NIH T35 Medical Student Summer Research Program in Infection and Immunity

2021 Preceptors

**Bryce Binstadt**, MD, PhD, Associate Professor of Pediatrics, is a practicing pediatric rheumatologist whose lab is broadly focused on autoimmunity. He is investigating the drivers of cardiovascular inflammation in systemic autoimmune diseases, and the role of dual TCR T cells in autoimmunity. His long-term goal is to identify therapeutically targetable pathways to reduce cardiovascular morbidity and mortality among patients with rheumatoid arthritis, SLE, and related diseases.

**Bruce Blazar**, MD, Regents’ Professor of Pediatrics, is a practicing Pediatric Hematologist/Oncologist with expertise in blood and bone marrow transplantation. His laboratory is broadly focused on the control of T cell responses to cancer, with specific interest in graft vs. host disease and graft vs. leukemia effect, as well as post-transplant immunity. He is also investigating the derivation of human T regulatory cells.

**Paul Bohjanen**, MD, PhD, Professor of Medicine, is a practicing Infectious Diseases physician and the Director of the Division of Infectious Diseases and International Medicine. He has a long-standing interest in the mechanisms by which RNA-binding proteins regulate T cell responses. He is also actively investigating the HIV immune reconstitution inflammatory syndrome in HIV/AIDS patients that receive antiretroviral therapy in Africa.

**David Boulware**, MD, Associate Professor of Medicine, combines his clinical research with nested basic science investigations into disease pathogenesis to conduct translational research. His primary research interests are in meningitis in resource-limited areas including diagnosis, prevention, treatment, and quality improvement initiatives incorporating cost-effectiveness analyses in order to translate knowledge into improved care.

**Michael Farrar**, PhD, Professor of Laboratory Medicine & Pathology, seeks to understand how cytokine signaling pathways govern lymphocyte development and function, and how deregulation of these pathways can lead to cancer. His lab’s current focus is on: IL2R/TCR/TNF signaling in Treg development, Jak/STAT5 signaling pathway in B cell development and B cell leukemia, and CD4+ T cell responses to BCR-ABL+ B cell leukemia.

**Brian Fife**, PhD, Associate Professor of Medicine, is focused on the identification of autoreactive T cells that are responsible for type 1 diabetes, as well as the mechanisms that we can exploit to re-establish immunological tolerance as a therapy. He is the Director of our 2-photon imaging core facility, and uses this technology heavily in his research.

**Tanya Freedman**, PhD, Assistant Professor of Pharmacology, studies how regulation of the Src-family kinases, especially LynA, regulate the receptor-ligand size threshold that sometimes results in macrophage hypersensitivity to smaller stimuli. She is also interested in how LynA and other signaling proteins contribute to macrophage roles in autoinflammation, tumor growth, and antimicrobial responses.

**Thomas Griffith**, PhD, Associate Professor of Urology, is investigating the immunosuppression that occurs following sepsis. He also studies immune cell-derived tumor necrosis family members for their ability to control cancer cells.

**Sara Hamilton Hart**, PhD, Assistant Professor of Laboratory Medicine & Pathology, is focusing her research on CD8+ T cells with the goal of learning how to manipulate them to elicit the optimal protective immune response to pathogen infection.

**Reuben Harris**, PhD, Professor of Biochemistry, Molecular Biology and Biophysics, College of Biological Sciences, studies the DNA cytosine deaminase APOBEC3 subfamily for its role in the
control innate immune responses to DNA-containing infective agents such as transposons and HIV-1. He is also investigating these proteins for their capacity to mutate DNA and cause cancer.

Geoffrey Hart, PhD, Assistant Professor of Medicine, uses a basic immunology approach to study protection against malaria species in endemic regions of Africa. He seeks to understand protective and pathological mechanisms of this disease with the belief that unanswered questions lie where innate immunity intersects with the adaptive immune system.

Kristin Hogquist, PhD, Professor of Laboratory Medicine & Pathology, has a long-standing interest in T cell development. Her group studies how selection processes shape the T cell repertoire to achieve a highly effective and self-tolerant adaptive immune system. Their current research is focused in three areas: positive and negative selection in the thymus, iNKT cell development, and the human T cell response to EBV.

Stephen Jameson, PhD, Professor of Laboratory Medicine & Pathology, is focused on CD8+ T cell activation, homeostasis, and memory. Current work is exploring which memory CD8+ T cell subsets provide the best protection against pathogens, what the role of KLF2 is in resident memory cells, and how homeostatic mechanisms drive naïve CD8+ T cells to acquire memory T cell characteristics and what the significance of such cells in host defense is.

Marc Jenkins, PhD, Professor of Microbiology and Immunology, studies how antigen-specific helper T cells and B cells are activated in the body. Their work seeks to understand the interactions between T cells, dendritic cells, and B cells that lead to effective immune memory and self-tolerance. By studying the activation of antigen-specific lymphocytes in the body, Jenkins hopes to gain information that can be used to improve vaccines and inhibit deleterious immune responses such as autoimmunity.

Alexander Khoruts, MD, Professor of Medicine, is a practicing gastroenterologist and immunologist. His lab investigates host-microbe interactions and is doing translational work involving microbiota therapeutics. His group was the first to demonstrate successful fecal microbiota transplantation (FMT) for the treatment of patients with Clostridium difficile infection, and they are currently exploring the effects of gut microbiota on bile acid metabolism and immune-mediated colonization resistance in the gut.

Ryan A. Langlois, PhD, Assistant Professor of Microbiology and Immunology, addresses fundamental questions in virology and viral immunology that have been difficult to dissect using conventional approaches in the Influenza A Virus (IAV). Utilizing host-derived microRNAs, small non-coding RNA capable of mediating silencing of mRNA, to restrict the natural tropism of IAV allows for previously unavailable insights into immune responses to the virus.

David Masopust, PhD, Professor of Microbiology and Immunology, studies the CD8 T cell response to viral and bacterial infections. In particular, he is interested in the memory T cells that reside within respiratory, intestinal, and reproductive mucosa--the common portals of pathogen entry. He mainly uses mouse models to understand T cell migration to different anatomical locations, commitment to the memory lineage, and how these contribute to protection, although findings are being applied to primate models of SIV infection.

Jeffrey Miller, MD, Professor of Medicine, is focused on Natural Killer (NK) Cell Development with the goal to develop NK-cell based immunotherapies to treat cancer without the morbidity of CMV infection. He also studies targeted immunotherapy to treat human cancer, testing novel strategies to activate NK cells in vivo (using novel proteins such as interleukin-15) and to create antigen-specific NK cells with Bispecific Killer Engagers (BiKEs).
Jaime Modiano, DVM, PhD, Professor of Veterinary Clinical Sciences, College of Veterinary Medicine, is examining mechanisms related to neoplastic transformation and tumor progression. In particular, he is interested in the regulation of T cell responses to tumors.

Daniel Mueller, MD, Professor of Medicine, is a practicing adult rheumatologist interested in CD4+ T cell anergy, a natural self-tolerance mechanism that prevents autoimmunity. His lab is currently examining the mechanisms by which Foxp3+ regulatory T cells control anergy induction during self-antigen recognition, and the molecular mechanisms that control differentiation of anergic CD4 T cells to a Foxp3+ regulatory phenotype. He also investigates the role of B cells in rheumatoid arthritis pathogenesis.

Kirsten Nielsen, PhD, Associate Professor of Microbiology and Immunology, focuses on understanding how Cryptococcus causes disease, with the goal of developing better treatment strategies that improve patient survival.

Angela Panoskaltsis-Mortari, PhD, Vice Chair for Research and Professor of Pediatrics focuses on bioengineering the lung using adult stem cells and decellularized whole lung scaffolds with the goal of creating autologous lungs for transplant. She is also exploring methods of enhancing proper lung repair in several lung injury models using mesenchymal stromal cells, anti-fibrotic interventions and novel antioxidants.

Erik Peterson, MD, Associate Professor of Medicine, is a practicing rheumatologist, whose research interest is in the molecular and cellular bases for human autoimmune disease. Currently, he is focused on the role of PTPN22, a potent risk allele for rheumatoid arthritis, lupus, and type 1 diabetes. He discovered that PTPN22 selectively regulates type 1 IFN production in myeloid cells and is exploring the mechanism of action and role in pathogenesis.

Marco Pravetoni, PhD, Associate Professor of Pharmacology focuses on novel and more effective treatments for substance use disorders. Dr. Pravetoni's research interests focus on the pre-clinical development of novel immunotherapies for drug addiction using strategies that can be extended to other chronic non-communicable diseases.

Mark R. Schleiss, MD, Professor of Pediatrics, is engaged in the study of congenital cytomegalovirus (CVM) infection vaccines, immunopathogenesis, and placental infection. Using a variety of vaccine strategies, including purified protein subunit and DNA vaccines, his lab is evaluating the extent of protection of the maternal-placental-fetal unit against CMV infection and disease, using animal models of infection.

Kaylee Schwertfeger, PhD, Associate Professor of Laboratory Medicine & Pathology, is focused on the breast cancer microenvironment and how breast cancers cells interact with cells in the stroma, particularly with immune cells. The cell of particular interest to her group is the macrophage. Schwertfeger’s laboratory is also exploring how breast cancer cells interact with osteoclasts to promote bone metastasis using the FGFR signaling pathway with the goal to see whether the FGFR pathway inhibitors can be used to inhibit breast cancer metastasis.

Yoji Shimizu, PhD, MSTP Program Director and Professor of Laboratory Medicine & Pathology, has a research interest in lymphocyte adhesion and migration, and how these mechanisms contribute to effective immunity to pathogens and tumors. The long-term objective of his work is to provide the knowledge base necessary to specifically modulate the immune response by targeting these mechanisms of cell adhesion and migration.

Ingunn Stromnes, PhD, Assistant Professor of Microbiology and Immunology, is focused on advancing the understanding of cancer immunology and immunotherapy, with a particular emphasis on properties of the tumor and the tumor microenvironment that influence antigen-specific T lymphocyte migration and function.
Vaiva Vezys, PhD, Associate Professor of Microbiology and Immunology, studies T cell responses in autoimmunity and chronic infection. She is currently investigating what maintains the population of memory T cells specific for persistent pathogens, such as polyoma and lymphocytic choriomeningitis viruses. In addition, her group studies how tolerance is induced and maintained to intestinal proteins, as breakdown of this can lead to diseases such as ulcerative colitis and Crohn’s disease.

Chun Wang, PhD, Associate Professor of Biomedical Engineering, is interested in exploring how to engineer polymers so we can build biomaterials to use to solve problems in biology and medicine. The long-term goal is to develop implantable multifunctional biomaterials that serve as synthetic cell niches, capable of integrating instructive molecular signals for promoting recruitment, retention, survival, proliferation, and differentiation of stem/progenitor cells, ultimately leading to significant improvement of the clinical outcome of cell therapy.

Carston R. Wagner, PhD, Professor of Medicinal Chemistry, seeks to apply the principles of organic chemistry, enzymology analytical chemistry, molecular & cellular biology, biophysics and nanotechnology to the development of new methods for drug design and delivery, chemically engineered cellular therapies and tissue engineering.

Bruce Walcheck, PhD, Professor of Veterinary and Biomedical Sciences, is examining various aspects of inflammation regulation. His lab is actively involved in understanding the function and regulation of this proteolytic process in order to manipulate inflammation and bolster innate immunity or diminish damaging inflammation.