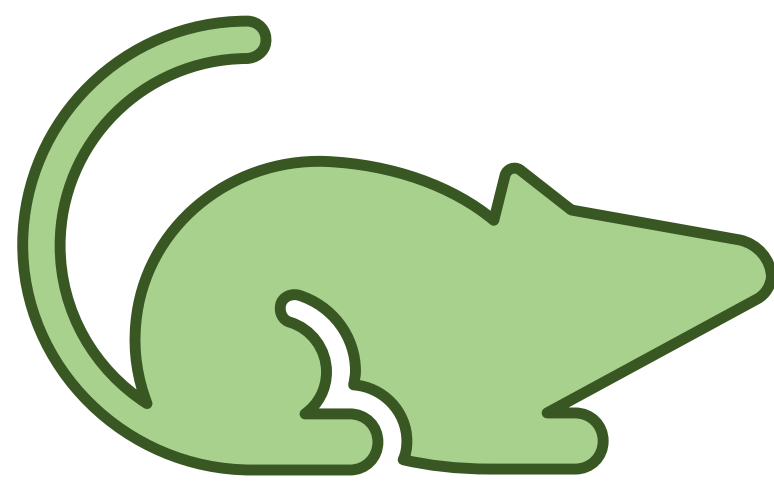


The Effects of a 5-HT_{1A} Receptor Agonist on Fear Memory Recall

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Introduction

- Fear is essential for survival. However, dysregulation of fear can lead to anxiety-like disorders, including post-traumatic stress disorder (PTSD) and anxiety.
- **Serotonin (5-HT)** is a neurotransmitter that is associated with a wide range of cognitive disorders, particularly PTSD, depression, and anxiety.
- The **5-HT_{1A} receptor** is abundant in brain regions linked to these cognitive disorders and memory functions, such as the dentate gyrus (DG).
- We can examine this through contextual fear conditioning (CFC), the TRAP2 mouse system, and immediate-early genes such as Arc.

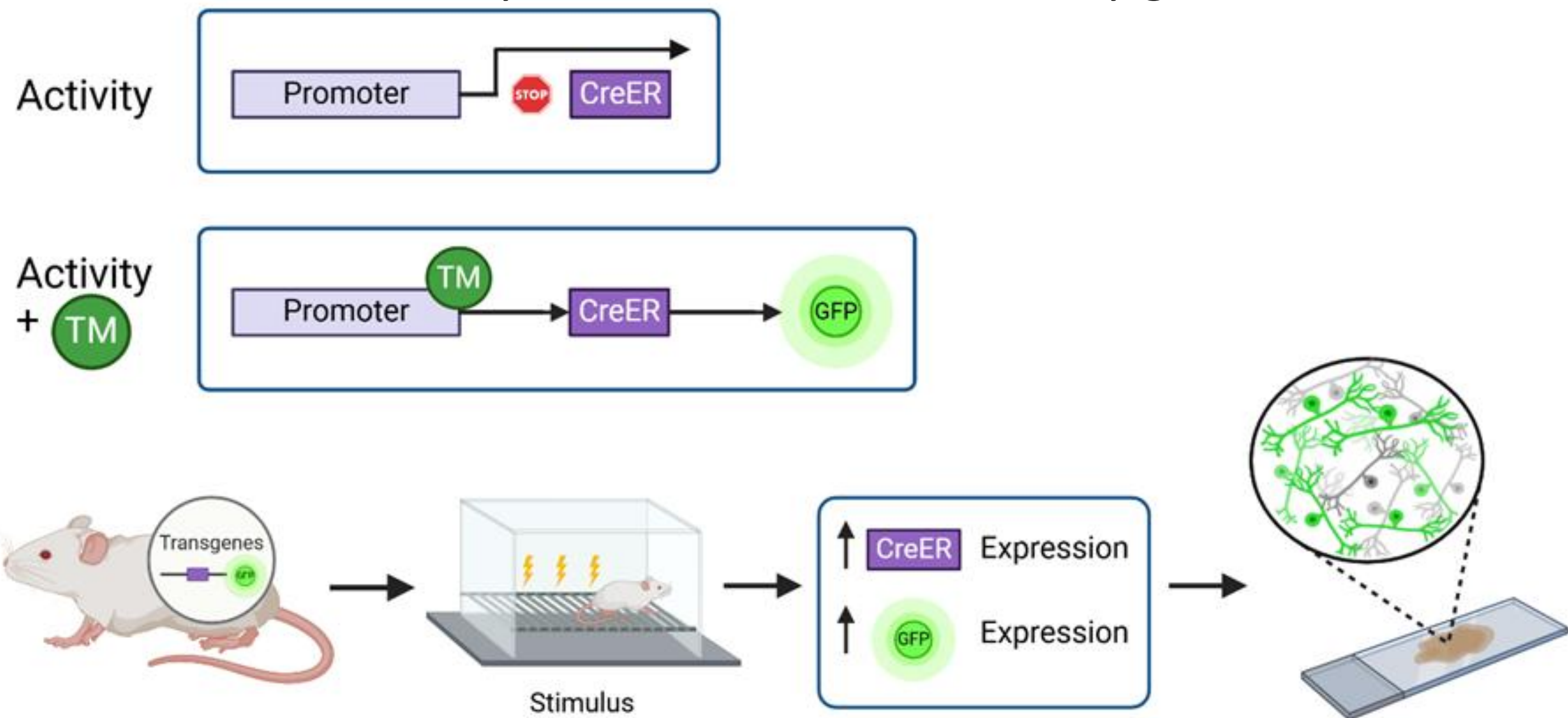


Figure 1: Transgenic Targeted Recombination in Active Populations (TRAP) Mice System.

Aims

This study aims to investigate how 5-HT_{1A} receptor agonist's presence influences behavioral and biological alterations such as engrams in the recall of fear memories, particularly through the lens of CFC.

Methods

Behavioral:

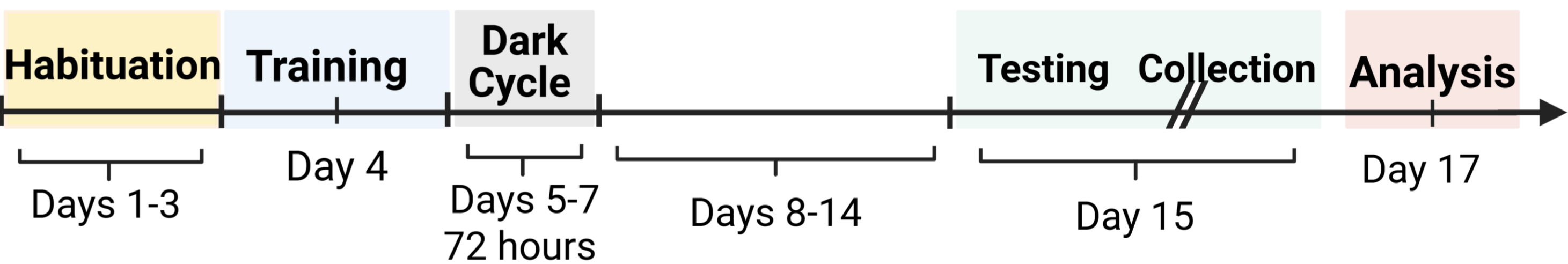


Figure 2: Contextual Fear Conditioning Behavioral Timeline.

Molecular:

- 1.) TRAP2 Mice – ZsGreen+ Identification
- 2.) Immunohistochemistry – Expression of Arc

Results

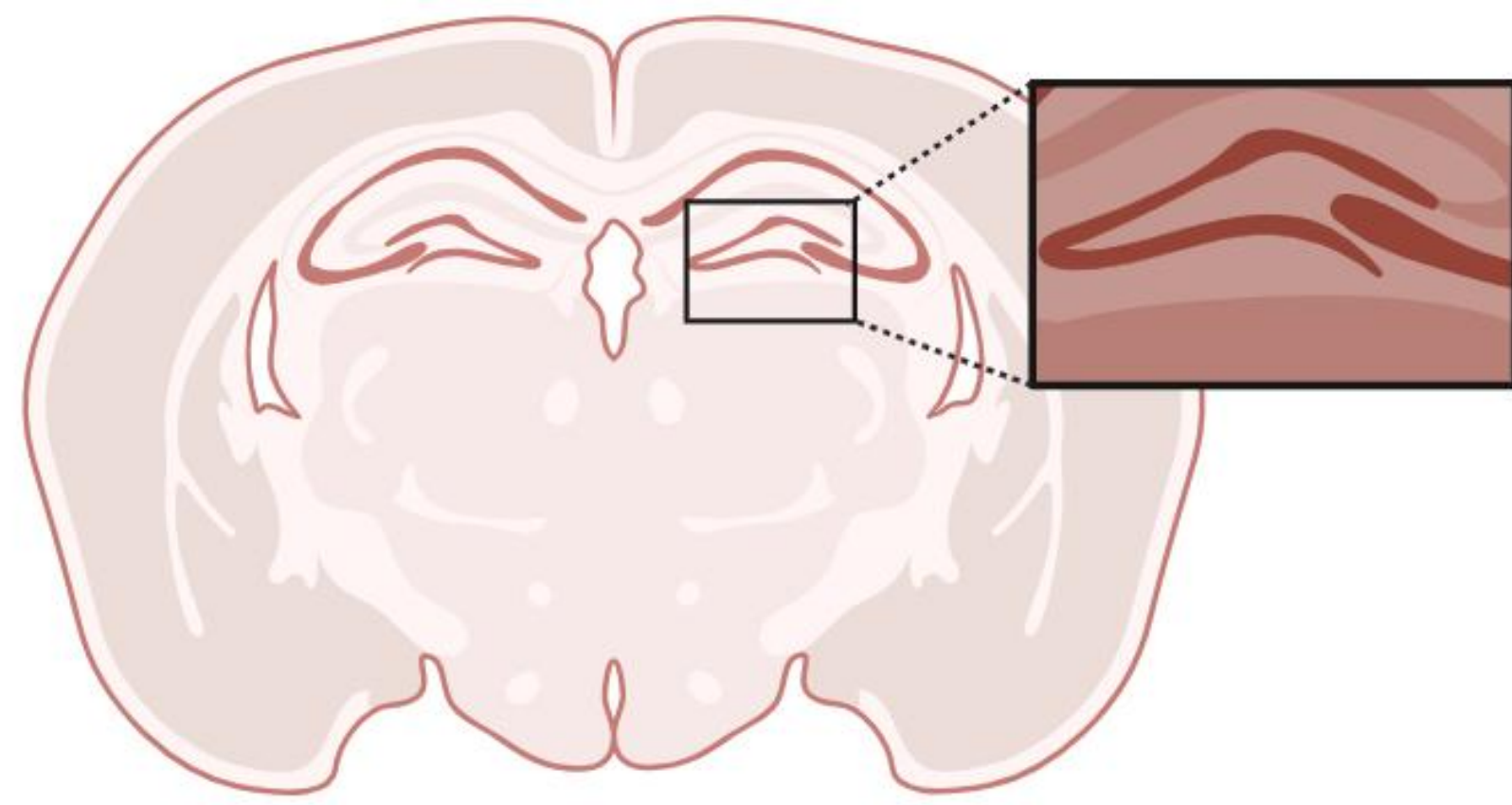


Figure 3: Diagram of Dentate Gyrus (DG) and experimental region.

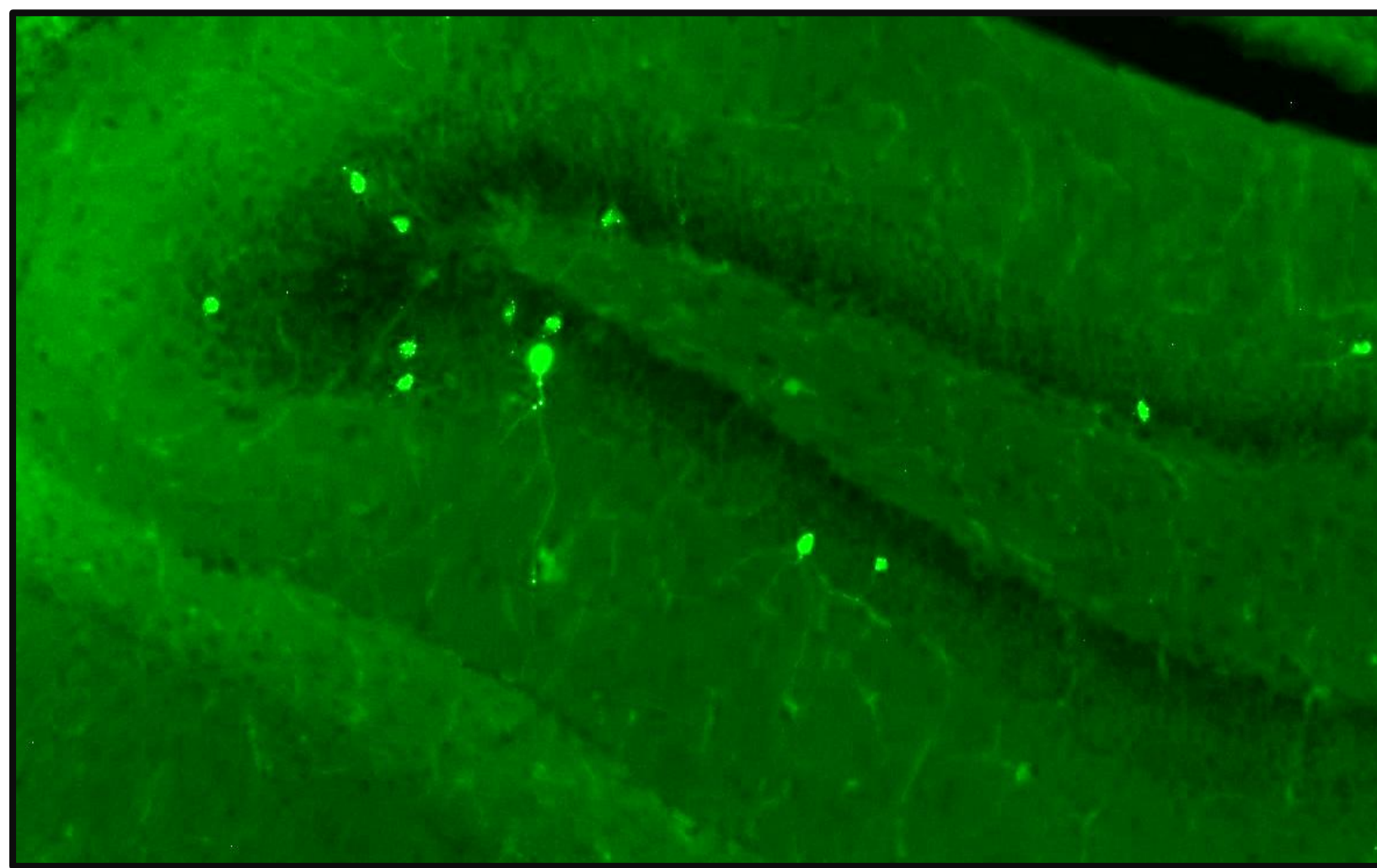


Figure 5: ZsGreen expression in the dentate gyrus.

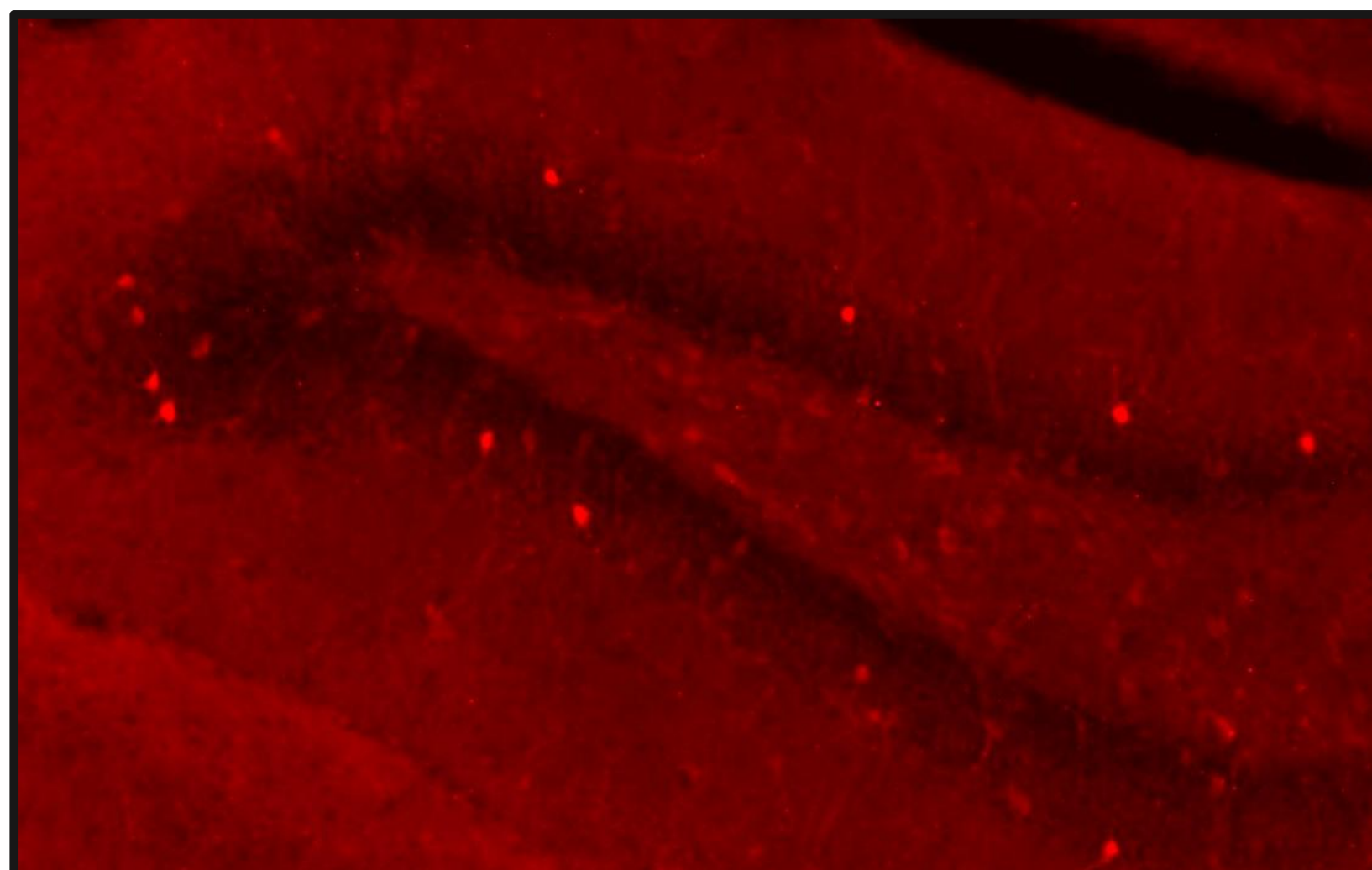


Figure 7: Expression of Arc in the dentate gyrus during fear recall.

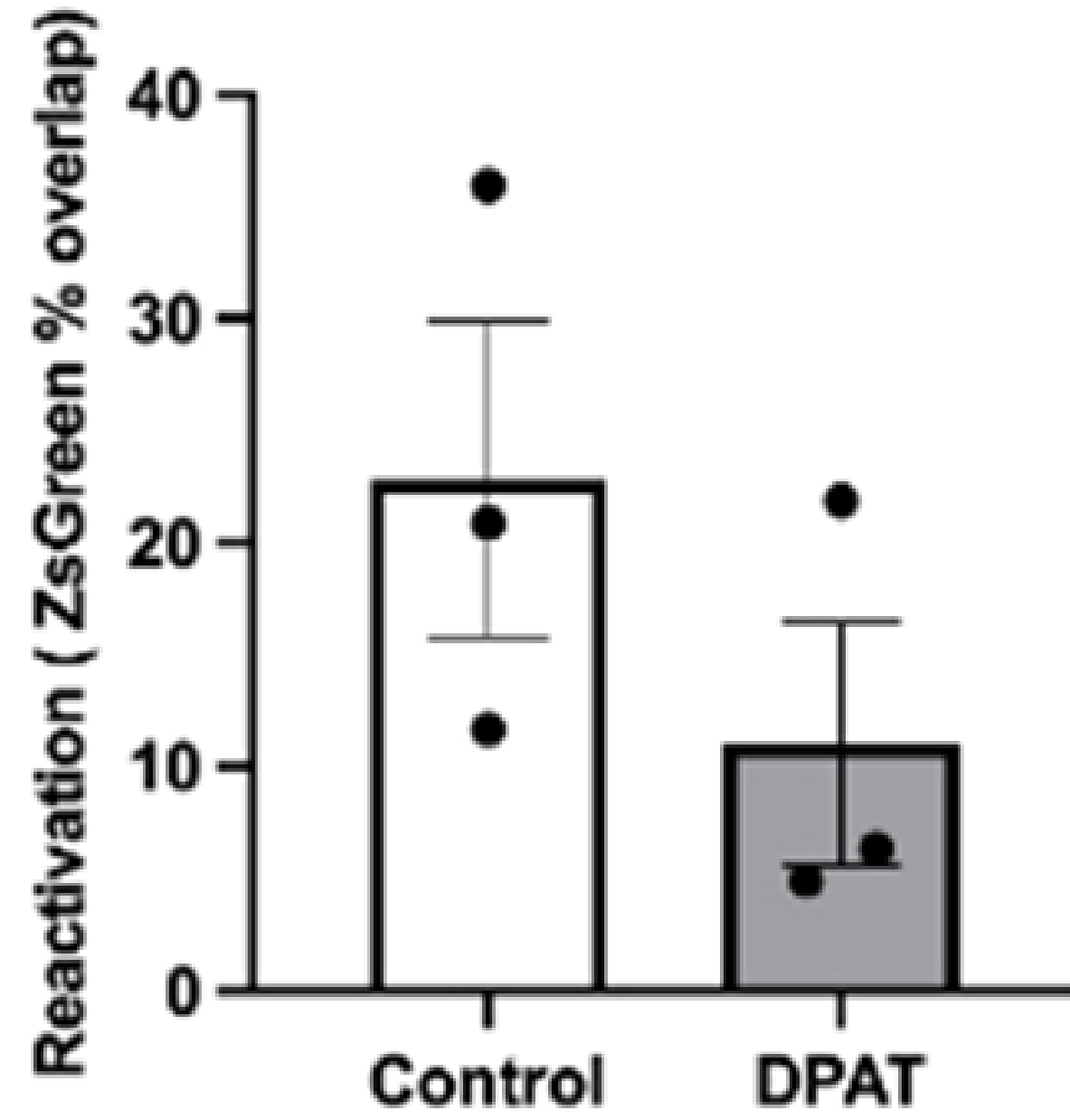


Figure 9: Fear engram reactivation in 8-OH-DPAT and Control.

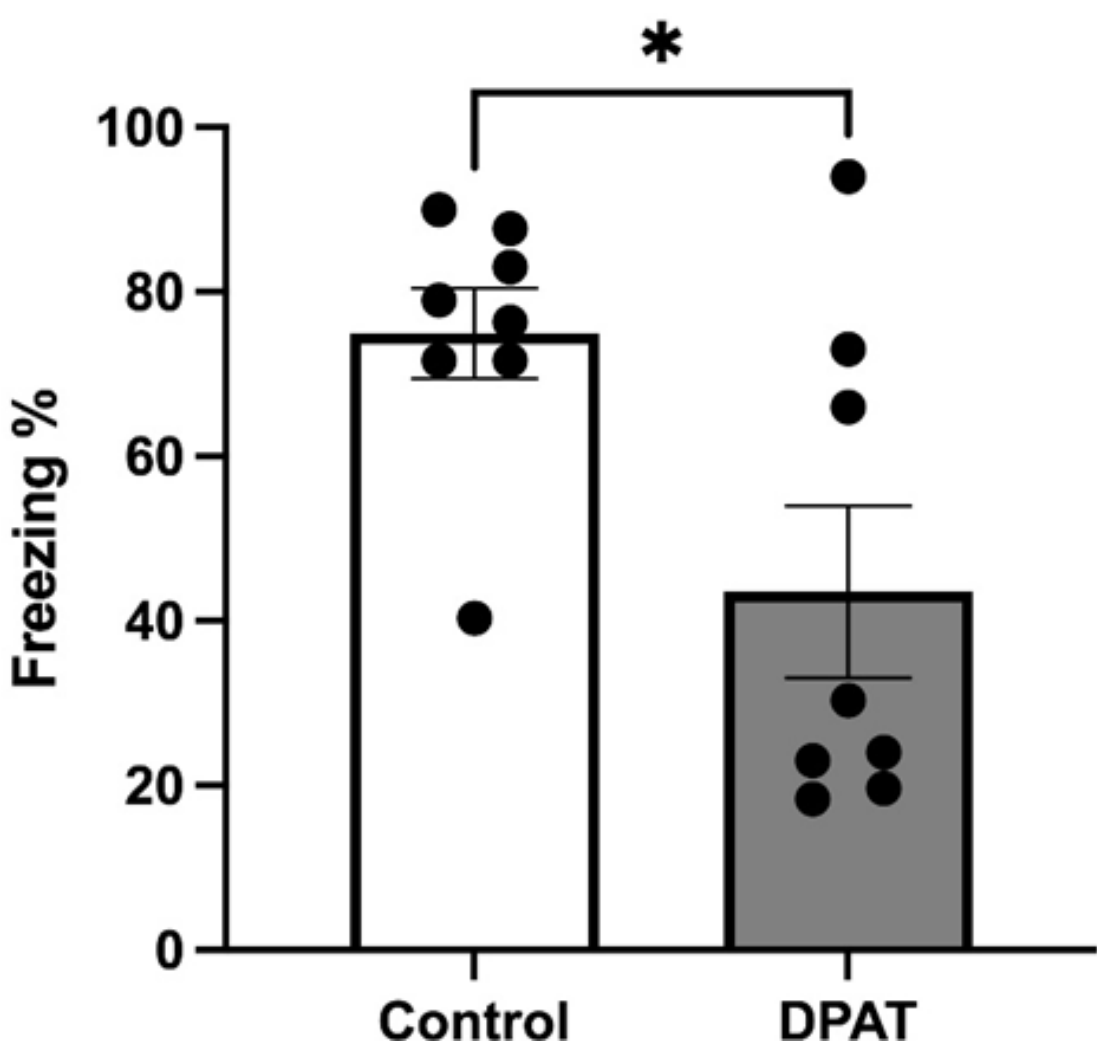


Figure 4: Contextual Fear Conditioning Performance in 8-OH-DPAT Mice vs. Control.

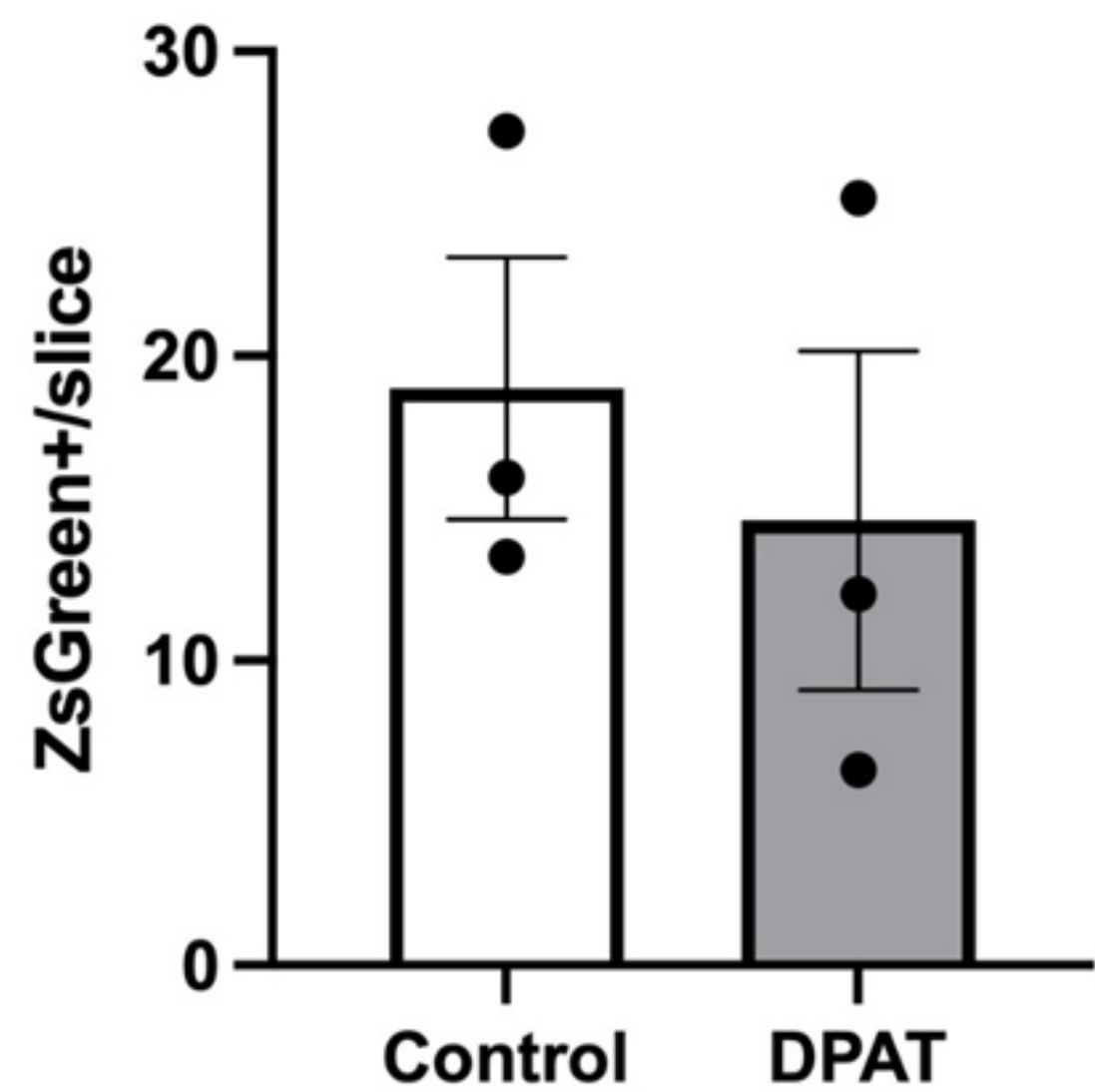


Figure 6: Acquisition of fear engram ZsGreen Expression in 8-OH-DPAT vs. Control.

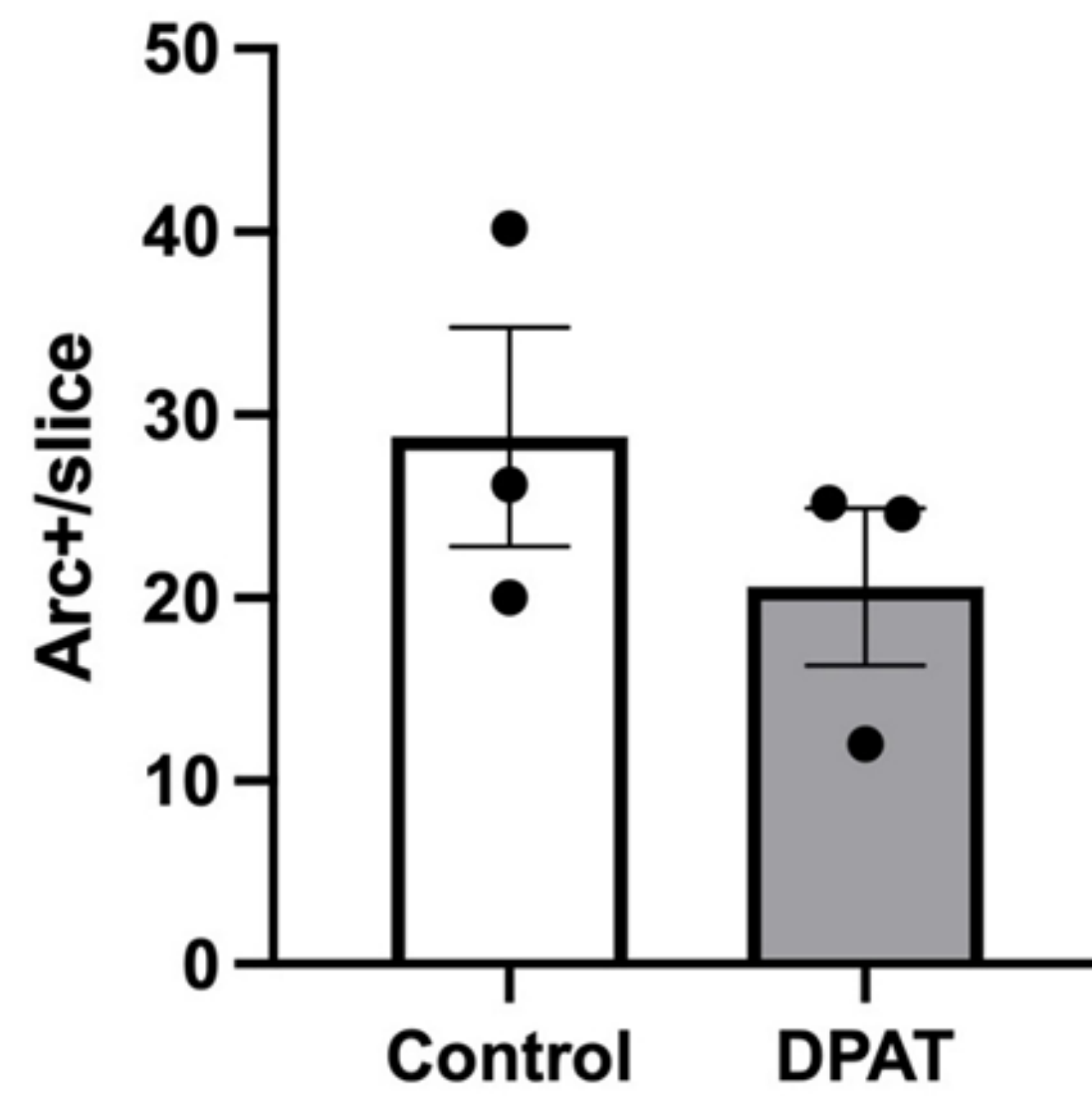
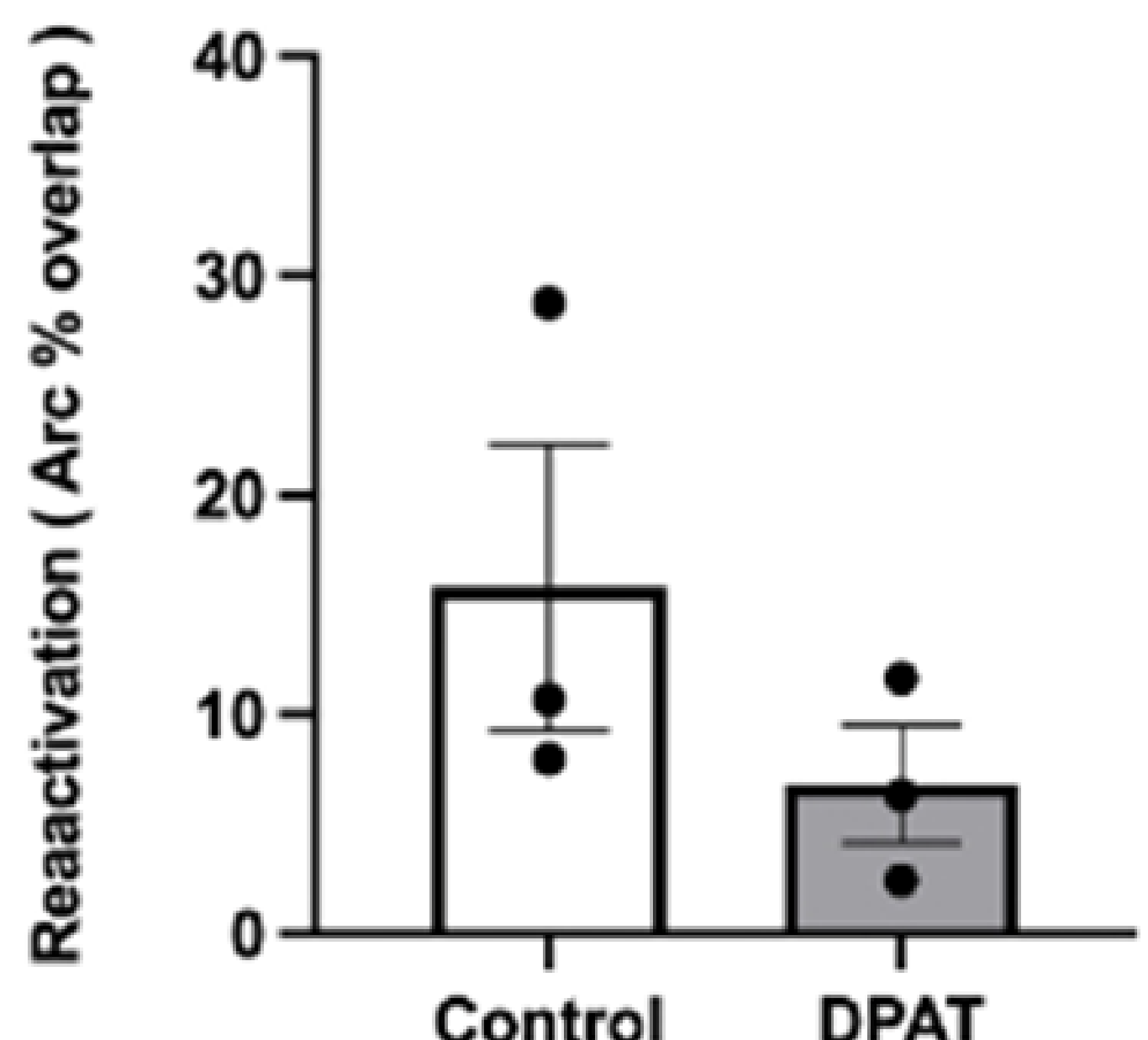


Figure 8: Fear Engram Arc Expression in 8-OH-DPAT vs. Control.



Conclusions

- Results indicated that the Activation of 5HT_{1A} receptors inhibits the recall of fear memory
- There was a significant decrease in freezing behavior when 8-OH-DPAT was administered.
- There was no significant difference in the activation of ZsGreen⁺, Arc⁺, and the overlap of both ZsGreen⁺ and Arc⁺.
- These findings suggest that 5-HT_{1A} receptors are involved in modulating fear memory, particularly evidenced by the reduction in freezing behavior.
- However, the exact role of the 5-HT_{1A} receptors in the modulation of the engram remains unclear and requires further investigation.

Future Directions

- Additional behavioral testing such as a water maze, to identify the presence of fear and to ensure locomotor function is not being compromised.
- Analysis of additional anxiety behaviors, such as climbing and jumping responses.
- Examination of engrams within different brain regions, such as the amygdala and raphe nucleus.
- Better understand the role of 5-HT_{1A} in fear memory to aid in finding treatment options for cognitive disorders.

Acknowledgements

Thank you to my advisor, Dr. Zuniga, for all the mentorship and guidance offered throughout this process. I would also like to thank my family and friends for their constant support. This project was funded by the College of Wooster Neuroscience Program.

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