Cocaine Sensitization Increases Kyphosis and Modulates Neural Activity in Adult Nulliparous Rats

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Introduction

Although millions of adults use cocaine each year, and data from both animals and humans suggests that prior adult cocaine use can have long term effects on behavior, it is unknown if prior cocaine use affects future maternal behavior in females exhibiting maternal behavior towards the offspring of others.

Experimental

In the current study, intraperitoneal cocaine or saline was administered to adult female rats for 10 days, the animals were withdrawn from cocaine for 7 days, and the females were then exposed to donor pups to induce the expression of maternal behavior. Maternal care was assessed daily on days 1-8 of pup exposure, and video recorded for detailed analysis on days 2 and 8 of pup exposure while the females were presented with pups or a novel male intruder [1].

Results and Discussion

The cocaine treated females exhibited behavioral sensitization on treatment day 10. Nulliparous females previously treated with cocaine were more likely to retrieve pups, spent more time caring for the pups, and were more likely to express full maternal behavior on day 8 of pup exposure compared to saline treated control animals at this time point. These effects were specific to maternal care, as other behaviors (self-grooming, locomotor activity, maternal aggression) were mostly unaffected by prior cocaine treatment.

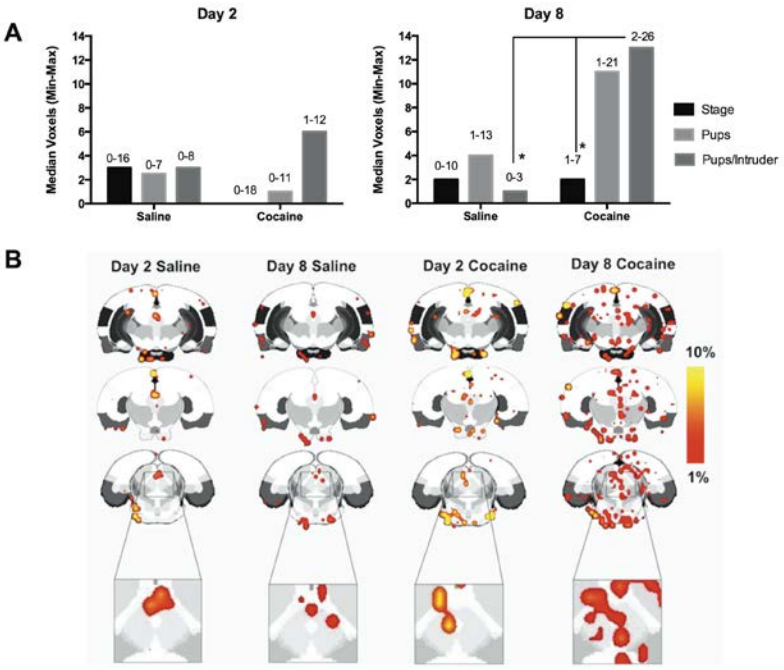

Figure Caption: Composite activation maps showing areas of increased BOLD activation in rats presented with an empty presentation stage, stage with pups and pups in the presence of a male intruder rat. Insets at the bottom highlight the area of the periaqueductal grey. Data are shown for control and cocaine treated rats on day 2 following initial exposure to pups and on day 8 after repeated sessions of exposure in their homecage.

Conclusions

Prior adult cocaine use may have lasting effects on offspring care, and this effect is not dependent on pup mediated effects or the endocrine changes of gestation and lactation. The present findings provide further support for the hypothesis that maternal motivation to exhibit maternal behavior is enhanced by prior cocaine sensitization, possibly due to cross sensitization between cocaine and the natural reward of maternal behavior.

Acknowledgements

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References

[1] Nephew *et al*., European Journal of Neuroscience 30: 934-45 (2009).
[2] Nephew *et al*., Brain Sciences in press (2013).