

Exploring Canid Monogamy: Characterization of the Distribution of Oxytocin Receptors in the Brain of the Coyote (*Canis latrans*)

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Research Introduction

- Oxytocin is a neuropeptide that has been shown to be a factor in species that display social monogamy¹. The neural actions of oxytocin are necessary for social memory of familiar individuals of the same species.
- Much research has been done on oxytocin receptors (OXTR) in the brains of socially monogamous rodents and non-human primates, and these studies have demonstrated a critical role of oxytocin in the neurobiology of social attachment.
- Coyotes are a unique species in the context of social research because they are socially monogamous and have been shown to also exhibit sexual and genetic monogamy.

The goal of the current study is to establish the distribution of OXTR throughout the coyote forebrain in order to compare their receptor map to other known monogamous species and to lay the neuroanatomical foundation for future studies of the oxytocin system of coyotes. To our knowledge, this study is the first to examine measures of the oxytocin system in coyotes and will serve as guidance for future research on the biological basis of sociality in this species.

Brain Regions of Interest

Our area of interest includes regions previously shown to be important in social behavior in other monogamous mammals¹: the nucleus accumbens, striatum, lateral septum, and cingulate cortex. We expected to find a high density of OXTR in all of our regions of interest.



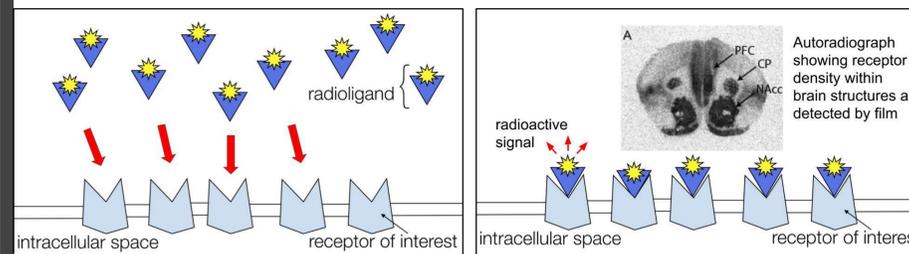
Methods

Animal specimens. In order to map coyote OXTR, we utilized five brains that were opportunistically collected from captive-housed coyotes at the USDA Millville Predator Research Center. These animals, four males and one female, were euthanized for other reasons unrelated to this study.

Specimen preparation. The brain samples were fresh frozen on dry ice within hours of death and cut into blocks. The blocks were then sectioned at 20 microns using a cryostat, and the slices mounted on glass slides.

Receptor autoradiography. These slides were processed according to established methods to visualize OXTR using receptor autoradiography². This process uses radioactively labeled ligands that bind to OXTR and emit radiation, which is detected by radiosensitive film (Figure 1). The resulting grayscale film images of each brain section reveal the locations and densities of receptor binding. We then compared these binding patterns to a laboratory canine brain atlas³ in order to qualitatively describe the regional distribution of OXTR in the coyote forebrain.

Figure 1. Diagram demonstrating autoradiography mechanism.



Results

Using a brain atlas developed for use in laboratory canines³ for comparison, our preliminary results show high density of oxytocin receptors in the expected areas such as the nucleus accumbens, olfactory bulbs, striatum, lateral septum, and cingulate cortex.

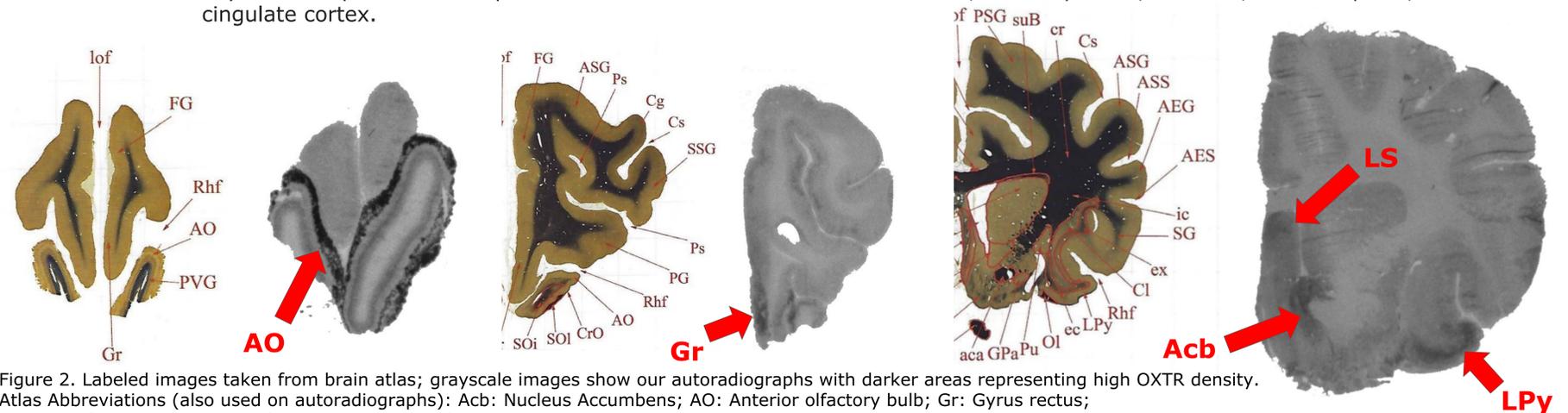


Figure 2. Labeled images taken from brain atlas; grayscale images show our autoradiographs with darker areas representing high OXTR density. Atlas Abbreviations (also used on autoradiographs): Aca: Nucleus Accumbens; AO: Anterior olfactory bulb; Gr: Gyrus rectus; LS: Lateral septum; CG: Cingulate gyrus; LPy: Piriform Lobe.

Conclusions & Future Directions

- While the current study is largely qualitative, it provides an exploratory characterization that will allow for quantitative analysis by our research team in the future.
- By showing that oxytocin receptor distribution follows a pattern similar to those of other monogamous species, we confirm our hypothesis and lend support to conserved oxytocin pathways convergently giving rise to monogamous behaviors in various mammalian species.
- Future directions include: continuing to section through the rest of the brain to describe receptor binding beyond the forebrain, counter staining the brain sections to determine neuroanatomical boundaries and confirm our identified regions of receptor expression, and quantitatively measuring the binding densities across regions to provide measurements of receptor density.

References

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