**The effect of repeat stress on excitatory neurons in the female rat dorsomedial hypothalamus.**

**Background**

Over the past five years, people worldwide have experienced significant levels of stress and uncertainty. The health effects of chronic stress are understood to affect many systems, such as the cardiovascular, immune, and endocrine systems (McEwen, 2008). Stress hormones motivate the intake of comfort foods, potentially as a coping mechanism (Dallman, 2003). This connection between stress and eating behaviours was illustrated during the COVID-19 pandemic, which affected the eating habits of different demographic groups in various ways. Notably, Davies et al. (2023) found females were at higher risk for pandemic stress-induced binge eating. High stress is known to trigger eating disorders (Auger et al., 2023), and the rates of hospitalization for eating disorders increased with each wave of the pandemic. The most affected group was females ages 10 to 19, whose hospitalization rates more than doubled their pre-pandemic levels (Auger et al., 2023).

Sex differences in food intake are seen in rodent models of emotional stress-induced binge eating. A study by Anversa et al. (2019) found that female rodents with unrestricted food access, and no previous history of food restriction, ate 72% more when subjected to chronic stress than their unstressed controls. This change was not seen in male rodents with the same unrestricted food access (Anversa et al., 2019).

The dorsomedial hypothalamic nucleus (DMH), a region of the hypothalamus that is implicated in food intake and body weight regulation (Bellinger and Bernardis, 2002), is an ideal region of the brain to study, both for its role in appetite and its receptors for stress hormones (Myers et al., 2014). Unpublished data from Dr Crosby’s lab has shown that in male rats exposed to repeated stress, there is a decrease in the strength of excitatory synapses onto DMH neurons. The main objective of my study is to determine the effects of repeated stress on the DMH of female rats and determine if there is a sex difference in the synaptic transmission that may be underlying the behavioural differences seen.

**Experimental Design**

Once approval from the Mount Allison Animal Care Committee is obtained, female Sprague-Dawley rats will be separated into two groups, i) chronic stress, and ii) unstressed controls. Groups will have unrestricted food access, and the chronic stress group will undergo five consecutive days of 30-minute restraint, a well-established stressor (Patchev and Patchev, 2006). Following the fifth day, both groups will be heavily anesthetized and euthanized, then their brains will be removed. The brains will be sliced and neurons will be kept alive in oxygenated artificial cerebrospinal fluid. Using patch clamp electrophysiology, electrical current and action potential properties will be measured (~8-10 cells/group, ~2 cells/brain).

**Expected Outcome**

In the preliminary male research data we see a decrease in the strength… but might we see an increase in females that underlies the different behaviour? -DMH neurons can be inhibited or excited by CRH (Myers et al., 2014)

**Impact/Significance**

Despite sex differences in behaviour, most electrophysiology studies used for human application only use male rats, creating a gap in knowledge for females. This research aims to answer the question how does repeated stress in young female rats affect the synaptic transmission of excitatory neurons in the DMH that regulate appetite.