JOHNS HOPKINS
BIOMEDICAL ENGINEERING

BME COVID-19 SEMINAR SERIES

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Time: 1:30 p.m.
Location: Virtual - Zoom

Faculty Host: Reza Kalhor

Multiscale Engineering of Immunity in Infectious Disease, Aging, and Gut Microbiome Disorders

Abstract: Antibiotic-resistant bacteria are a major and rising global health threat. Although this threat affects all ages, pediatric patients and aged individuals are at increased risk of antibiotic-resistant bacterial infections. Currently, vaccines and therapeutic antibodies are unavailable for most antibiotic-resistant bacteria. To generate these antibodies, B cells must be activated by T cells to form germinal centers, which are sub-anatomical structures in the B cell follicles of lymph nodes. In germinal centers, B cells rapidly proliferate and mutate to form somatically mutated high-affinity antibody secreting cells, such as plasma cells, and memory B cells. However, emerging evidence suggests that conditions like aging and alterations to gut microbiome can diminish the ability to generate germinal center-mediated B cell immunity. In this talk, I will discuss my laboratory's effort in developing ex vivo immune organoids using cells from both young and aged individuals to generate antibody secreting cells in a dish against viral infections and antibiotic-resistant bacteria. We further elucidate the role of epigenetic modifiers, such as EZH2, in these responses. Finally, I will discuss how alterations to the gut microbiome from metabolic disorders affects germinal center and thereby vaccine response, which can then be improved through nanomaterial vaccines.

Bio: Ankur Singh is an Associate Professor of Mechanical Engineering and Biomedical Engineering at Georgia Institute of Technology. Prior to Georgia Tech (2020), he was Associate Professor at Cornell University, where he served as the Associate Director on the NIH/NIBIB T32 training grant on Immune-Engineering. He has served on the Executive Council of Cornell's Center for Immunology and the tri-campus Academic Integration Executive Committee. His "Immunotherapy and Cell Engineering" laboratory is developing strategies to engineer adaptable, designer immune organoids and enabling technologies for the understanding of healthy and diseased immune cells and their immunomodulation.