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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Alcorn, John	Fall and Spring	Projects are available studying the immunopathogenesis of influenza pneumonia and secondary bacterial super-infection. The laboratory is interested in host pathways that mediate susceptibility to infection and worsened lung injury. In addition, the opportunity exists to test novel therapeutic options in this context. Currently, the role of macrophage metabolism and cellular stress on super-infection and the impact of bacterial virulence factors on MRSA infection are of interest for development towards dissertation projects. A variety of additional pathways in immunology and microbiology remain open for investigation based upon student interest. In addition, the potential exists to work on human influenza and SARS-CoV-2 samples from infected or vaccinated patients as we partner with the CDC and NIH for vaccine clinical trials.
Ambrose, Zandrea	Fall and Spring	Current projects in the Ambrose lab include: 1) Understanding HIV or SARS-CoV-2 protein interactions with host cell proteins during replication, using molecular biology, virology, and microscopy (live cell, super resolution, single molecule fluorescence, EM) techniques. 2) Understanding HIV pathogenesis and co-infection with other pathogens, such as *M. tuberculosis* and hepatitis B virus, using animal models. 3) Characterizing new antiretroviral drug delivery methods for HIV treatment and/or prophylaxis. 4) Characterization of HIV common drug resistance mutations on novel antiretroviral drugs. See www.ambrose-lab.com for more details.
Atianand, Maninjay	Fall and Spring	Our research is aimed at uncovering novel genetic determinants of immune cell development and function during homeostasis, infection and inflammatory diseases. In particular, we are currently working on discovering the immune functions of long noncoding RNAs, a large family of genes (~16,000 in humans) in the so called "junk" or "dark matter" of the genome. The rotation project(s) would be developed based on student's research interests and training goals.

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Bakkenist, Chris	Fall and Spring	T cell cycles – A project to study how DNA replication and transcription are coordinated in T cells is available. Since T cells divide extremely rapidly and have a short G1 phase, the majority of transcription has to occur with DNA replication in S phase. A mechanism that ensures DNA and RNA polymerases travel through genes in the same direction is essential to prevent DNA-RNA polymerase collisions. A mechanism that allows the synthesis of a single, long transcript through multiple T cell cycles is also essential as long genes cannot be transcribed within a single T cell cycle.
Bina, Jim	Fall and Spring	The Bina lab studies antibiotic resistance and pathogenesis in the gram negative pathogens Vibrio cholerae and Klebsiella pneumoniae. Current areas of interest include the link between multiple drug efflux systems and environmental adaption, evolution of resistance in K. pneumoniae, and the molecular mechanisms involved in host interactions and disease development. Trainees in the Bina lab gain expertise in molecular biology, gene regulation, bioinformatics, antimicrobial resistance, bacterial pathogenesis and in vitro model systems.
Binder, Robert	Fall and Spring	The Binder Lab is focused on the role of heat shock proteins in initiating immune responses to cancer. Current projects include: 1. Examining the role of single nucleotide polymorphisms in the HSP receptor on interactions with ligands 2. Examining the prophylactic and therapeutic role of autologous tumor derived HSPs in a mouse model of osteosarcoma 3. Role of HSPs in cancer immunosurveillance. Trainees in the lab will gain significant expertise in mouse models of cancer, human immunology, tissue culture work, molecular biology, biochemical purification techniques, flow cytometry, bioinformatics, imaging etc.

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Biswas, Partha	Fall and Spring	Current projects in Biswas lab include: (1) Determine how IL-17 drives irreversible kidney damage, with the ultimate goal of revealing effective therapeutic approaches to block IL-17 signaling in chronic kidney diseases. (2) Delineate the mechanisms of IL-17-mediated renal immunity against disseminated candidiasis and uropathogenic E. coli infection. (3) Define the role of IL-17 signaling in renal fibrosis, the final outcome of acute or chronic kidney diseases leading to kidney dysfunction. (4) Define the mechanisms of increased mortality in patients with kidney disease due to systemic bacterial and fungal infections.
Bruno, Tullia	Fall and Spring	The Bruno lab is focused on understanding the function of B cells in solid tumors. In particular, we are interested in evaluating their role within tertiary lymphoid structures (TLS) as most B cells gravitate to these structures within patient tumors. Further, both B cells and tertiary lymphoid structures correlate with increased patient survival and immunotherapeutic response. We are utilizing a multi-level approach for a thorough interrogation of B cells within patient tumors. Specifically, we routinely perform single cell RNAseq, high level flow cytometry (18-35 parameters), micro-sized in vitro functional assays, and spatial analyses, including multispectral imaging (Vectra) and spatial transcriptomics (Nanostring DSP and 10x Visium). We are particularly interested in evaluating these structures within head and neck squamous cell carcinoma and lung cancer, but have begun working on ovarian, melanoma and glioma-focused projects as well. While we routinely utilize patient samples to study B cells and their interactions with CD4+ and CD8+ T cells, we have begun to also develop physiologically-relevant mouse models for an enhanced mechanistic understanding of TLS formation within solid tumors. Current projects in the lab are surrounding B cell function with and without TLS formation, the impact of the tumor microenvironment on TLS formation, and the importance of TLS formation in cancer progression.

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Byersdorfer, Craig	Fall and Spring	The Byersdorfer Lab studies in vivo T cell metabolism during graft-versus-host disease (GHVD) and in the development of anti-leukemia responses. The lab utilizes mouse models, genetic manipulation, and metabolic analyses to elucidate the role of specific proteins in the metabolic reprogramming of immune cells. Projects for rotating students include using conditional knock-out mice to functionally characterize the role of specific metabolic proteins in the pathogenesis of GVHD, testing novel metabolic inhibitors to mitigate GVHD while still preserving anti-leukemia effects, and enhancing immune based cellular therapies by increasing the in vivo persistence of anti-leukemia T cells through metabolic manipulation. The Byersdorfer Lab is a dynamic group and welcomes PSTP, MSTP and graduate students for rotation and thesis projects as well as medical students to conduct their Longitudinal Research Project or to perform summer research as part of the Dean's Summer Research Program.
Campfield, Brian	Fall and Spring	The Campfield Lab focuses on the discovery of novel mediators of host defense and innate-to-adaptive immune responses. We have several ongoing collaborative projects ready for MD, PSTP, MSTP, rotation and graduate students: 1) The protective role of follistatin-like 1 (FSTL-1) in bacterial pneumonia. 2) Novel mechanisms of host immunity to lung infection. 3) The role of FSTL-1 in acute lung injury/ARDS. 4) Novel mechanisms regulating hematopoietic stem cell function. Learn more at Website: https://www.pediatrics.pitt.edu/infectious-diseases/research/campfield-lab or @TheCampfieldLab

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Chang, Yuan / Moore, Pat	Fall and Spring	The Chang-Moore lab studies host-pathogen interactions in the context of the two human cancer viruses discovered by the laboratory: Kaposi sarcoma herpesvirus (KSHV/HHV8) and Merkel cell polyomavirus (MCV) Our goal is to uncover fundamental processes in cancer cell formation and to understand how our model viruses regulate their own life cycle within the complicated intracellular millieu. We harness biochemical, molecular biology, and biophysical tools. Projects include 1) KSHV: Biogenesis of virus-encoded circular RNAs, 2) Merkel cell polyomavirus: Regulation of MCV replication and anti-innate immune strategies 3) Single molecule MCV replication origin studies using C-trap optical tweezers, AFM and cryoEM. Additional studies are ongoing to understand potential vaccine immune responses to KSHV LANA and SCoV2 RdRp proteins.
Cooper, Vaughn	Fall and Spring	The mission of the Cooper laboratory is to study evolutionary processes in near real-time in systems with high stakes. These include: • the causes of treatment failure, when the combined forces of drugs and immunity are ineffective. • the ecological and population-genetic causes of rapid diversification in microbial biofilms • novel genetic mechanisms of adaptation to environmental stress • the biology that underlies our revolutionary EvolvingSTEM curriculum that enables students grades 7-16 to learn concepts and practices of microbiology, genetics, and evolution with a classroom laboratory experiment. Our lab uses various in vitro and in vivo models as well as prospective clinical sampling to study these problems, in collaboration with researchers at many leading institutions. We develop new methods and implementations of high-throughput genomics to track the evolutionary process, and we build new analytical tools to enable anyone to resolve evolution-in-action. We also work with experts in science education to measure how our curricula influence learning and attitudes towards careers in STEM.

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Culyba, Matt	Fall and Spring	Our lab studies how bacterial stress-responses enable antibiotic evasion. Current projects are focused on MRSA. Projects include monitoring microbial evolution using WGS, biochemistry of purified stress-response enzymes, molecular mechanism, and high-throughput screening.
Das, Jishnu	Fall and Spring	Current projects in the lab involve the use of computational systems approaches (machine learning and network systems approaches) to analyze high-dimensional immunological datasets (including genomic, transcriptomic, proteomic and metabolic) in the contexts of autoimmunity and alloimmunity. Specifically, we are interested in using these techniques to elucidate molecular mechanisms underlying the pathophysiology of 1) arthritis (rheumatoid arthritis and osteoarthritis) and 2) organ rejection following liver and kidney transplants. The lab's research program is highly interdisciplinary (lab members have backgrounds in immunology and computational systems biology), and the training environment is tailored to individual mentees, based on their interests.
Delgoffe, Greg	Fall and Spring	Our lab studies how T cell activation, differentiation, motility, and function are influenced by metabolic programs within cells and nutrient availability in the local environment. This plays a critical role within cancer tissue, where cancer cells deplete the local environment of nutrients, produce toxic byproducts, and chronically stimulate immune cells. We leverage metabolic reprogramming in a number of orthogonal ways to improve immunotherapy of cancer. Broad projects areas in the lab involve (1) using genetic or pharmacologic means to improve adoptive cell therapy of cancer, (2) exploring the role of hypoxia in T cell differentiation in different contexts, (3) understanding how diet and postprandial metabolic changes can influence immunity.
DePas, William	Fall and Spring	The main focus of our lab is understanding how nontuberculous mycobacteria (NTM) form biofilms in response to the infection environment. We use an in vitro aggregation system to determine what genes are involved in regulating aggregation in response to environmental cues. In parallel, we use a tissue clearing/bacterial labeling technique to quantify bacterial biofilm formation (and other spatial phenotypes) directly in patient samples.

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Dermody, Terry	Fall and Spring	The Dermody laboratory has several projects in the general area of reovirus replication and pathogenesis. These include (i) viral attachment and entry into cells, (ii) mechanisms of genome replication and packaging, (iii) patterns of cell signaling and gene expression in response to viral infection, and (iv) links between reovirus and celiac disease. Trainees in the Dermody laboratory gain expertise in genetics, cell biology, biochemistry, and organismal biology.
Dutta, Partha	Fall and Spring	The focus of my lab is to understand the mechanisms of innate inflammation, primarily mediated by monocytes and macrophages, in cardiovascular disease. We use RNA seq, single cell RNA seq, spatial RNA seq, high resolution microscopy, intra-vital microscopy, multi-color flow cytometry in various transgenic mouse models and human samples. Lab website: https://duttalab.pitt.edu
Falo, Jr., Louis	Fall and Spring	Our research focuses on understanding and utilizing skin immune networks to control systemic immune responses, with the goal of translational development of novel vaccines and immunotherapeutic strategies. To accomplish this, we integrate an evolving mechanistic understanding of skin immune function with novel bioengineering approaches. Current projects include: 1) Development and clinical application of skin targeted COVID-19 vaccines, including the current PittCoVacc and "next generation" vaccine strategies; 2) Development of novel strategies to modify the tumor microenvironment of cutaneous neoplasms, including non-melanoma skin cancers, to utilize the patient's existing tumor as a patient and tumor specific vaccine; and 3) To engineer the skin microenvironment to induce systemic tolerance to cutaneously delivered antigens including contact sensitizers and food allergens.

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Ferris, Robert	Fall and Spring	Dr. Ferris's research and clinical programs are focused on understanding immunological and molecular mechanisms of resistance to immuno-oncology (IO) therapies, biomarker discovery and identifying novel IO drug candidates with the overall aim of early diagnosis and improved treatment of head and neck squamous cell carcinoma (HNSCC). Recent work has focused on the impact of TIM-3 expression on effector and regulatory T, as well as NK cells and the roles they play in tumor elimination. The premise of current research projects includes preclinical, basic, translational, as well as clinical research using multi-dimensional molecular biological (single-cell RNAseq), cell-based (multicolor flow cytometry and functional assays) and mouse model platforms leading to novel investigator-initiated clinical trials.
Flynn, JoAnne	Fall and Spring	Our lab studies tuberculosis using non-human primate models. We are interested in immunology and pathogenesis of tuberculosis and interventions—including drugs and vaccines. We have numerous funded projects regarding host-pathogen interactions, immunology, pathology, and vaccines. Such projects include the role of CD8 and CD4 T cells in TB, the role of innate cells in TB, the mechanisms by which BCG delivered intravenously provides profound protection against TB, enhanced vaccine strategies, host-pathogen interactions in the granulomas and lymph nodes, the ability of primary infection to prevent reinfection, and the pathways needed for Mycoacterium tuberculosis to survive in vivo. We develop and employ cutting edge technologies, including PET CT imaging; single cell RNAseq of tissues; multiparameter flow cytometry; reporter, barcoded and mutant strains of Mtb, among others. We are an interactive and inclusive lab and strongly believe in collaboration and teamwork.

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Gao, Shou-Jiang (SJ)	Fall and Spring	The Gao lab is part of the Cancer Virology Program (CVP) in the UPMC Hillman Cancer Center. The lab primarily studies the mechanism of infection and oncogenesis of cancer viruses. The student will be exposed to molecular virology, cancer biology, cancer metabolism, epigenetics, epitranscriptomics, interactions of cancer cells with tumor microenvironment and immune cells, inflammation, microbiome and cancer therapy. The lab closely collaborates with computational biologists, particularly Dr Yufei Huang, who is also in CVP, allowing the development of novel systems approaches for dissecting complex biological questions, including the recent development of novel analytic tools for spatially-resolved single cell transcriptomics. Recent works have identified novel tumor suppressive functions of an arginine sensor CASTOR1, which regulates both tumor and immune cells. Ongoing works are examining the functions of CASTOR1 in other types of cancer including lung cancer and HPV-associated head and neck squamous cell carcinoma, and innate and adaptive immunity in models of colitis and colon cancer.
Gong, Yi-Nan	Fall and Spring	1) Modulating lipid mobilization on the plasma membrane to promote anti-cancer immunity. We will work with genetical tools to control a phospholipid and move it to either inner or outer leaflet on plasma membrane. We are also developing therapeutic strategies to neutralize the inhibitory effects of this lipid. 2) We will use genome-wide CRISPR knockout screening to study the programmed cell death in tumor cells and macrophages and explore the consequent inflammatory responses as well as in drug resistance. 3) We study how plasma membrane pore-forming damage can affect the tumor microenvironments via immune or non-immune modulations.

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Gottschalk, Rachel	Fall and Spring	Rotation trainees will gain experience in quantitative analysis of macrophage signaling and inflammatory responses. 1) By quantifying inflammatory responses in mice with conditional deletion of the transcription factor GATA2. This will include using qPCR, flow, and ELISA to assess the magnitude and duration of inflammatory responses in mice with bacterial pneumonia 2) Using phosphoproteomics, motif analysis, and statistical approaches, we have identified candidate STAT-cooperating transcription factors that we believe support cytokine specific gene expression. Help us validate these findings in bone marrow derived macrophages, by quantifying regulation of these transcription factors and the consequence of their knockdown or deficiency.
Guo, Haitao	Fall and Spring	The research in Guo lab is focused on the viral pathogenesis of hepatitis B virus (HBV) and antiviral discovery. HBV is the etiologic agent of viral hepatitis B, a disease affecting approximately 300 million people worldwide who suffer from the high risk of liver failure, cirrhosis and hepatocellular carcinoma (HCC). We aim at understanding the molecular mechanisms of HBV DNA replication and morphogenesis, with special focus on the biosynthesis and epigenetic regulation of HBV covalently closed circular (ccc) DNA, which is the persistent form of HBV infection, and is the culprit for the failure of current antiviral therapies. Making use of the HBV cccDNA reporter cell line systems recently established in-house, we are screening small molecule compound libraries for cccDNA inhibitors in a high throughput fashion, followed by mechanism of action study and preclinical development. In addition, we are studying the innate immunity and oncogenic signaling pathways that regulate HBV replication, as well as identification and characterization of host restriction factors that inhibit HBV infection and propagation in human hepatocytes. We are also investigating the mechanisms of viral hepatitis-induced HCC and finding therapeutic targets.

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Hand, Tim	Fall and Spring	The Hand lab studies the interaction of the immune system and the microbiome in the intestine. We have a particular interest in how T and B cells respond to and shape new bacterial colonizations. Current rotation projects are focused on 1) how memory CD4 T cells mediate intestinal protection via long-term interactions with the enteric nervous system and 2) how antibodies in breast milk shape the neonatal microbiome. https://www.chp.edu/research/rkmfi/research-labs/hand-lab
Hawse, Bill	Fall and Spring	The Hawse lab utilizes proteomics, biochemistry, genetics, chemical genetics, high resolution imaging and animal models to study signal transduction in T cells. Current projects focus on 1) elucidating how kinase signaling networks drive T cell fate choices and 2) understanding how signaling lipids function in T cell biology. The overarching hypothesis is that differential phosphorylation of key proteins involved with metabolism, signaling and transcription regulates T cell fate decisions. Our current mass spectrometry analysis of CD4+ T cell differentiation identified 200 phosphoproteins that correlate to specific cell fates. We are performing functional studies to determine how these signaling events shape cellular differentiation programs. There are many possible rotation and thesis projects that can be tailored to the student's interests ranging from basic mechanism to in vivo models of autoimmunity.
Hinterleitner, Reinhard	Fall and Spring	The Hinterleitner lab studies the role of gut commensal protists in modulating mucosal immune responses in health and disease. Rotation projects will be centered on understanding the mechanisms of how mouse and human colonizing protists of the Parabasalia family modulate tolerogenic- and suppress inflammatory immune responses under homeostasis and in the context of celiac disease and colitis. The goal will be to decipher the mechanistic underpinnings from a cellular- and cell-intrinsic angle using immunology- molecular biology- and sequencing-based approaches. Furthermore, we are investigating the protist-derived factors that modulate immune responses using metabolomics and proteomic approaches. We also have specific projects that study the interaction of intestinal epithelial cell-intrinsic pathways and their role in communicating with immune cells. For further information: https://www.meisel-hinterleitner-lab.com/

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Hooven, Tom	Fall and Spring	The Hooven laboratory on the 8th floor of the Rangos Research Building studies bacteria that contribute to maternal, fetal, and neonatal disease. A major focus area is group B Streptococcus (GBS), the dominant cause of neonatal sepsis in the U.S. and worldwide. Projects are available to 1) use a CRISPR/Cas9-based knockdown library of conserved GBS surface proteins to identify novel targets for preventing perinatal infection; 2) study the influence of changing metabolite levels on GBS virulence outside of its commensal niches; 3) define the molecular mechanism of MrvR, a bacterial regulatory protein with virulence-enhancing properties. See www.hoovenlab.com.
Joglekar, Alok	Fall and Spring	The Joglekar lab focuses understanding the antigenic targets of T cell responses and engineering T cells for immunotherapy. Two main projects are available in the lab: 1) Identify the cognate epitopes of autoimmune T cells using a novel epitope discovery technology called SABRs (Zdinak et al in revision). We will use systems immunology approaches to combine TCR repertoire, single cell and spatial T cell transcriptomics, and TCR specificities to understand the autoimmune T cells in Type 1 Diabetes: 2) Engineer T cells and other immune cells for immunotherapy. We will use chimeric receptors to engineer T cells, B cells and APCs to augment or suppress autoimmune responses in an antigen-specific manner. We will also use computational methods to aid design of chimeric receptors. For further information: www.joglekarimmunolab.org
Kane, Melissa	Fall and Spring	The Kane Lab studies immunity to retroviral infections at a cellular and organismal level. Ongoing projects include, 1) Mechanism of inhibition of HIV-1 nuclear import by the restriction factor Mx2; 2) Genetic and immunological mechanisms of antiviral resistance in animal models; 3) Regulation of retroviral gene expression; 4) Inhibition of viral replication by interferon stimulated genes. http://www.kanelab.org/

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Kaplan, Dan	Fall and Spring	The Kaplan lab explores how innate and adaptive immune cells interact in peripheral tissues, particularly skin. We focus on how epithelial cells control the residence of peripheral memory cells during memory as well as within the tumor microenvironment. We also explore how neurons that innervate the skin control the development, amplification, persistence and resolution of innate and adaptive responses. Individual projects can be crafted to suit the interest of the rotating student.
Klimstra, William	Fall and Spring	The following rotation projects are available: 1) Development of live attenuated vaccine vectors for eastern, Venezuelan and western equine encephalitis viruses (EEEV/VEEV/WEEV) based on identification and inactivation of viral virulence determinants and then testing the recombinant viruses for virulence and immunogenicity in the mouse model. 2) Characterization of the role of syndecan heparan sulfate (HS) proteoglycans in EEEV cell infection and pathogenesis. In this project, CRISPR/Cas9 technology, ectopic over-expression and knockout mice are being used to modify syndecan proteoglycan levels in various cell types and in vivo, and the dependence of EEEV infection on syndecan levels will be assessed. 3) Use of next generation sequencing to track host-adaptive mutations that arise during eastern equine encephalitis virus infection. We are examining the changes that occur in HS binding sites and miR142-3p microRNA restriction sequences that occur during EEEV replication cycles in mice, monkeys, quail and mosquitoes. The goal is to assess the capability of EEEV to acquire replication competence in myeloid cells (normally restricted by miR142-3p binding and HS receptor use) by alteration of the HS/miR142-3p sites and the effect of such mutations upon virus replication and innate immune cytokine induction in myeloid cell cultures and mice.

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Kohan, Alison	Fall and Spring	The Kohan Lab has made major contributions to identifying chylomicron triglyceride metabolism as a key regulator of Inflammatory Bowel Disease, Cystic Fibrosis, and Atherosclerosis. We've shown that apolipoprotein (apo) C-III inhibits chylomicron secretion into the mesenteric lymphatics [PMID: 24760506], while also regulating intracellular triglyceride metabolism in enterocytes [PMID: 31152000]. This work has positioned apoC-III as a key regulator of dietary lipid absorption in addition to its known role in cardiovascular disease [PMID: 25692924]. Most recently, the Kohan Lab has discovered that chylomicrons containing apoC-III, or the inhibition of apoC-III's major receptor LDLR, shifts Foxp3$^+$ Treg metabolism, Treg accumulation in the gut, and Treg suppressive activity. This work has uncovered a role for lipoproteins in delivery fuel to Tregs, and the importance of this mechanism in inflammatory disease. To make these discoveries, our members have pioneered unique model systems. They were the first to engineer primary intestinal organoid cultures for studies of dietary lipid absorption [PMID: 28159868] and have subsequently established a unique surgical lymph cannulation model in mice for the collection of flowing mesenteric lymph for 6-h after an intra-duodenal lipid infusion [PMID: 36152881; PMID: 36533833]. This makes the Kohan Lab one of the world's only labs that can collect post-prandial lymph in real-time as nutrients are being activity absorbed. **Major questions in the Kohan Lab:** 1. How do Foxp3$^+$Tregs differentiate between lipoprotein triglyceride and plasma free fatty acid fuels, and does this change their suppressive activity in inflammatory disease? 2. What is the role of chylomicron formation and metabolism in Cystic Fibrosis? 3. What is the role of dysfunctional, triglyceride-poor chylomicrons in Treg accumulation during chronic, small intestinal Environmental Enteric Dysfunction (EED), an inflammatory disease of the small intestine. 4. What are the mechanisms of mesenteric lymph versus hepatic portal partitioning of intestinally derived molecules, and how is this regulated in health and disease? **Keywords:** Regulatory T cells (Tregs); Mesenteric lymph; Chylomicrons; Lipoproteins; Primary organoids; Lipid metabolism; Small intestine https://kohanlab.com/

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Lakkis, Fadi	Fall and Spring	The Lakkis lab is interested in innate immune mechanisms that govern transplant rejection pregnancy. The lab also has an active research program focused on resident memory T cells, which play a role in transplant rejection but also a wide array of immune-mediated diseases. Work in the lab traditionally starts with mouse models but then extends into humans, using biosamples from the highly developed Starzl Transplantation Institute Biorepository. In addition to traditional immunological approaches, we also utilize genetic and genomic approaches to understand the immune response to transplanted organs.
Larregina, Adriana	Fall and Spring	The Larregina Laboratory studies the skin immune system and the way that regulatory mechanisms modify local and systemic immune responses. Specifically, we study how proinflammatory neuropeptides modify innate and adaptive immune responses initiated by antigens that permeate the skin. We are also interested in dissecting the mechanisms of cell to cell communication that propagate Ag and generate skin immunostimulatory or suppressive responses.
Lee, Nara	Fall and Spring	The Lee lab studies how noncoding RNAs expressed by the Epstein-Barr virus benefit the viral life cycle. Our methodologies include RNA biochemistry, techniques to study RNA modifications, and a plethora of different next-generation sequencing applications. Candidates will learn how to put a modern twist on 'old-school' techniques by coupling them with cutting-edge technology.
Lee, Robin	Fall and Spring	The REC Lee lab investigates how single cells process information to make cell fate decisions in inflammatory disease and cancer. Projects regularly use wet-lab experiments, such as CRISPR, particle tracking, and live-cell imaging with microfluidic and robotic cell cultures, as well as computational approaches to extract data and develop mechanistic models. Upcoming projects will use cutting edge approaches to decipher roles of cell-cell communication and interacting cell types in establishing healthy and diseased cellular responses.

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Levin, Tera	Fall and Spring	Mechanisms of immunity and pathogenesis are constantly changing as organisms evolve new modes of attack and defense. The Levin lab's overall research goals are to understand the evolutionary processes that alter mechanisms of host-microbe interactions. Our integrative approaches combine evolution, genetics, cell biology, and microbiology studies of emerging pathogens and environmental hosts to answer three key questions: 1. How do new immune defenses arise and evolve in eukaryotes? 2. How do new microbial pathogens emerge from the wild? 3. How do hosts and microbes co-evolve? We seek to discover the causes and consequences of host-microbe coevolution within the natural environment, and its consequences for the emergence of new pathogens. We focus on a unique and powerful microbial model system: *Legionella* bacteria as pathogens and free-living unicellular eukaryotes (amoebae) as hosts. Rotation project areas include: 1) determining how rapidly evolution alters the functions of Legionella effectors used to hijack host cells, 2) discovering 'immune' strategies used by amoeba to detect and respond to bacteria, and 3) detecting signatures evolutionary arms races in bacterial and/or amoeba genomes. We welcome rotation students from a variety of backgrounds and are happy to discuss these or additional projects. Feel free to get in touch! https://www.teralevinlab.com/

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Li, Renfeng	Fall and Spring	Epstein-Barr virus (EBV) is a ubiquitous virus that causes cancer and multiple sclerosis. The Li lab is focusing on understanding the molecular mechanisms by which viral and host factors control the transition of EBV from latency to reactivation with a goal of developing novel therapeutic strategies to cure EBV-associated cancer. The Li lab has established multiple model systems to address EBV latency and reactivation in both B cells and epithelia cells. Our group has identified multiple restriction factors that restrict EBV replication. The lab also discovered unique anti-restriction mechanisms by viral protein kinase and host apoptotic caspases. Based on our extensive expertise in both virology and quantitative proteomics, we are utilizing an innovative immunoprecipitation coupled with mass spectrometry (MS) approach to identify novel caspase substates that normally restriction EBV replication. Multiple candidate proteins involved in epigenetics and epi-transcriptomics will be open for rotations students. We welcome rotation students from any backgrounds and are happy to discuss in detail for potential projects. https://sites.google.com/view/renfengli-lab/
Little, Steven	Fall and Spring	The Little Lab merges the fields of Bioengineering, Chemical Engineering and Immunology as we seek to develop biomimetic drug delivery strategies which treat inflammation and restore immune homeostasis. We formulate polymeric, controllable release strategies (i.e., microparticles, stimuli-responsive hydrogels, etc.) which release immunological cues (i.e., chemokines, cytokines, etc.) in a local microenvironment for immunomodulation. Current ongoing projects in our lab are focused on therapies for periodontal disease, chronic rhinosinusitis, myocardial infarction and vascularized composite allotransplantation rejection. We are looking for students to join our transplant-focused sub-team, as we move towards large animal models and clinical translation of our immunotherapy platform.

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Liu, Shihui	Fall and Spring	We sincerely welcome PMI graduate students to join our research team for their thesis studies. We are located in the excellent scientific environment of the Aging Institute and the Division of Infectious diseases. Our research is supported by three R01 grants from the National Cancer Institute and the National Institute of Allergy and Infectious Diseases, NIH. We are using various state-of-the-art molecular, genetic, and mouse gene-targeting approaches to understand the molecular mechanisms underlying the pathogenesis of several medically important bacterial toxins, including anthrax toxins and B. cereus hemolysins, which are essential in guiding development of therapeutics for treating the infectious diseases caused by B. anthracis and B. cereus. We study how the key signal transduction pathways, such as the RAS and ERK pathways, are dysregulated by these toxins in both normal cells as well as cancer cells. We use the knowledge learned to develop the biological-based therapies for anthrax disease as well as for tumor targeting. As such, we have recently generated a series of novel reengineered anthrax toxins with potent and high tumor-specificity that directly target a wide range of cancer cells, as well as tumor stromal cells. Using unbiased genome-wide CRISPR knockout screens, we recently identified the cellular receptors for B. cereus hemolysin BL
Mailliard, Robbie	Fall and Spring	Our laboratory focuses on basic immunology related to HIV pathogenesis, and the development of immunotherapy approaches to treat chronic HIV-1 infection. Much of our work focuses on dendritic cells and their crosstalk with T cells and NK cells. One project is centered on the use of dendritic cells as a latency reversal agent, to kick latent HIV out of hiding for subsequent elimination by effector cells. In this study, we are interested in characterizing the antigen specificity of the T cell receptor (TCR) on CD4+ T cell harboring latent HIV. Another study focuses on the therapeutic potential of a rare population of 'memory-like' NK cells that are highly expanded in HIV infected individuals. Candidates working on these projects will develop skills in primary tissue culture, flow cytometry/sorting, ELISpot assays, single cell RNA sequencing and general dendritic, T cell and NK cell biology.

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Mathers, Alicia	Fall and Spring	We have several ongoing projects, including both basic science and translational studies examining cutaneous inflammation. Projects include, 1) understanding how ATP signals through the purinergic P2X7R to induce autoinflammatory/autoimmune psoriasis and chronic wounds, 2) studying how Trm cells regulate innate immunity in the skin using pet store mice and inflammatory models, and 3) examining the ability of electrophilic fatty acids to suppress psoriatic inflammation in a translational project using xenotransplants and psoriasis models.
McCarthy, Kevin	Spring	Adaptive immunity is an evolved trait. Individual B cells evolve their B cell receptors to bind antigens more tightly in a process termed affinity maturation. The secreted versions of these receptors, antibodies, mediate humoral immunity. Antibodies can directly interfere with cell-entry and/or mark viruses and cells for destruction by other arms of the immune system. We study how B cells affinity mature, how convergent evolution among B cells produces antibodies that engage common sites and how these processes drive viral evolution. Pathogens currently studied in our laboratory are influenza viruses and SARS-CoV-2.
McElroy, Anita	TBD, email me and we'll talk	The FABLAB (https://fabvirology.com/) studies the hemorrhagic fever virus known as Rift Valley fever virus. Ongoing projects are focused on understanding the role of liver and brain tropism in clinical disease manifestations. Studies utilize in vitro techniques with a focus on primary cells in addition to various mouse models to assess the role of host genetic diversity in disease.

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Megan Culler Freeman	Fall and Spring	The Freeman lab studies picornaviruses with tropism for the central nervous system using human tissue models (organoids) of relevant sites derived from induced, pluripotent stem cells. *Our current focus is on how enterovirus D68 (EV-D68) mediates acute flaccid myelitis (AFM), a polio-like illness, in children by using a novel human spinal cord organoid model.* EV-D68 was responsible for widespread biennial outbreaks of severe respiratory viral illness in children from 2014-2018 as well as AFM. Current investigations include: 1. How does EV-D68 mediate acute flaccid myelitis? 2. What factors allow for entry of EV-D68 into the CNS? 3. What virologic or host differences were responsible for the lack of acute flaccid myelitis in the 2022 season, despite significant viral circulation? Website: mcfreelab.org
Meisel, Marlies	Fall and Spring	1) Examine how the tumor-microBiome impacts on tumor immunity and cancer immunotherapy at gut-distal sites cancer. 2) Define whether and via which mechanisms physical exercise acts as an adjuvant to boost cancer immunotherapy
Moore, Pat / Chang, Yuan	Fall and Spring	The Chang-Moore lab studies host-pathogen interactions in the context of the two human cancer viruses discovered by the laboratory: Kaposi sarcoma herpesvirus (KSHV/HHV8) and Merkel cell polyomavirus (MCV) Our goal is to uncover fundamental processes in cancer cell formation and to understand how our model viruses regulate their own life cycle within the complicated intracellular millieu. We harness biochemical, molecular biology, and biophysical tools. Projects include 1) KSHV: Biogenesis of virus-encoded circular RNAs, 2) Merkel cell polyomavirus: Regulation of MCV replication and anti-innate immune strategies 3) Single molecule MCV replication origin studies using C-trap optical tweezers, AFM and cryoEM. Additional studies are ongoing to understand potential vaccine immune responses to KSHV LANA and SCoV2 RdRp proteins.

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Morelli, Adrian	Fall and Spring	To unveil basic mechanisms of allorecognition and regulation of the host-immune response following transplantation and during feto-maternal tolerance. To study the role of donor- and recipient-derived antigen-presenting cells (i.e. dendritic cells) and extracellular vesicles (i.e. exosomes, microvesicles) during allo-sensitization, graft rejection, and induction of donor-specific immunosuppression / tolerance following transplantation and during pregnancy The work will be focused on the role of dendritic cells and extracellular vesicles (e.g. exosomes, microvesicles), the later as a mechanism of cell-to-cell communication between the graft donor and the recipient, or the fetus and the mother. Research will be conducted in experimental models of skin and heart transplantation in mice and humanized mouse models, and in mouse pregnancy models. Techniques will include state-of-the-art methods of extracellular vesicle generation, purification and analysis; in vitro in vivo and ex vivo immunological analysis; and biological imaging by intravital multiphoton, confocal, super-resolution and immuno-electron microscopy.
Overacre-Delgoffe, Abby	Fall and Spring	The Overacre Lab studies the interaction between the microbiome and immune system in relation to cancer progression and immunotherapy response, with the ultimate goal of harnessing and targeting this for cancer therapies. Current available projects include: (1) How are bacteria- and tumor-specific T cells impacted by the gut microbiota, from the naïve to the terminally exhausted? (2) How do gut microbes impact anti-tumor immunity and immunotherapy response at distant tumor sites? (3) What role to microbiota-specific regulatory T cells play in anti-tumor immunity, and how can we leverage them to both increase response to immunotherapy and reduce immune related adverse events? See website for more details: www.OveracreLab.com

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Poholek, Amanda	Fall and Spring	The Poholek Lab explores the transcriptional and epigenetic pathways regulating immune cell differentiation and function in settings of loss of tolerance or dysfunction such as asthma and cancer. We use innovative genetic mouse models and NextGen sequencing approaches including RNAseq, CUT&TAG, ATACseq, single cell sequencing and Spatial Transcriptomics to understand immune cell function in the context of the tissue environment. Current projects in the lab focus on the tissue-specific function of Blimp-1 to initiate Th2 cells in the lung and drive allergic asthma, the role of Blimp-1 in ILC2s and Trm cells in the lung, and factors in the tumor microenvironment such as hypoxia that promote dysfunctional epigenetic landscapes to drive exhaustion in T cells. Please contact for specific rotation projects available. www.poholeklab.com
Ray, Prabir / Ray, Anuradha	Fall and Spring	Research in our laboratory is focused on elucidating host defense mechanisms against bacterial and viral pathogens. This knowledge will help us to develop better tools to treat bacterial pneumonia or viremia. As an example, *Klebsiella pneumoniae* is an opportunistic bacterial pathogen. During active infection, most virulent strains can be targeted with antibiotics as they are sensitive to antibiotics, and also the host immune system can control this pathogen to prevent bacterial pneumonia. Unfortunately, more and more, recent clinical isolates are showing resistance to antibiotics and are refractory to the host's immune system. One way to address this problem is to improve the host's immune response to infection. Our laboratory uses multiple molecular and immunological approaches to address this. Our current projects are: 1) How hypervirulent *K. pneumoniae* isolates escape host defense mechanisms by dysregulating antibacterial properties of neutrophils. 2) How host proteases induced during bacterial infection cause lung injury. 3) How inhibitory functions of the anti-inflammatory properties of regulatory myeloid cells gets inhibited during infection leading to persistent inflammation in the lung. We have an outstanding group of lab members who can help new students to learn all relevant techniques.

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Reed, Doug	Fall and Spring	"It's all about the aerosols." The Reed lab studies the biology of aerosolized viruses and bacteria that cause severe, acute diseases, the pathogenesis of respiratory infection in animal models, and the host immune response to respiratory infection. We predominantly work on three pathogens, two viruses (avian influenza and encephalitic alphaviruses) and one bacteria (tularemia, a severe zoonotic infection caused by *Francisella tularensis*). Possible projects include 1) infectious disease aerobiology, including the generation and characterization of infectious aerosols, and the impact on disease in the host, 2) respiratory delivery and efficacy of vaccines, antivirals, and therapeutic mAbs for treating severe, acute infections, 3) the pathogenesis and transmission of avian influenza viruses in relevant animal models, 4) pathogenesis of the encephalitic alphaviruses in ferret and nonhuman primate models, and 5) flow cytometry and transcriptomics to develop novel, translatable correlates of protection in the rabbit model for live, attenuated tularemia vaccines.
Richardson, Anthony	Fall and Spring	The Richardson Lab studies immunometabolism in the context of Staphylococcus aureus infections. We focus on the metabolic adaptations that this pathogen undergoes to cause disease as well as the metabolic changes that immune cells make to mount an effective immune response. Our approach employs cell culture, bacterial genetics, mouse models of infection, molecular biology and comparative evolutionary biology to answer questions surrounding the immunometabolic state of the host and the pathogen during infection.

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Rinaldo, Charles		The Rinaldo laboratory studies cellular immunologic responses to human immunodeficiency virus (HIV), Kaposi's sarcoma associated herpesvirus (KSHV or human herpesvirus 8 [HHV-8]), cytomegalovirus (CMV) and SARS-CoV-2, with the overall goal of curing and preventing these infections. The lab focuses on the functions of professional antigen-presenting cells (myeloid dendritic cells, monocytes/macrophages and B lymphocytes) and their interactions with T cells. Newest areas of this research include (a) single cell transcriptomics to assess cell-to-cell transcriptome heterogeneity and cellular differences concealed by standard, bulk RNA sequencing, and (b) CRISPR/Cas9 gene-editing to target HIV-1 genome activity and immunotherapies, including T cells and professional antigen presenting cells.
Rothstein, David	Fall and Spring	The Rothstein lab is focused on immunoregulation mediated by the balance between TIM-1+ regulatory B cells (Bregs) that maintain self-tolerance, and TIM-4+ B cells that promote inflammatory responses. A number of rotation projects are available including: 1) Determining whether TIM-1+ B cells belonging to different B cell subsets regulate distinct aspects of the immune response. 2) Identifying transcriptional regulation and cross-talk between IL-17 and IL-10 expression in B cells. 3) Identifying the role of IL-10 as a B cell autocrine growth factor. 4) Determining how the microbiome regulates Breg expansion. 5) Identifying the transcriptional regulation underlying development of a novel population of TIM-1+ ProB cells that differentiate into exceedingly potent Bregs in mice. 6) Determining whether we can identify similar ProB cells human marrow and establishing their activity in humanized mouse models. These projects are all novel and most have preliminary data sufficient to allow steady progress.
Sadovsky, Yoel	Fall and Spring	Our lab studies molecular processes underlying placental development and function, and their impact on early human development, with a focus on trophoblast-specific microRNAs (miRNA), which are packaged in extracellular vesicles and communicate genomic material among the fetal, placental, and maternal compartments. We study signals that regulate miRNA expression and trafficking in target cells, and the role of these RNAs in trophoblast immunity.

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Sarkar, Saumen	Fall and Spring	Sarkar Lab is interested in the innate immune responses in the context of infectious disease and cancer. Our research uses state-of-the-art molecular biology, immunology, and in vivo studies to dissect the complex dialogue that occurs between virus/bacteria and host during the course of microbial infections, and to identify potential therapeutic targets that might limit pathogenesis of human diseases. Specific Projects include: (1) Defining the novel roles of ISGs in regulating antiviral innate and adaptive immunity; (2) Antibacterial functions of OAS family proteins and (3) Role of IFN-regulatory factors (IRFs) in tumor progression. Students will have the freedom to pursue one of these ongoing projects and/or develop new projects under the broad area of Innate Immunity.
Shair, Kathy	Fall and Spring	Epstein-Barr virus (EBV)-associated cancer mechanisms and molecular pathogenesis. Projects open to rotation students examine how EBV infection, and the expression of EBV genes, contribute to oncogenic mechanisms and molecular pathogenesis in the nasopharynx. There are two projects available. One of these projects is more cancer focused and the other addresses EBV infection in primary 3-D nasal organoid systems.
Shlomchik, Mark	Fall and Spring	The Shlomchik lab works on B cell immune responses and systemic autoimmune disease mechanisms. We have exciting rotation and thesis projects in the area of: 1) germinal center B cell signaling, 2) memory B cell epigenetics, 3) cloning and analyzing T cells that promote autoimmunity, and 4) investigating how TLRs promote autoimmunity using novel genetically modified mice.
Shlomchik, Warren	Fall and Spring	Warren Shlomchik's lab studies alloimmunity in the context of allogeneic hematopoietic stem cell transplantation and the development of adoptive T cell immunotherapies for use in conjunction with an allogeneic stem cell transplant and in treatment of cancer in general. A second focus is on understand the resistance of acute myelogenous leukemia (AML) to T cell therapies. Available rotation projects include CRISPR/Cas9 editing of mouse AML lines, the use of a rapid T cell receptor (TCR) cloning approach to identify TCRs reactive against targets of allogeneic T cells, and performing adoptive T cell therapy experiments testing the role of TCR affinity in dictating efficacy of therapies.

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Shuda, Masahiro	Fall and Spring	Shuda lab is studying the mechanisms of viral oncogenesis induced by two small DNA tumor viruses: Merkel cell polyomavirus (MCV), an etiological agent of Merkel cell carcinoma (MCC) , and high-risk human papillomavirus (HPV), which causes head and neck cancer, cervical cancer, and anal cancer. We are also investigating the mechanisms of Merkel cell polyomavirus replication with a focus on the viral small T (sT) antigen protein. Potential rotation projects include: (1) delineating the mechanism of MCV-induced activation of stem cell factor Sox2, (2) analyzing the genes deregulated by HPV E6-E7 oncoproteins in head and neck cancers, and (3) identifying host proteins that interact with sT and promote MCV replication.
Silva, Laurie	Fall and Spring	Research in the Silva laboratory focuses on various aspects of viral replication of chikungunya virus (CHIKV) and other related alphaviruses. Current areas of interest include: 1) characterizing viral determinants of glycosaminoglycan attachment factor binding; 2) elucidating mechanisms of virus entry into muscle and endothelial cells; and 3) understanding the role of host proteins in viral egress. Rotation projects will be developed with students' interests in mind. Depending on the rotation project, students will develop skills in tissue culture, basic virology techniques, seamless cloning strategies, transfections, flow cytometry, ELISAs, or CRISPR/Cas9 technology.
Singh, Harinder	Fall	Bone marrow plasma cells (BMPCs) are terminally differentiated B cells that constitutively secrete pathogen or vaccine induced antibodies and protect the host during primary and secondary infections. We are elucidating the nature of BMPC precursors that emanate from the spleen during an immune response and migrate through the circulation to the bone marrow, where they undergo terminal differentiation into long-lived plasma cells. We have established a new experimental model to identify and analyze the genomic states of BMPC precursors using scRNA-Seq and CITE-Seq. The extensive datasets are revealing new genes and molecular pathways that appear to control the generation of long-lived plasma cells.

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Sluis-Cremer, Nicolas	Fall and Spring	Dr. Sluis-Cremer's laboratory uses a multi-disciplinary approach that includes biophysics, biochemistry, virology, and analysis of clinical samples to gain insight into the mechanisms of action of antiretroviral drugs; antiviral and antimicrobial drug resistance; and understanding how HIV-1 persists in infected individuals despite potent antiretroviral therapy. His lab uses state-of-the-art biophysical methods, including transient kinetic and single-molecule fluorescence approaches, to define how small molecules affect retroviral enzyme function, the intramolecular protein conformational dynamics, and the intermolecular enzyme-substrate interactions. In regard to HIV-1 persistence, the lab focuses on characterizing the latent pool of HIV-1 infection that resides in resting CD4+ T cells, in particular the naive and central memory subsets, using novel primary cell models of HIV-1 latency and by studying purified subsets of the resting CD4+ T cell population from HIV-infected individuals on suppressive antiretroviral therapy. His lab also studies antibiotic resistance and is exploring novel therapeutic approaches to reverse fosfomycin resistance.
Smithgall, Tom	Fall and Spring	Research in the Smithgall laboratory applies a chemical biology approach to a variety of questions related to HIV/AIDS and myeloid leukemias. Our work involves high-throughput chemical library screening, medicinal chemistry and drug development, structural biology of drug-target protein complexes and in vivo pharmacology using animal models. Rotation projects related to HIV involve evolution of drug resistance to novel antiretroviral drug candidates, mechanisms by which viral proteins hijack host cell signal transduction pathways to benefit the virus, and use of chemical biology tools to better understand viral persistence and latency.
Snyder, Mark	Fall and Spring	The primary focus of our research is studying how maladaptive adaptive immune responses contribute to chronic lung injury. We do this using translational models of investigation. Projects include: 1. Studying the impact of inhaled and systemic glucocorticoids on the function of human lung tissue resident memory T cells using ex-vivo lung perfusion. 2. Studying the impact of the DUSP4/MAPK pathway in the promotion of pulmonary fibrosis in both idiopathic pulmonary fibrosis (IPF) and chronic lung allograft dysfunction (CLAD).

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St. Leger, Anthony	Fall and Spring	The St. Leger Lab currently has several projects that are developed and ready for a motivated graduate student. First, we are interested in the host's generation of immunity response against the ocular microbiome. Projects along these lines focus on 1) understanding the microbial genes that regulate ocular colonization and immunity (microbiology and immunology) or 2) identifying how human cells respond to components of the ocular microbiome (immunology). For these studies, we have an array of transposon mutants of a single ocular bacterium, Corynebacterium mastitidis. We also have a library of Corynebacteria that were isolated from the eyes of humans. A recently funded project will look at how the human ocular microbiome changes over time in healthy subjects. At the same time, the project will look at the associated ocular and systemic immune responses. The other arm of the lab focuses on herpes simplex virus type 1 infection of the cornea. Projects along these lines focus on 1) understanding pathological processes that result in corneal pathology and blindness (neuroimmunology and virology); 2) understanding how HSV-1 can disrupt the corneal nerve architecture to cause disease (neuroimmunology); 3) how HSV-1 can cause dysbiosis in the ocular microbiome (immunology); 4) how HSV-1 can modulate cell metabolism at the ocular surface (cell metabolism and immunology). For these studies, we have several strains of HSV-1 that result in varying degrees of pathology, which would allow for comparisons of mechanisms governing pathology.
Storkus, Walter	Fall and Spring	Projects are available to investigate therapeutic interventions promoting vascular and immune cell normalization within the tumor microenvironment (TME) that lead to diversification in the anti-tumor T cell repertoire, tertiary lymphoid structure neogenesis and enhanced treatment benefit against disseminated disease. Models include exploratory analysis in ongoing clinical trials for patients with advanced-stage melanoma or renal cell carcinoma, as well as murine models of these 2 forms of cancer. Based on compensatory regulatory changes occurring in the TME, combination treatment regimens will be designed and tested for improved bioefficacy in translational models.

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Turnquist, Heth	Fall and Spring	The Turnquist lab has opportunities for trainees to complete graduate projects as part of NIH-, DoD-, and Industry-funded studies 1) Elucidating immune-mediated mechanism of tissue repair after transplant and trauma, 2) Developing novel biologics and cell therapies for tissue repair and tolerance in transplant, 3) Identifying how alarmins/damage-associated molecular patterns shape outcomes after the transplantation of organs and cells. These projects will provide training in successful completion of discovery science using rodent models and clinical samples harnessing cutting edge technologies.
Van Tyne, Daria	Fall and Spring	Project 1: VRE adaptation to cause extra-intestinal infection. We want to understand how enterococci adapt to cause infection in the bloodstream, rather than their native gastrointestinal tract environment. We are analyzing the genomes of VRE strains from bacteremia and GI colonization to generate hypotheses about genes/pathways that are important for bloodstream infection. Project 2: Bacteriophages to treat drug-resistant infections. We are isolating bacteriophages from a variety of environmental sources that can kill multidrug-resistant bacteria. We build panels of phages that can infect particular bacterial species, and which can ultimately be combined and used as phage therapy.
Vignali, Dario	Spring	The Vignali Lab primarily studies inhibitory mechanisms in cancer using mouse models and patient samples, with a focus on inhibitory receptors and regulatory T cells (Tregs). We also study immune regulatory insufficiency that underlies autoimmunity, and structure-function analysis of TCR and LAG3 signaling, and emerging projects on neuroimmunology. We make heavy use of sophisticated mutant mouse models, transcriptomic analysis (scRNAseq), super-res microscopy and multispectral imaging, and samples from patients treated with immunotherapies.

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PI/Lab Name	Rotation Semester(s)	Rotation Project(s)
Vlad, Anda	Fall and Spring	We focus on identifying immune biomarker or response in ovarian cancer patients treated in Phase I/II clinical trials with combination chemo-immunotherapies. We also aim to develop new immune modulators using aldehyde dehydrogenase inhibitors (ALDHi). Our work combines translational studies using clinical trial specimens with in vivo studies in transgenic mice.
Wang, Jing Hong	Fall and Spring	The goals of my research program include: (1) define the cellular and molecular mechanisms of immune evasion during cancer development; (2) develop more effective cancer immunotherapy, with a focus on head and neck squamous cell carcinomas (HNSCCs) and B cell lymphomas; (3) elucidate the basic mechanisms of antibody gene diversification and B cell lymphomagenesis.
Williams, John	Fall and Spring	The Williams lab studies immunity and pathogenesis of human metapneumovirus (HMPV), a leading cause of lower respiratory infection. Current areas of interest include the role of type I and type III interferons in viral pathogenesis and mechanisms of lung T cell impairment induced by HMPV and other respiratory viruses. Rotation projects in our lab involve in vitro and in vivo experiments. Students have the opportunity to learn virology and immunology techniques including viral culture and plaque titration, measurement of cytokine gene and protein expression in cells, flow cytometry, and mouse models of HMPV infection.
Wright, Erik	Fall and Spring	We are seeking a graduate student to lead a projects about the clinical use of antibiotics, including: (1) predicting resistance before it arises by knowing an organism's genome, and (2) combining antibiotics to achieve greater potency, breadth of coverage, and evade resistance development.

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You, Zhaoyang	Fall and Spring	Projects that are ready for incoming students include: 1) investigate the impacts of our newly identified in-clinic small molecules on modulating skin immune microenvironment for promoting vaccine potency; 2) develop adoptive CD4 T cell transfer-based strategy to regulate the immune system for immunotherapy; 3) understand our novel vaccine strategy that elicits tumor-specific CD8 T cells including $PD1^{+}TCF1^{+}$ stem-like CD8 T cells in tumors to overcome cancer resistance to PD1 blockade, leading to novel effective and safe translational cancer vaccination combination with anti-PD1 therapy to successfully treat PD1-resistant cancer.