2022 Buck Summer Scholar: Varun Sridhar

Varun Sridhar is an undergraduate Biology major at Hofstra University in the 8-year BS-BA/MD program in association with the Zucker School of Medicine at Hofstra/Northwell. At Hofstra, Varun works in Dr. Michael Dores's lab to investigate the cellular mechanism that the SARS-CoV-2 spike protein implicated in COVID-19 utilizes to cause lung tissue to become susceptible to inflammation. Varun also works in the Neurocognition of Speech Lab at Hofstra with Dr. Susan DeMetropolis to examine language and cognition links in stroke survivors dealing with aphasia, which encompasses a variety of language disorders. Varun's interactions with elderly dementia patients while volunteering at a nursing home and his prior neuroscience research experiences, most notably a summer internship at the Buck Institute as a high school junior, sparked his interest in studying neurodegenerative diseases and inspired him to pursue a career in medicine. As a Summer Scholar at the Buck Institute, Varun is working with Dr. Grant Kauwe in Dr. Tara Tracy's lab. The Tracy Lab focuses on studying the events that cause dysfunction to occur in the synapses, or points of connection between neurons in the brain, which lead to cognitive decline and memory loss present in Alzheimer's disease and frontotemporal dementia.

Under normal circumstances, a crucial aspect of synaptic function that allows the brain to form and retrieve memories is the ability of synapses to strengthen their signal transmissions between neurons based on stimulation of brain cells from new experiences. After being stimulated from the outside environment, neurons communicate with other neurons through the release of neurotransmitters, which are signaling molecules that bind to receptor proteins on the surface of other neurons to stimulate them. To transmit a stronger signal between neurons, synapses that are stimulated require a greater number of receptors to bind to the neurotransmitters and receive the signal. To produce these receptor proteins, a process known as protein synthesis occurs that involves many other supporting proteins to carry out the initial steps of synthesis. Varun is investigating the cellular mechanisms by which tau, a key protein that drastically increases in the brain in Alzheimer's disease and other tauopathies, disrupts protein synthesis, leading to synaptic dysfunction, cognitive decline, and memory loss. Dr. Kauwe and Varun are utilizing human neurons and mice with genetic mutations found in frontotemporal dementia patients as models to study tau's effects on synapse function. With decades of research and clinical trials not yielding any effective treatments or cures for tauopathies, the long-term goal of this project is to provide a basis for developing novel therapeutics to restore proper synapse function and prevent memory loss.

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