PI/Lab Name	Rotation Semster(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, type III interferon signaling and the role of the lectin receptor CD209 (DC-SIGN) are of interest for development towards dissertation projects.A variety of additional pathways remain open for investigation based upon student interest.
Ambrose, Zandrea	Fall and Spring	1) Imaging fluorescently HIV capsid and pre-integration complexes with host cell factors. 2) Development of humanized mouse models to study HIV infection and co-infection with other pathogens. 3) Bioinformatics of HIV reservoirs during infection with and without co-infection with other pathogens.
Apetrei, Cristian	Fall and Spring	1. Studies on the role of a Western diet on the SIV reservoir formation, maintenance and reactivation. Rotation projects designed for optimization of assays aimed at measuring the SIV reservoir. 2. Assessment of new strategies to improve gut health during acute and chronic SIV infection. Rotation projects to test biomarkes of gut integrity, chronic inflammation and comorbidity risk. 3. Studies on the role of intrinsic host immunity in controlling the outcome of SIV infection upon crossspecies transmission. Rotation projects to test the expression of host restriction factors.
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	Current projects center on the role of heat shock proteins in initiating immune responses to cancer (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. Trainees in the lab will gain significant expertise in mouse models of cancer, tissue culture work, molecular biology, biochemical purification techniques etc
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.

PI/Lab Name	Rotation Semster(s)	Rotation Project(s)
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.
Campfield, Brian	Fall and Spring	The Campfield Lab focuses on the discovery of novel mediators of host defense and innate-to-adaptive immune responses in the lung. We have several projects for rotation and graduate students: 1) The protective role of follistatin-like 1 (FSTL-1) in bacterial pneumonia. 2) Novel mechanisms of host immunity to infection. 3) The role of FSTL-1 in acute lung injury/ARDS. Learn more at Website: https://www.pediatrics.pitt.edu/infectious-diseases/research/campfield-lab or @TheCampfieldLab
Chang, Yuan / Moore, Pat	Fall and Spring	1) KSHV: Biogenesis of virus-encoded circular RNAs, 2) Merkel cell polyomavirus: Regulation of MCV replication and control of cell-cylce dependent protein translation, 3) Molecular control mechanisms of SARS CoV2 replication.
Cooper, Vaughn	Fall and Spring	1) Evolutionary dynamics, genetics and mechanisms of antimicrobial resistance in Acinetobacter baumannii or Psuedomonas aeruginosa. 2) Population demography and molecular mechanisms of biofilm formation
D'Cruz, Louise	Fall and Spring	The D'Cruz lab studies the interplay between immune cells and adipocytes and how this crosstalk can affect insulin resistance, whole-body metabolism and weight loss. Current projects in the lab are investigating the effects of 1) the transcription factor Atf3, 2) the lactate transporter MCT1, and 3) the transcription factor Blimp-1 on the function of adipose tissue resident Tregs. The rotation project will investigate how arginase metabolism functions in adipose Tregs to modulate secretion of modulators thus affecting Treg-adipocyte crosstalk.
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	TBD
DeLuca, Neal	Fall and Spring	Virus-cell interactions affecting the expression of herpesvirus genomes.
DePas, Will	Fall and Spring	The DePas lab is interested in 1.) How nontuberculous mycobacteria (NTM) regulate biofilm formation and dispersal, 2.) How biofilms manifest and function in different physical environments (i.e. in liquid culture, on solid surfaces, and embedded in a 3D matrix) and 3.) Developing and implementing a tissue clearing and pathogen visualization technique, MiPACT-HCR, to describe the biogeography of infection environments.

PI/Lab Name	Rotation Semster(s)	Rotation Project(s)
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.
Flynn, JoAnne	Fall and Spring	Our lab studies tuberculosis using non-human primate models. We are interested in immunology and pathogenesis of tuberculosis, and also 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 mechanism by which BCG delivered intravenously provides profound protection against TB, the host-pathogen interactions in the granulomas, the ability of primary infection to prevent reinfection, etc. We develop and employ cutting edge technologies, including PET CT imaging, single cell RNAseq, multiparameter flow cytometry, reporter and barcoded strains of Mtb, among others. We are an interactive and inclusive lab and strongly believe in collaboration and teamwork.
Gaffen, Sarah	Spring	The Gaffen lab studies the Th17 pathway and its role in mediating autoimmunity and anti-fungal immunity, using both cell-based and mouse-based approaches. Rotation projects will vary depending on the interest of the rotation student and availability of open projects.
Gao, Shou-Jiang (SJ)	Fall and Spring	The Gao's 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, immunity, inflammation, microbiome and cancer therapy. The lab has also recently worked on the new coronavirus that causes COVID-19. Areas of works include cell tropism and viral gene expression program, pseudovirus entry and trafficking, innate immunity and inflammation, and antiviral therapy.
Glorioso, Joseph	Fall and Spring	My lab focuses on the development of HSV vectors for pain gene therapy and cancer immuno-therapy. The pain research uses HSV to deliver pain mitigating genes to the peripheral nervous system and targets include bladder pain and post-herpetic neuralgia. The cancer work concentrates on the creation of tumor targeted oncolytic HSV vectors armed with immunoregulatory genes for treatment of animal models of human brain tumors. The goal is to provide for long-term animal survival through the induction of anti-tumor adaptive immunity.
Gong, Yinan	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 macrophages and the consequent inflammatory responses.
Gottschalk, Rachel	Spring	Rotation trainees will gain experience in quantitative analysis of macrophage signaling and in high content imaging, with opportunities to participate in ongoing lab projects related to computational modeling or in vivo lung infection. 1) Assess the impact of age on macrophage polarization potential. This project involves using high content imaging to quantify macrophage polarization across a matrix of stimulation conditions, using macrophages from old and young mice and human donors. 2) Investigate type I IFN crosstalk with inflammatory cytokines in the context of age. In an effort to validate computational modeling predictions (from ongoing work in the lab), we will stimulate macrophages with combinations of stimuli and quantify STAT phosphorylation using high content imaging.

PI/Lab Name	Rotation Semster(s)	Rotation Project(s)
Guo, Haitao	Fall and Spring	Guo lab is studying the mechanisms of hepatitis B virus (HBV) persistent infection and HBV-induced hepatocellular carcinoma (HCC), as well as developing novel therapeutics for treatment of HBV and HCC.
Hartman, Amy	Fall and Spring	Rotation projects are availably studying the pathogenesis of Rift valley fever virus (RVFV) in rodents. Projects include: 1) Elucidating the role of host factors in binding and entry of RVFV into host cells. 2) Tropism of RVFV and other bunyaviruses for mammalian placenta. 3) RVFV infection of neurons and amelioration with immunotherapeutic drugs.
Hinterleitner, Reinhard	Fall and Spring	1) Study how gut microbes modulate immune responses to dietary antigens in the context of celiac disease and food allergies. 2) Study the mechanisms of gut epithelial-immune crosstalk in intestinal inflammatory disorders and enteric infections.
Joglekar, Alok	Fall and Spring	The Joglekar lab focuses understanding the antigenic targets of T cell responses and engineering T cells for immunotherapy. There are three main projects available in the lab: 1) Identify the cognate epitopes of autoimmune T cells using a novel epitope discovery technology called SABRs. We will use systems immunology approaches to combine TCR repertoire, T cell transcriptomics, and TCR specificities to understand the autoimmune T cells in Type 1 Diabetes and other autoimmune diseases; 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 immune responses in an antigen-specific manner. We will also use computational methods to aid design of chimeric receptors; 3) Determine the fundamental rules of TCR-pMHC binding. We will use epitope discovery technology along with machine learning tools decipher the structural rules that govern TCR-pMHC recognition.
Kane, Melissa	Fall and Spring	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.
Kaplan, Dan	Spring	The Kaplan lab has available project exploring the capacity for neurons in the skin to control local immune responses. Projects make use of mice with selective gain and loss of function in selected neuron subset. We also have projects exploring the relationship between resent memory T cells and their escape from antigen specific T cell clearance in multiple mouse models.
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.
Lohmueller, Jason	Spring	Engineering novel cytokine/receptor pairs to augment chimeric antigen receptor (CAR) T cell function. Cytokine/receptor pairs will be engineered to specifically stimulate signaling in CAR T cells while not affecting other immune cells. The project will involve genetic engineering of T cells, in vitro testing/optimization, and eventual testing in a human tumor xenograft mouse model.
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 or our work focuses on dendritic cell biology and their crosstalk with T cells and NK cells. One project that we have centers 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. The person working on this project will develop skills in primary tissue culture, flow cytometry/sorting, dendritic and T cell biology, and TCR cloning.
McElroy, Anita	Fall and Spring	1) MV-RVFV vaccine evaluation- safety, efficacy and correlates of immune protection. 2) Pathogenesis mediated by RVFV NSs protein. 3) Defining the role of tropism in RVFV pathogenesis.

PI/Lab Name	Rotation Semster(s)	Rotation Project(s)
McGeachy, Mandy	Fall and Spring	The McGeachy lab studies Th17 cells and their actions on non-immune stromal cells during autoimmunity and infection. Projects are available to study 1) the unexpected roles of IL-17 in control of viral infection and related immunopathogenesis, and 2) molecular pathways that regulate human Th17 cell activation and function.
Meisel, Marlies	Fall and Spring	1) Define whether and how probiotics impact systemic immunity during health and infectious diseases. 2) Define the underlying mechanisms how environmental factors (physical exercise, microbiota, diet) impact on systemic tumor immunity and complex diseases.
Moore, Pat / Chang, Yuan	Fall and Spring	1) KSHV: Biogenesis of virus-encoded circular RNAs, 2) Merkel cell polyomavirus: Regulation of MCV replication and control of cell-cylce dependent protein translation, 3) Molecular control mechanisms of SARS CoV2 replication.
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.
Ray, Prabir	Fall and Spring	In the rotation project, the student will study: 1) Differential expression of a panel of genes by multiplexed RT-qPCR using RNA isolated from mononuclear cells obtained from patients, 2) Myeloid cell specific expression of specific receptor molecules by high dimensional flow cytometry, and 3) Effect of knockdown of SOCS3 in human myeloid cells to create a model of hyperinflammation. The student will learn multiple high throughput techniques to investigate molecular mechanisms of hyperinflammation relevant in human disease. The student will be trained by lab members as needed to be able to successfully conduct the experiments using appropriate controls and statistical methods for data analysis.
Reed, Doug	Fall and Spring	My lab is interested in understanding the host immune response to pneumonic tularemia. Tularemia is caused by a gram-negative bacterium, Francisella tularensis, that behaves like a virus in that it infects cells and replicates in the cytoplasm. In particular, we are interested in understanding the immune mechanisms induced by delivery of live attenuated strains to the respiratory tract and how those lead to subsequent protection when challenged with virulent strains. Rotation projects are available to study two aspects: a) early events after infection in the respiratory tract, and b) T cell responses to vaccination and how they correlate with protection.
Sadovsky, Yoel	Fall and Spring	Molecular processes underlying placental development and function, and their impact on early human development, with a focus on (1) trophoblast-specific microRNAs, which are packaged in extracellular vesicles and communicate genomic material among the fetal, placental, and maternal compartments, and (2) trophoblast utilization of lipidic fuels, and the role of phospholipids in ferroptosis and placental injury.
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.

PI/Lab Name	Rotation Semster(s)	Rotation Project(s)
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.
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.
Storkus, Walter	Fall and Spring	Analysis of interventional therapies for their ability to promote improved recruitment and fitness of lymphocytes into the tumor microenvironment; formation and function of tumor-associated tertiary lymphoid structures (TLS).
Thibodeau, Patrick	Fall and Spring	Projects are available studying structure-function relationships of bacterial virulence factors. The lab uses a variety of biochemical and biophysical approaches to study protein function and activity, with a focus on virulence factors associated with cystic fibrosis. Projects typically utilize a combination of cell culture, in vitro protein biochemistry and biophysics, and in vitro model systems to probe the role of virulence factors in bacterial colonization, infection and exacerbation.
Turnquist, Heth	Fall and Spring	1) Elucidating immune-mediated mechanism of tissue repair. 2) Developing novel biologics and cell therapies for tissue repair. 3) Identifying how alarmins/damage-associated molecular patterns shape outcomes after the transplantation of organs and cells.
Vignali, Dario	Fall and Spring	Inhibitory mechanisms (ie inhibitory receptors, Tregs etc) in cancer using mouse models and patient samples. Also have projects studying Treg insufficiency in autoimmunity, structure-function analysis of TCR and LAG3 signaling, and 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. Rotations available in our mouse or human labs, or both.
Wright, Erik	Fall and Spring	We are recruiting a graduate student to work on how to reverse antibiotic resistance by changing the growth medium and searching for antibiotic synergy in multi-drug space.