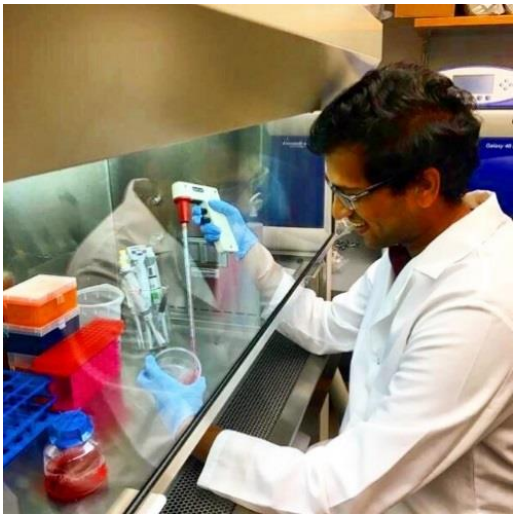

Identifying Mechanisms for Human Inflammasome Activation
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I spent the summer studying human inflammasome activation under the mentorship of Dr. Sunny Shin in the Department of Microbiology. In humans, there are two forms of immunity: adaptive immunity, a response to specific infections involving antibodies and B- and T-cell response, and innate immunity, a generalized response to infection which mounts as soon as infectious microorganisms are detected. An important component of innate immunity is the inflammasome, a large multi-protein complex that assembles when the host cell detects it is infected. Inflammasomes are crucial players in human innate immunity, as they are responsible for detecting bacterial ligands and releasing pro-inflammatory interleukin (IL)-1-family cytokines to signal other cells that infection has occurred.

Understanding the mechanisms underlying inflammasome activation has also been an area of interest because uncontrolled inflammasome activation in humans has been implicated in causing sepsis, a severe pathology that results from dysregulated inflammasome response to microbial infection. Thus, the objective of this project is to characterize the NAIP/NLRC4 inflammasome that activates caspase-1 in order to identify potential targets for clinical intervention in cases of prolonged sepsis.

First, we infected primary human macrophages with several strains of *Salmonella* Typhimurium, a Gram-negative pathogen which utilizes its Type III Secretion System (T3SS) to inject effector proteins to seize host cell processes. We were investigating the ability of the inner rod and needle proteins of its T3SS in activating the human inflammasome. We also infected human macrophages with strains of *Listeria monocytogenis* engineered to ectopically express these *Salmonella* ligands to study activation from a gain-of-function approach. Then, we assessed inflammasome activation in several ways. We used a lactate dehydrogenase (LDH) release assay as a marker for programmed cell death resulting from inflammasome activation. We used ELISAs to quantify secretion of IL-1-family cytokines, and Western blots to characterize the presence of active forms of IL-1β and the inflammasome enzyme caspase-1.

Research has been an important part of my undergraduate experience. I often learned most from my early mistakes, as I sought feedback from senior members of the lab and gained insight on the reasons behind my mistakes so I would not make them again. I started writing protocols for my experiments before running them, ensuring that I thought through the procedure and had a detailed plan of action, which helped me stay attentive to details and appreciate the scientific reasoning behind experiments. Most importantly, I gained a sense of responsibility to the field in addition to my responsibilities in lab—my results may be cited by other scientists in the future, and I feel compelled to work hard for the benefit of future investigations.