4-29-2021

Influence of Social Status on Behavior and Stress in Mice

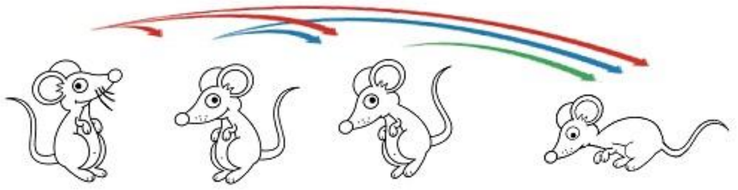
Samantha Everett

Influence of Social Status on Behavior and Stress in Mice

Samantha Everett, R. Parrish Waters
Department of Biology, University of Mary Washington

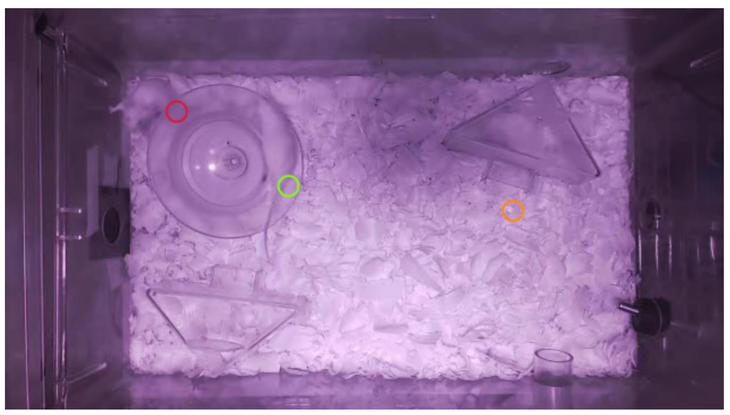
Background

Mice are socially aggressive animals and tend to interact in ways that are representative of a social hierarchy. Their interactions and behaviors will determine their position in this social hierarchy; i.e. dominant, submissive, or somewhere in-between. Dominant mice are aggressive and then to control the cage's resources, while submissive mice are less aggressive and have little to no control over the cage's resources.



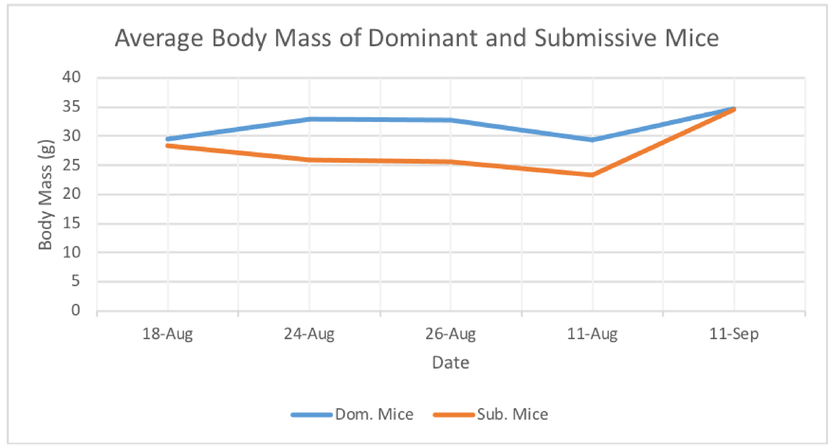
Social enrichment is a stressor that can induce a moment of acute stress (anxiety) and elicit specific behaviors. The running wheel is an important resource to the mice, as it provides an opportunity for a stress relieving activity (exercise). Having an accessory cage with selective access also provides a moment of stress relief by allowing mice to isolate themselves one at a time.

Home and Accessory Cages

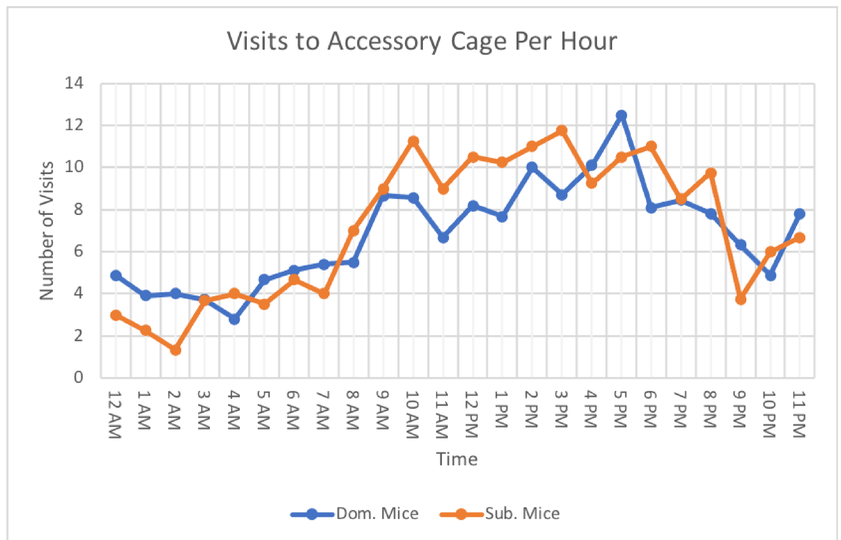


We microchipped 20 mice and split 16 of them into groups of 4 before housing them in their respective cages for 35 days. The other 4 mice were housed individually and treated as controls. Each home cage was fitted with a running wheel, feeding tube, and water, and each accessory cage was fitted with a running wheel and water. The home cages and the accessory cages were connected by an RFID sorter that allowed one mouse into the accessory cage at a time.

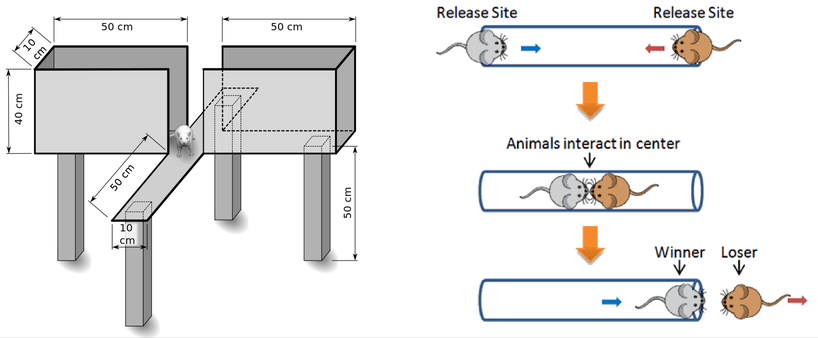
Daily Activity



We measured the mice's daily activity by periodically recording their weight and how often the mice visited their accessory cage.

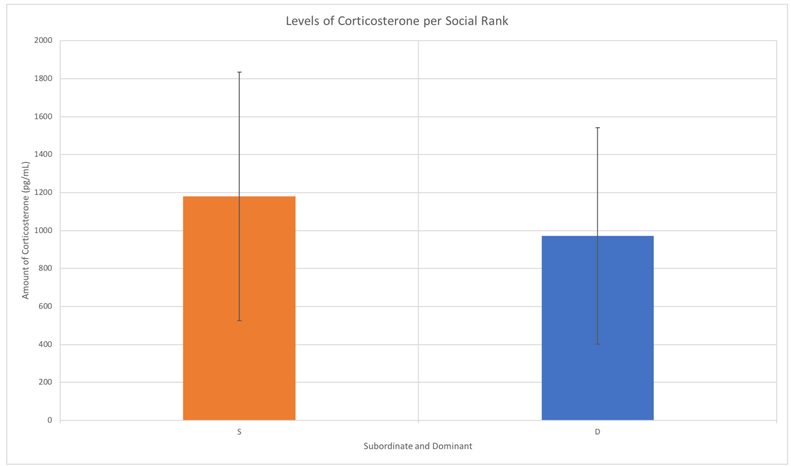


Behavioral Results



The Elevated plus maze is a test that is thought to demonstrate anxiety. The tube test is a behavioral assay used to measure social hierarchy in mice. We performed the tube test twice to narrow down our dominant and submissive mice. We performed the elevated plus maze twice and did not find it to be a reliable measure of social rank.

Physiological Results



Corticosterone is primary stress hormone of the pituitary adrenocortical axis in mice and is secreted in response to environmental challenges. It plays an important role in stress and adaptation. We observed no effect of social rank or social isolation on corticosterone, which is surprising, given the important role of this hormone in the response to stress.

Conclusion

We were able to determine the social rank of all mice, however none of our physiological or behavioral tests provided conclusive results demonstrating significant differences in anxiety or response to stress. We can attribute this to the fact that the home cages were large in comparison to the number of mice housed in them, the availability of the accessory cage, and the fact that the mice had access to two running wheels. These three factors could have played a role in creating a much less stressful environment for the mice. Our lack of significant results could also mean that the behaviors and tests we observed were not the appropriate tests to detect the effects of social subordination stress in mice.

Acknowledgements

I would like to thank Dr. Waters for his valuable assistance and guidance through the development of this research project. His support and encouraging attitude helped push this experiment forward through the challenges. Dr. Waters has been an amazing professor and mentor both academically and personally. Being a student in his classes and on his research team has been one of the most positive experiences I've had as a Biology major at UMW.