2022 Buck Summer Scholar: Kaitlyn Hung

My name is Kaitlyn Hung, and I am a rising 3rd-year undergraduate at Northwestern University, majoring in biology and minoring in data science and global health. I plan to attend graduate school, achieve a Ph.D. in biology, and pursue a career in research. At Northwestern, I work in Dr. Clara Peek's lab in the Department of Biochemistry and Molecular Genetics. There, I study circadian rhythms in muscle. Circadian rhythms are centered in the brain and influence when we sleep and wake, but they are also found throughout the body and influence many other processes. I study the role of circadian rhythms on glucose metabolism, working to understand how disrupted circadian rhythms (from jet lag, shift work, etc.) affect metabolic diseases like obesity and type 2 diabetes.

More broadly, I am interested in studying how key aspects of lifestyle such as exercise, diet, and sleep influence health and disease. I stumbled upon the aging field and realized it connected many of my interests. This summer, I joined Dr. Eric Verdin's lab, which studies the interconnection between the immune system and metabolism during aging. Inflammation is characteristic of aging, with baseline inflammation increasing as we age due to improper function of the immune system. The Verdin Lab studies how natural metabolites produced by our bodies, like NAD+, influence the immune system during aging to try to better understand the causes and mechanisms of inflammation.

My project focuses specifically on understanding the processes behind female reproductive aging. The female reproductive system is the first to age, with women undergoing a gradual loss in fertility that ultimately ends in menopause. An earlier age of menopause is correlated with the development of age-related diseases and shorter lifespans, making it imperative to develop therapies to improve fertility and delay female reproductive aging. Additionally, the average age at which women give birth has increased globally in the past few decades. Childbearing at an older reproductive age increases the risk of miscarriage, birth defects, and pregnancy complications. Given that no clinically proven therapies exist, it is important to find ways to slow reproductive aging and improve fertility at an older age.

The metabolite NAD+ has a broad physiological function, involved in pathways from energy metabolism to the immune system and DNA repair. NAD+ levels have been shown to decrease with age leading to the development of age-related diseases such as neurodegenerative diseases, metabolic diseases, and cancer. The decline in NAD+ also occurs in the ovary during female reproductive aging, contributing to loss of fertility. Furthermore, increasing NAD+ levels improves many aspects of female reproductive aging. Despite this important role for NAD+ in female reproductive aging, the cause of the decrease in NAD+ is unknown.

My project studies the enzyme CD38, one of the primary consumers of NAD+. CD38 is becoming a key actor in the aging field as it increases with age in several tissues, driving the decline in NAD+ levels. However, the role of CD38 in female reproductive aging and the decline in NAD+ is unknown. To understand the role of CD38, we must first understand where CD38 is found in the ovary and how its expression changes with age. Knowing when and where CD38 is expressed in the ovary will allow us to perform research using drugs and more specific models to target CD38, bringing us one step closer to developing therapies to address reproductive aging.

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