

The role of pubertal hormones in female rats' development to anxiety-like behavior in an early life adversity model

Cassidy Jessenia Scott

PI: Dr. Jennifer Honeycutt
Bowdoin College
Neuroscience Department

Abstract

Early life adversity (ELA) can be characterized by a series of stressful or traumatic experiences that occur in an individual's early development that is associated with an increased risk in emergence of affective/psychiatric disorders such as depression and anxiety. The fact that women are twice as likely to develop these affective disorders highlights a necessity to better characterize sex-specific differences in neural development. Brain regions such as the prefrontal cortex (PFC) have been shown to play an important role in the affective processing in both rodents and humans, which makes it a region of interest. Following ELA, parvalbumin (PV)-containing inhibitory interneuron density is altered in the PFC in a sex-dependent manner, which makes this cell type a cell type of interest. One drug that has recently demonstrated promising potential for treatment of affective disorders is ketamine, a noncompetitive glutamate NMDA receptor antagonist that may regulate excitatory neuronal output by blocking the inhibitory function of PV neurons. Research in our lab suggests that post-pubertal/adult female rats show a hypervigilant behavioral phenotype while prepubertal/juvenile female rats show more typical anxiety-like behavior as those shown across ages in male rats. Pubertal hormones might be mediating this unique behavioral phenotype in adult females as such that older female rats look different than their male rats or prepubertal female rats. We hoped to further investigate this hypothesis by replicating preliminary data.

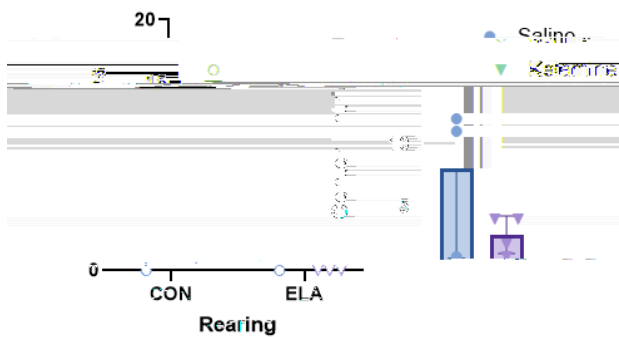
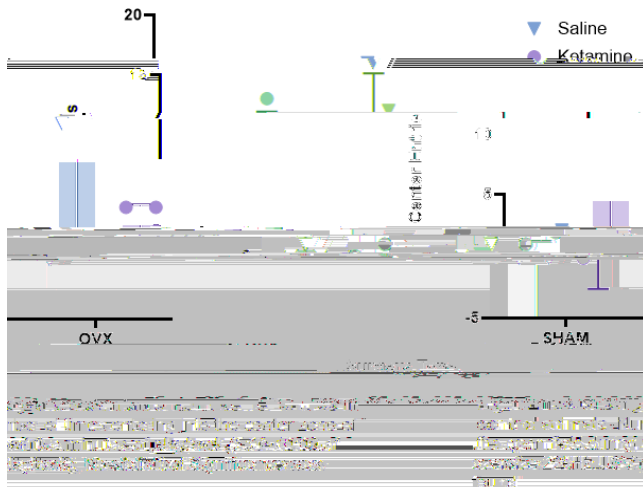
Project Objectives

This project aims to further characterize the potential role of female pubertal hormones in female rats' sensitivity to acute ketamine treatment and subsequent 0.00000912 0 612 84e

like b9(beh)-2(v)11(i)

Klump et al., 2021). Rats were injected with a dose of 2.5mg/kg body weight of Meloxicam subcutaneously as preoperative analgesic. Rats then underwent initial anesthesia before surgery and consistent oxygen and isoflurane throughout surgery. For OVX animals, both ovaries were removed. For Sham animals, a similar surgical procedure was performed until ovaries were visualized, from which point the ovaries were tucked back in. Internal and external suturing was performed. Antibiotic ointment was applied to external sutures. Following surgery, all rats were housed individually for recovery for one

Figures/Charts



2. Effect of rearing and treatment on OEF center. Fig.

Acknowledgments

Thank you to the Maine Space Grant Consortium. Thank you to my PI, Dr. Jennifer Honeycutt and our lab technician, Liz Mann. Thank you to the Honeycutt Research in Affective & Translational [RAT] Neuroscience Lab summer members: Yenavith Peña, Ana McLaughlin, Ayla Taylor, Lilly Curtis, Piper Wilson, Alena Lemeshova. Thank you to our lab Alumni for your hard work and research. Thank you to the summer animal care team who looked after the rat's environment and health. Lastly, thank you to the rats.

References

Steele, M. S. & Bennett, R. A. (2011). Clinical Technique: Dorsal Ovariectomy in Rodents. *Journal of Exotic Pet Medicine*, 20(3): 222-226

References

- Garcia, L. S. B., Comim, C. M., Valvassori, S. S., Réus, G. Z., Barbosa, L. M., Andreazza, A. C., Stertz, L., Fries, G. R., Gavioli, E. C., Kapczinski, F., & Quevedo, J. (2008). Acute administration of ketamine induces antidepressant-like effects in the forced swimming test and increases BDNF levels in the rat hippocampus. *Progress in Neuro-Psychopharmacology and Biological Psychiatry*, *32*(1), 140–144. <https://doi.org/10.1016/j.pnpbp.2007.07.027>
- Shieh, J. C., & Carter, M. (2015). Animal Behavior. In *Guide to research techniques in neuroscience*. (pp. 39–71). Elsevier Science Publishing Co.
<https://www.sciencedirect.com/science/article/pii/S1557506311001170>
- Sinclair, E. B., Klump, K. L., & Sisk, C. L. (2019). Reduced Medial Prefrontal Control of Palatable Food Consumption Is Associated With Binge Eating Proneness in Female Rats. *Frontiers in Behavioral Neuroscience*, *13*(252). <https://doi.org/10.3389/fnbeh.2019.00252>
- Stout Steele, M., & Bennett, R. A. (2011). Clinical Technique: Dorsal Ovariectomy in Rodents. *Journal of Exotic Pet Medicine*, *20*(3), 222–226. <https://doi.org/10.1053/j.jepm.2011.04.008>
- Wang, J., Goffer, Y., Xu, D., Tukey, D. S., Shamir, D. B., Eberle, S. E., Zou, A. H., Blanck, T. J. J., & Ziff, E. B. (2011). A Single Subanesthetic Dose of Ketamine Relieves Depression-like Behaviors Induced by Neuropathic Pain in Rats. *Anesthesiology*, *115*(4), 812–821.
<https://doi.org/10.1097/aln.0b013e31822f16ae>