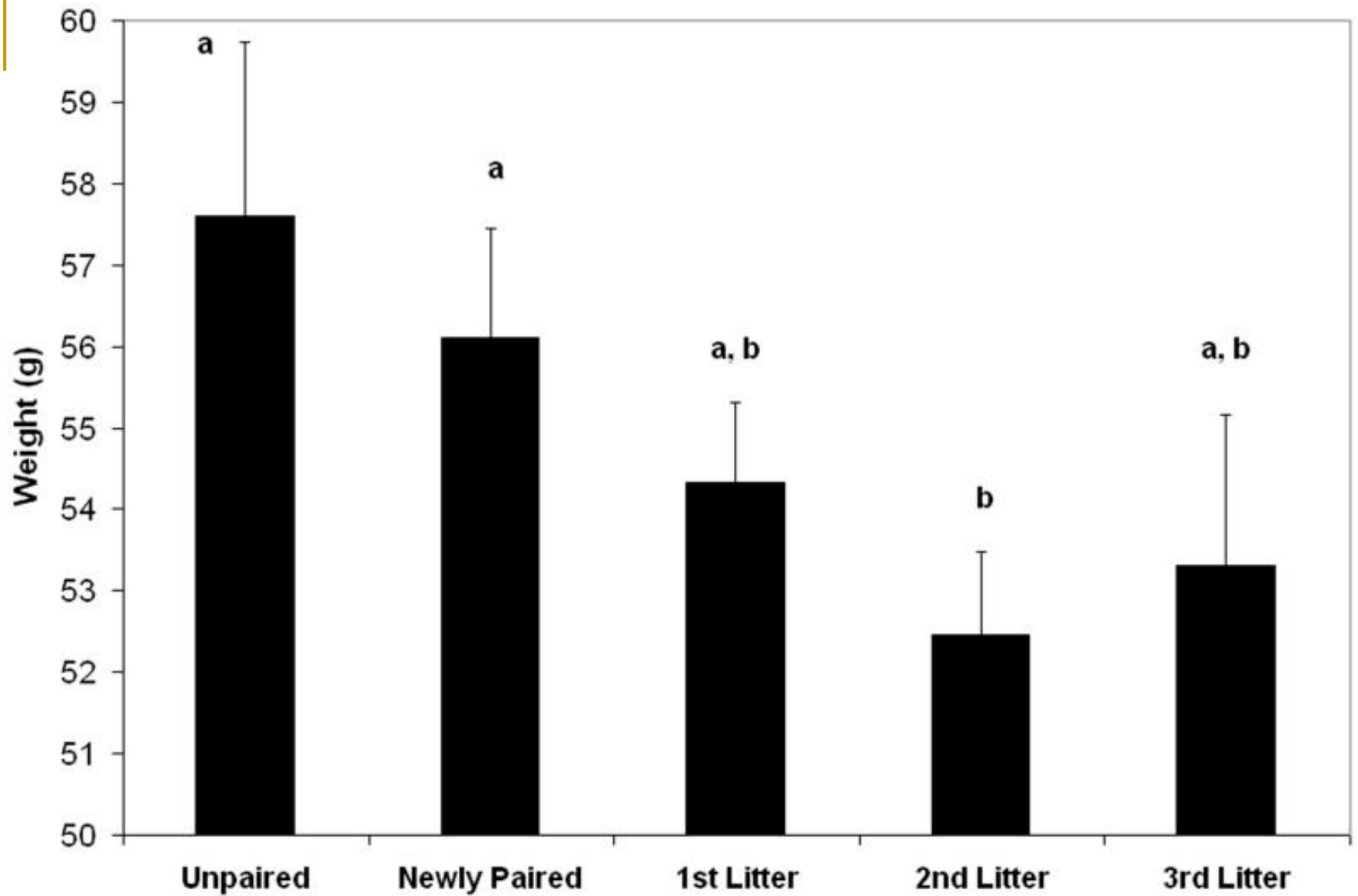




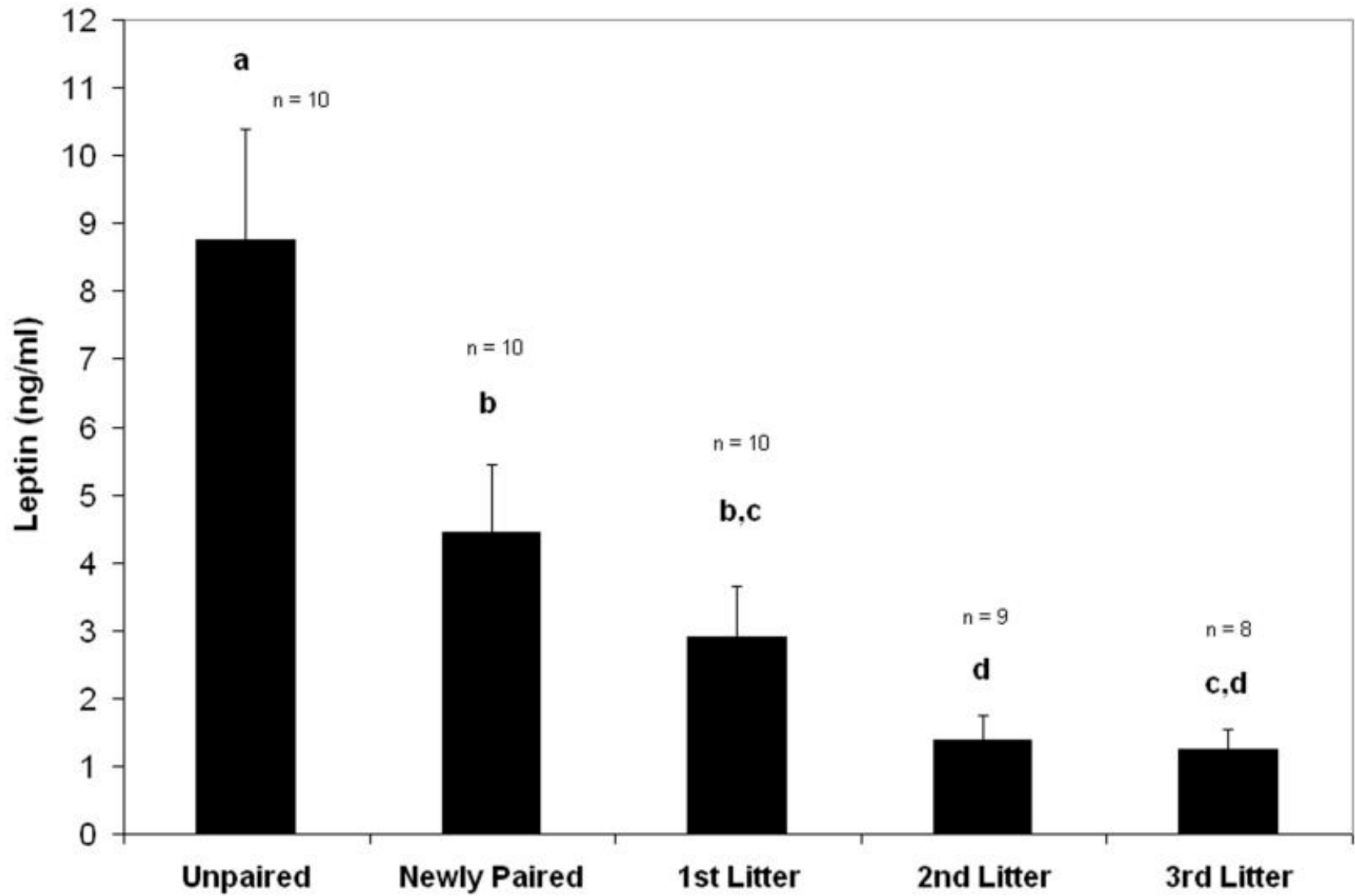
# Study Design



**Longitudinal: Body weight, sucrose preference, feeding, activity, social behavior, leptin, corticosterone**

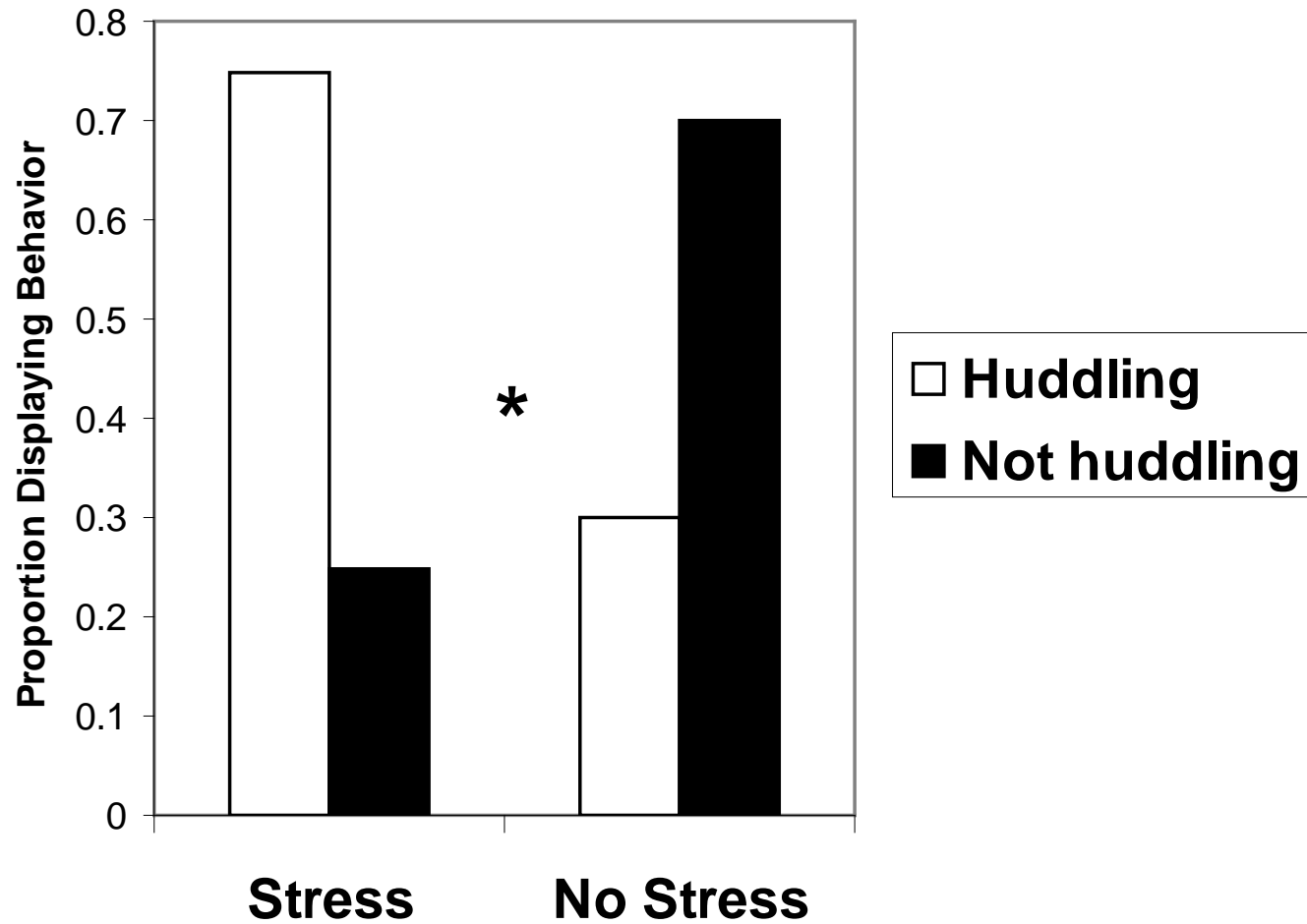


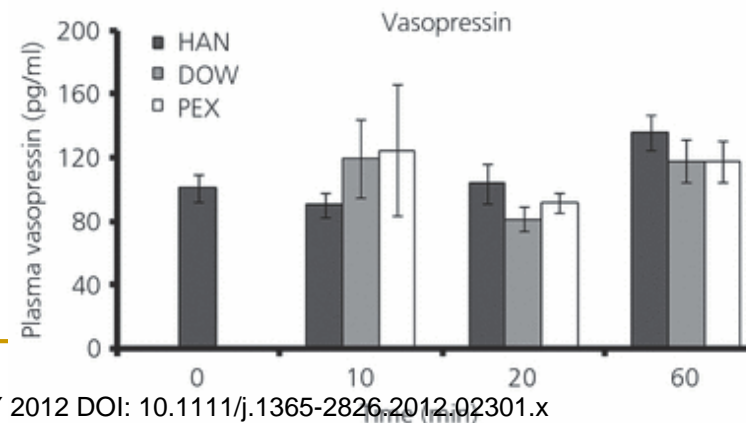
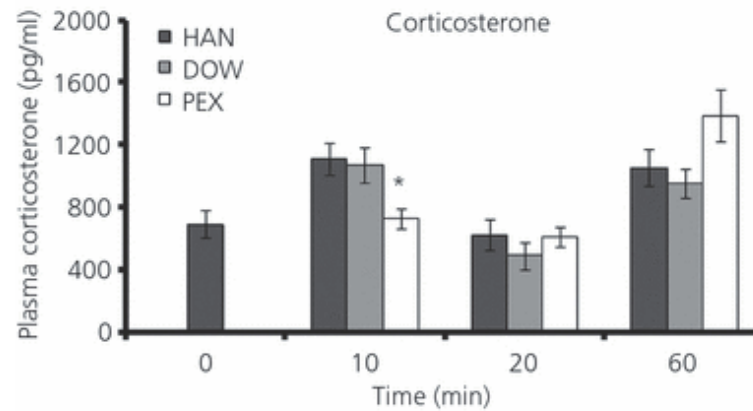
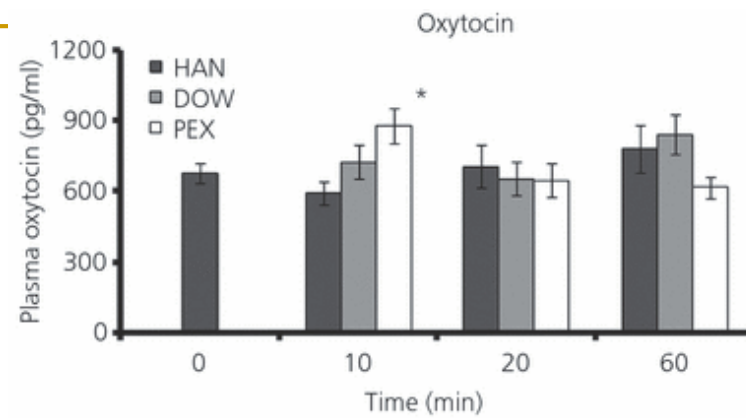
Campbell et al., 2009



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- Stress can affect paternal care.







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- What is the animal evidence for paternal involvement in outcomes?
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# Conclusions

- Males may use SIMILAR but not IDENTICAL mechanisms to females in promoting parental care
  - These mechanisms may differ by species but appear to have co-opted many of the same systems
  - Need more study! Particularly on brain mechanisms, oxytocin, vasopressin, and cortisol in humans
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# Acknowledgements

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  - Suzette Tardif
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  - Sally Mendoza
  - William Mason
  - Many student and post-doc collaborators
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