

Problem:

Attention-Deficit/Hyperactivity Disorder is a psychiatric disorder with no defined etiology [1]. It encompasses a number of symptoms such as, but not limited to, inattention, impulsivity, and hyperactivity. It was once thought of as a childhood disease, but recent research has shown that it is also prevalent in adults [2]. Stimulants are the typical drug of use to treat this condition. These drugs act on norepinephrine and dopamine receptors, therefore it is thought that ADHD affects individuals via these neurotransmitters [3]. However, the exact mechanisms behind it are still unknown.

Biological Question:

How is dopamine processed in a subject with ADHD vs one without?

Research Model:

Compare and contrast dopamine levels and dynamics in ADHD model rats versus a control group

Research Plan:

- The established rat model for ADHD is the SHR/NCrl rat [4]. This will be our experimental group. Our control group will be WKY/NHsd rats, to maintain consistency with the research done by Dupuy, et al.
- New generations of the mentioned rat models will be bred to exhibit the dLight1 genetically encoded sensor. This sensor will be added using *in utero* electroporation. ADHD has been shown to be an hereditary condition, therefore loss of expression in the experimental group is not a concern.
- Developed by Patriarchi, et al. [5], dLight1 is “an intensity-based genetically encoded dopamine indicator, to enable optical recording of dopamine dynamics with high spatiotemporal resolution in behaving mice.”
- Genetically encoded indicators are preferred because they allow us to perform *in vivo* experiments with no risk of leakage while also providing a view into neuronal dynamics.
- Both rat groups will be subjected to reward-learning experiments while their dopamine levels are actively monitored. After some trials, distractions such as sounds, and light will be added to further observe changes in dopamine levels between both groups.

References

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