

Comparative Gene Expression of Leptin in the Amygdala and Dorsal Hippocampus in Response to MDMA Exposure

Frances Margaret Perez, Joe Danica Inigo, Emily Clark, Kejia Zhang, Shveta Parekh, Ph.D.
Department of Psychology and Neuroscience, University of North Carolina at Chapel Hill

Introduction

Definitions

- ❖ **3,4-methylenedioxymethamphetamine (MDMA):** A schedule I psychoactive drug that causes a buildup of primarily serotonin, as well as dopamine and norepinephrine.
- ❖ **Leptin:** An adipose derived hormone responsible for regulating hunger.
- ❖ **Cocaine and Amphetamine Regulated Transcript (CART):** A neuropeptide protein that has roles in reward, feeding, and stress.

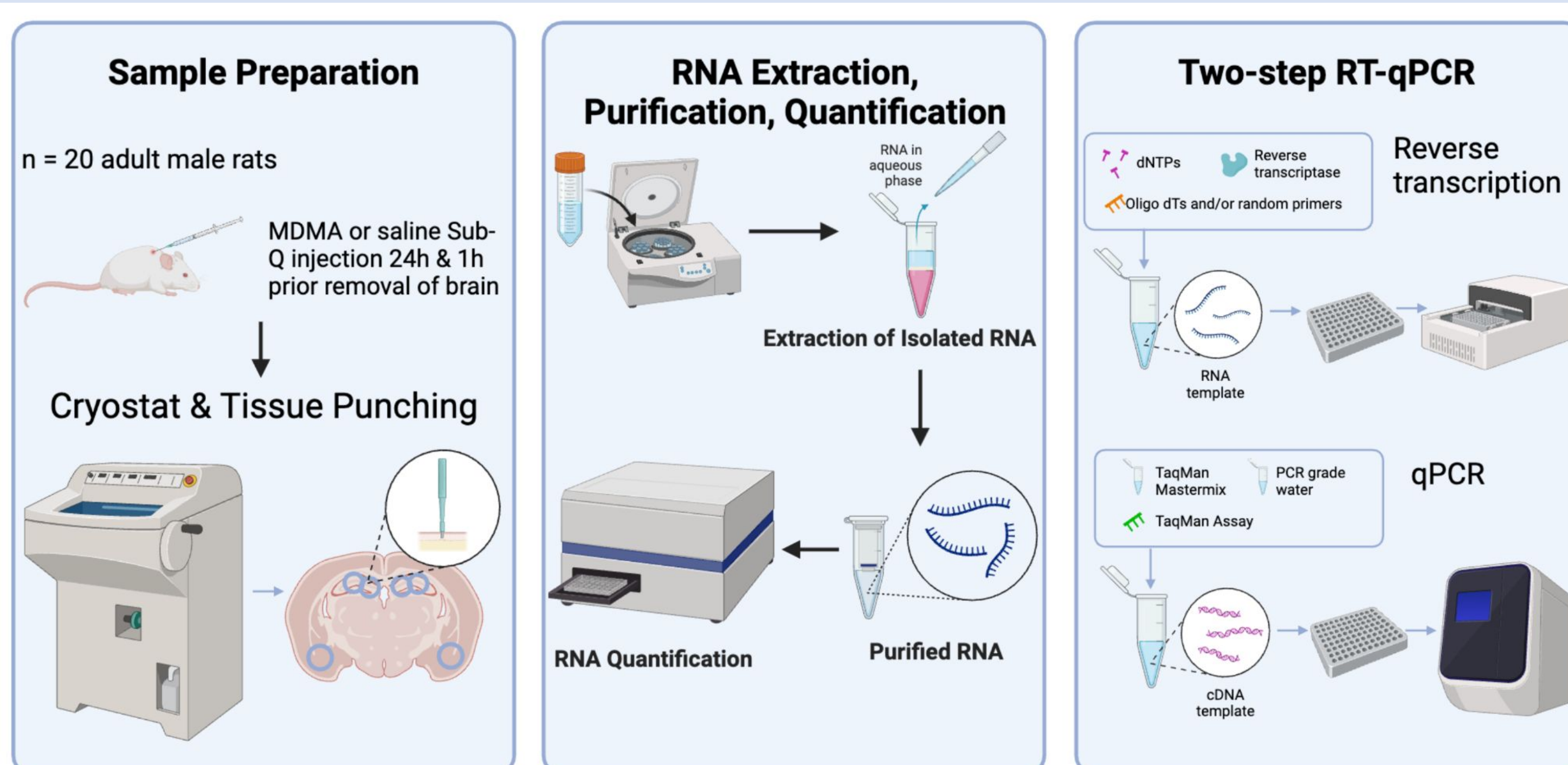
Connections

- ❖ MDMA has been investigated as a potential treatment for anxiety-related disorders¹
- ❖ Prior research associates MDMA with CART in the amygdala, influencing appetite via leptin, and with hippocampal cognitive function^{2,3}
- ❖ Limited research has directly examined the link between MDMA and leptin expression⁴
- ❖ Understanding this link may inform therapeutic interventions for anxiety-related eating disorders like anorexia and bulimia nervosa.

Hypothesis

Acute MDMA administration will increase leptin expression in the amygdala and decrease expression in the dorsal hippocampus in adult, male rodent brains.

Experimental Design



Results

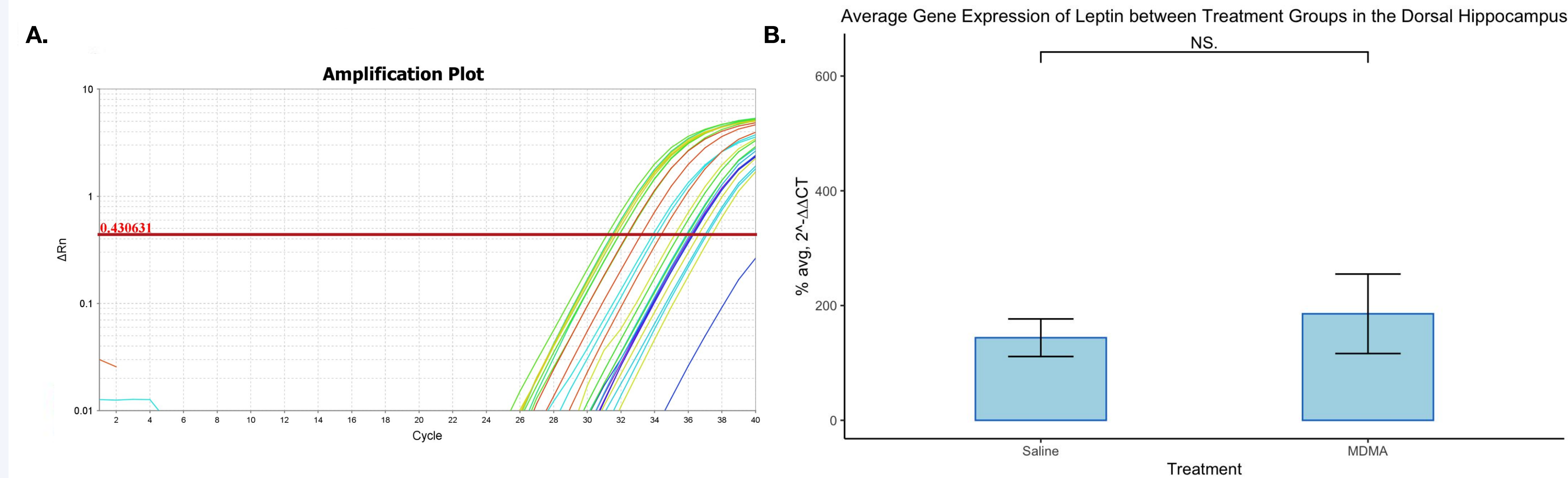


Figure 1. Effects of MDMA Exposure on Leptin Expression in the Dorsal Hippocampus. A) Amplification Plot of qPCR performed on DH for gene coding for the leptin protein. **B)** Comparison of the amount of gene expression for leptin in DH for rats treated with MDMA compared to those treated with saline, with error bars representing the standard error of the means of each group ($t = 0.28$, $p = 0.596$). * $p < 0.05$

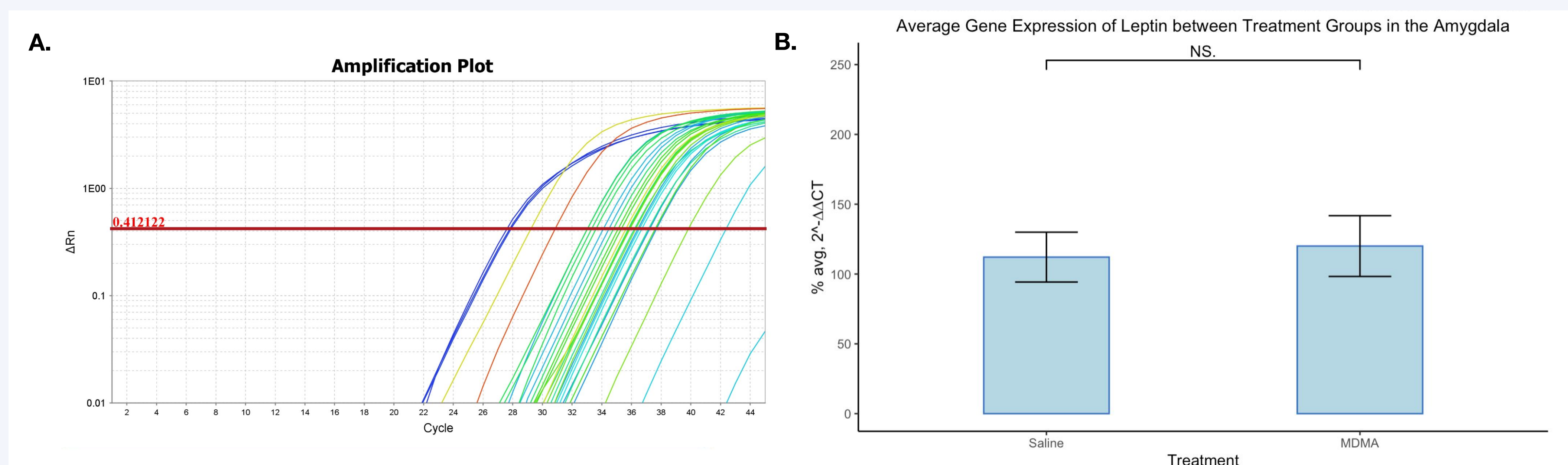


Figure 2. Effects of MDMA Exposure on Leptin Expression in the Amygdala. A) Amplification Plot of qPCR performed on amygdalar complex for gene coding for the leptin protein. **B)** Comparison of the amount of gene expression for leptin in the amygdalar complex for rats treated with MDMA compared to those treated with saline, with error bars representing the standard error of the means of each group ($t = -0.608$, $p = 0.782$). * $p < 0.05$

Conclusion

- ❖ No significant difference in leptin gene expression between rats treated with MDMA compared to rats treated with saline in the COA or in the DH.
- ❖ MDMA has no significant effect on leptin expression and therefore appetite through these pathways.

Limitations

- ❖ Only males rats used
- ❖ Only acute usage of MDMA
- ❖ Only one dosage of MDMA
- ❖ Lack of applicability from rats to humans

Future Implications

- ❖ Conduct this experiment using the same experimental design, this time on female rodents.
- ❖ Investigate long-term effect of MDMA on leptin expression.
- ❖ Examine MDMA's effect on other hormone involved in appetite regulation, like adrenocorticotrophic hormone (ACTH) produced in pro-opiomelanocortin (POMC) during stress response, as part of the hypothalamic-pituitary-adrenal (HPA) axis.

Acknowledgments

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Regions of Interest

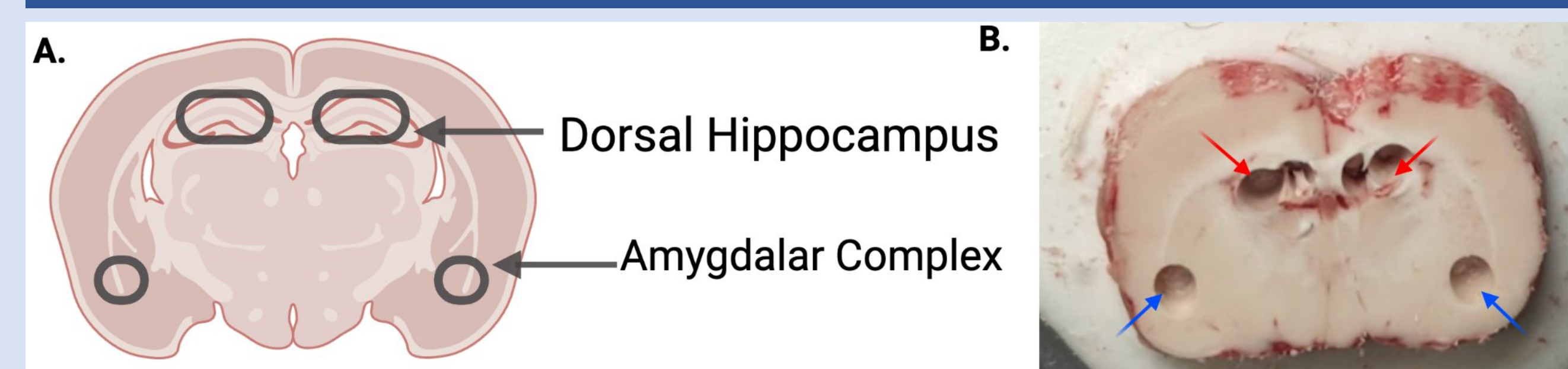


Figure 3. Diagram of Regions of Interest. A) Amygdalar Complex and Dorsal Hippocampus indicated on the coronal slice of a rat brain. **B)** Picture of real rodent brain with red arrows indicating the dorsal hippocampus punches and blue arrows indicating the amygdala punches.

References

