2024 Summer Scholar Profile: Sophia Skubic

My name is Sophia Skubic. I am a rising junior majoring in Behavioral Neuroscience with a minor in Spanish at the University of San Diego (USD). At USD, I work in Dr. Jena Hales's lab, investigating the neurobiological causes of Attention Deficit Hyperactivity Disorder, more commonly known as ADHD. The ADHD model rats perform spatial foraging and memory tasks to test their cognitive abilities. We use immunohistochemistry to examine microglia– cellular markers of inflammation in the brain–in order to study their role in ADHD. This summer, I worked with Dr. Parminder Singh, a postdoctoral fellow at the Buck Institute for Research on Aging, in Dr. Pankaj Kapahi's lab. The lab focuses on dietary restriction to extend lifespan and reduce age-related diseases using several different model organisms. Specifically, my project with Dr. Singh aims to see how dieting and lifestyle choices can affect postmenopausal women and what cellular pathways may lead to increased aging post-menopause. He is interested in how men and women age differently and how this can impact age-related diseases such as Alzheimer's, cancer, and obesity.

On average, women live longer than men, but they are also more susceptible to age-related diseases. Research suggests this susceptibility may be due to differences in their reproductive organs and their roles in the body outside of reproduction. Women go through several stages of reproductive decline in their lifetime, which we characterize as menopause. Once the ovaries stop producing estrogen during menopause, women experience a variety of adverse effects. Estrogen supplementation, the current method of treatment, has proven to be problematic, as it can lead to cancer formation. Our work aims to find a better way to address this deficiency that is more upstream of the problem and could pave the way for more effective treatments and a brighter future for women's health. We believe that the problem begins when inter-organ communication between the ovaries and the brain becomes severed or interrupted by menopause. We are focused on studying the hypothalamic region in the brain because of how closely it is related to aging and postmenopausal disorders. The question that this project aimed to answer was, "Are postmenopausal women more at risk for high fat diet (lifestyle) induced obesity?"

We compared four different cohorts of mice, including normal mice fed a standard and a high-fat diet and ovariectomized mice (our post-menopause mimic) fed the standard and high-fat diets to test our hypothesis. Then, we looked at the hypothalamus in the mice's brains to see where the inter-organ communication between the brain and the ovaries could be failing. We focused on microglia, astrocytes, and stem cells--cell types which may drive women's post-menopause vulnerability to obesity. The lab will utilize a drug that inhibits/activates these cells to see if vulnerability to obesity can be decreased by alteration of these cells. In the future, we hope to bring this information to clinical trials and develop a drug that could mitigate some of the adverse effects postmenopausal women experience, such as obesity.