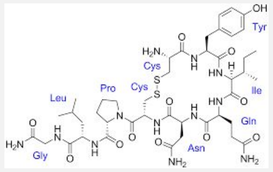
Effect of Partner Loss on Oxytocin Measures in the Social Brain of Monogamous Coyotes

Blake Nielson, *Utah State University* | Dr. Sara Freeman, *Utah State University*

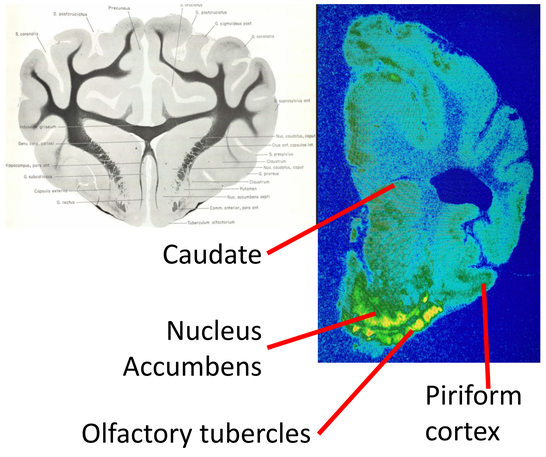
UtahStateUniversity
DEPARTMENT OF BIOLOGY

Introduction

- The neuropeptide oxytocin acts in the brain to modulate social functions in both humans and animals.



- Previous research has found that female monogamous prairie voles showed a decrease in oxytocin receptor binding in the nucleus accumbens shell after being separated from their mate[1].
- Coyotes (*Canis latrans*) are unique in the mammalian class in that they maintain long-term monogamous bonds[2].
- In effort to further understand oxytocin's role in social attachment, I studied the effect of partner loss on oxytocin receptor density in coyote brains.



Methods

- Fresh frozen, postmortem coyote brain specimens were sliced with cryostat at -15°C at 20 µm sections, mounted to microscope slides, and stored at -80 °C. Brain specimens were opportunistically acquired from the USDA's Predator Research Facility in Millville, Utah.

- Brain sections from 3 widowed female coyotes and 4 paired female coyotes were used. I selected sections that included brain regions that have been shown to be important in social behavior and reward.
- I conducted autoradiography, incubating the mounted tissue in a solution with a constant concentration of the commercially available radioligand ^{125}I-ornithine vasotocin analog.
- The slides were then exposed to radiosensitive film and later developed. I completed digital densitometry to quantify the binding densities in each brain region.

Figure 1 (left)- Locations of some of our coyote brain regions of interest on a autoradiogram viewed with densitometry imaging program. Locations referenced to well-established dog brain atlas.

Results

Figure 2 (below)- No effect of partner loss on oxytocin receptor binding in the female coyote forebrain

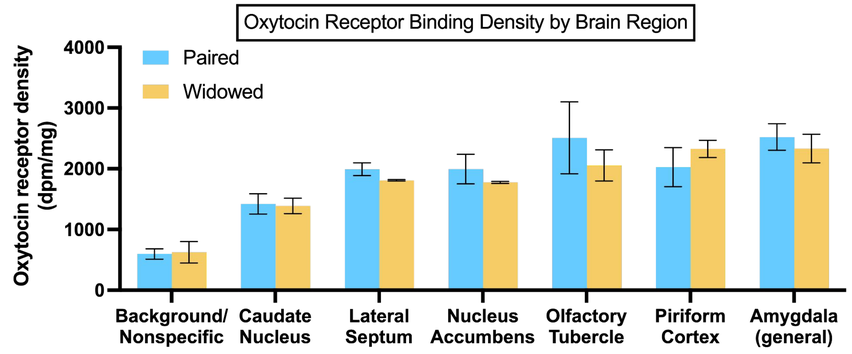
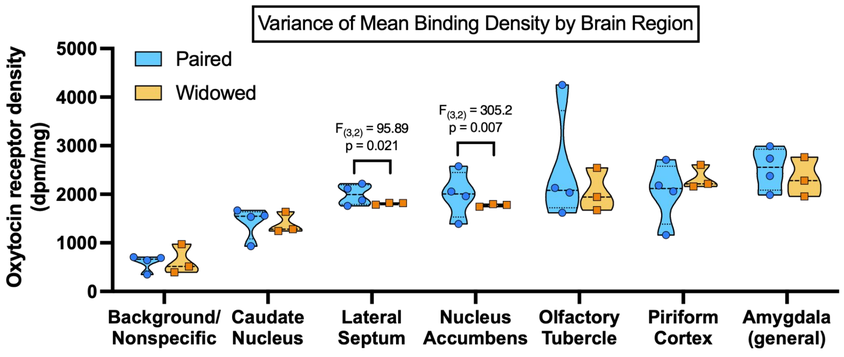


Figure 3 (below)- Widowed female coyotes have reduced variation in oxytocin receptor density in two regions



A two-way, repeated measures ANOVA analysis of our data produced the following results:

- There is no statistically significant variation comparing brain regions from the different pairing statuses (P value: 0.8166).
- There is a significant variation of binding densities between the different brain regions (P value: .0045).
- There is no statistically significant variation of binding density overall between widowed and paired females. (P value: 0.6171).
- There is statistically significant variation of the means of binding density in the nucleus accumbens and lateral septum between paired and widowed coyotes (stats shown on figure 3).

Conclusions

It does not appear that partner loss had an effect on oxytocin receptor density in the brain regions selected.

There is a difference between the variation of mean binding density in the nucleus accumbens and lateral septum, with widowed coyotes showing less variation.

Further research could continue to explore the effects of partner loss on the brain as more coyote brains become available, especially as continued slicing reveals deeper brain structures that are important in the production and utilization of oxytocin, such as the hypothalamus.

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References:
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2.Hennessy. (n.d.). Long-term pair bonding and genetic evidence for monogamy among urban coyotes (Canis latrans). *Journal of Mammalogy.*, *93*(3), 732–742. https://doi.org/info:doi/