Meet the Faculty of the 2027 Summer Child Health Research Internship

Children's Hospital Colorado, CU Anschutz
University of Colorado School of Medicine, Department of Pediatrics

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M. Eric Kohler, MD, PhD Blood and Marrow Transplant and Cellular Therapeutics

Lab Overview
M. Eric Kohler, MD, PhD leads the Blood and Marrow Transplant and Cellular Therapeutics laboratory. The lab's focus lies in pioneering cancer therapies harnessing the patient's immune system. Dr. Kohler is an experienced researcher in the field of immunotherapy and genetic engineering, particularly Chimeric Antigen Receptor (CAR) T cell technology.

Research Areas and Current Projects
The Kohler laboratory works on developing new therapies for cancer by using a patient's own immune system to kill malignant cells that no longer respond to traditional therapies. The research focuses largely on genetically engineering T cells with Chimeric Antigen Receptors (CARs) which re-direct the T cells from killing virally infected cells to killing cancerous cells. CAR T cells have shown great promise against certain types of leukemia and lymphoma, curing up to 40% of these patients, however, the majority of these patients will not have a long-term benefit from current CAR T cell therapies. Furthermore, CAR T cell therapies have not been as successful against solid tumors, which make up the bulk of cancer diagnoses.

The lab studies the signaling events occurring downstream of the CAR molecule to understand why CAR T cells are ineffective in so many patients. From this, they design new CAR molecules with the goal of improving the potency, persistence and sensitivity of current CAR T cells for leukemia and lymphoma, and to improve the metabolism and selectivity of new CAR T cells for malignancies that are currently untargetable with current CAR T cell designs. Through this work, the Kohler lab strives to develop new therapies for patients with relapsed and/or treatment-refractory cancers.

Learning Opportunities
Interns in the Kohler lab can expect to:
- Engage in immunotherapy research focusing on CAR T cell therapies.
- Learn genetic engineering techniques for modifying T cells and expressing CAR molecules.
- Explore cancer signaling pathways and their impact on CAR T cell therapy efficacy.
- Participate in the design and development of innovative CAR molecules.
- Gain insights into challenges related to treatment-refractory cancers and contribute to innovative therapeutic approaches.
- Acquire valuable skills in experimental design, data analysis, scientific writing, and interdisciplinary collaboration.

Celiac Disease Research Team

Edwin Liu, MD
Monique Germone, PhD, BCBA
Marisa Stahl, MD
Mary Shull, MD
Pooja Mehta, MD

Lab Overview
The Colorado Center for Celiac Disease has a clinical/translational research team led by Dr. Marisa Stahl. The team consists of five pediatric gastroenterologists, a pediatric psychologist, a dietitian, and a research assistant. Collaborators include the Sie Center for Down Syndrome, Barbara Davis Center for Diabetes, and national research consortiums. Our work focuses on mass screening for celiac disease, health behavior intervention for children and caregivers of families with celiac disease, and also new clinical and immunologic tools for celiac disease diagnosis.

Research Areas and Current Projects
The team has three current research studies in various stages which allows a trainee to observe and participate in various stages of research projects. Topics of study are currently: program development with an emphasis on addressing food insecurity and stakeholder engagement, celiac disease general population screening, and psychosocial impact of celiac disease on the child and family.

Learning Opportunities
A research trainee will have access to current databases. The trainee has the opportunity to support ongoing projects or create a project of their own. Supports for the research trainee include a bi-weekly team meeting, access to a research assistant and statistician, and weekly meetings with the mentoring psychologist (Germone) and a chosen physician mentor(s). In addition to research, the intern will have the opportunity to shadow our innovative clinical work conducted by our multi-disciplinary team (gastroenterologist, nursing, dietitian, pediatric psychologist).

Ken Maclean, PhD Clinical Genetics and Metabolism

Lab Overview
The Maclean laboratory, led by Dr. Ken Maclean, PhD, is dedicated to studying the etiology and pathogenesis of cystathionine beta-synthase deficient homocystinuria (HCU), Down syndrome, and various hepatic disorders. Dr. Maclean's research employs a wide range of transcriptomic and proteomic platforms, combined with biochemical, behavioral, genetic, and molecular approaches. The lab primarily utilizes mouse models of these diseases to investigate pathogenic mechanisms and develop innovative treatment strategies.

Research Areas and Current Projects
The lab's primary focus is around HCU, for which the Maclean lab has created a novel transgenic mouse model. Through a combination of behavioral analysis, hippocampal microarrays, and proteomic analysis, the lab has revealed several novel pathogenic mechanisms. These discoveries have been subsequently confirmed in human HCU tissue samples, leading to the identification of a novel treatment for HCU. An FDA-funded clinical trial is currently underway at the Children's hospitals of Denver and Philadelphia to test this treatment.

Learning Opportunities
Interns in the Maclean lab will have the unique opportunity to actively participate in research aimed at unraveling the etiology and pathogenesis of HCU, Down syndrome, and hepatic disorders. They will work with cutting-edge research methodologies, including transcriptomics and proteomics, behavioral analyses, and molecular approaches, to study mouse models of these diseases. Interns will have opportunities to develop practical laboratory skills and contribute to advancing the understanding of pathogenic mechanisms. The projects offered in the Maclean lab typically allow the intern to contribute significantly and receive a co-authorship on a peer-reviewed publication.

Christine Vohwinkel, MD, PhD Critical Care

Lab Overview
Dr. Christine Vohwinkel, MD, PhD, leads the lab within the Division of Critical Care, focusing on research in the field of acute lung injury. The primary clinical manifestation of interest is the acute respiratory distress syndrome (ARDS), a severe and highly morbid critical illness characterized by acute onset hypoxemia, pulmonary edema, and bilateral chest X-ray opacities.

Research Areas and Current Projects
The central focus of Dr. Vohwinkel's lab is the investigation of how metabolism regulates inflammation, a key element in the pathogenesis of acute lung injury and ARDS. The lab is particularly interested in understanding the mechanisms by which the lung epithelium communicates with macrophages. To explore these research questions, the lab employs various models, including mouse models of acute lung injury induced by ventilation, acid aspiration, and pneumonia, as well as cell cultures involving both mouse cells and cells donated by human patients. The lab utilizes an array of techniques such as PCR, Western Blotting, ELISA, enzyme activity assays, and histology to delve deeper into these research areas.

Learning Opportunities
Interns in Dr. Vohwinkel's lab will have the unique opportunity to actively engage in research focusing on critical aspects of acute lung injury and ARDS. They will be exposed to various research models, including mouse models and cell cultures, and learn to apply techniques such as PCR, Western Blotting, ELISA, enzyme activity assays, and

histology. This hands-on experience provides valuable insights into experimental methodologies and laboratory procedures relevant to critical care and pulmonary research. Students will work closely with Dr. Vohwinkel and her team, contributing to ongoing projects aimed at understanding the molecular and cellular mechanisms underlying acute lung injury. This experience offers the opportunity to develop practical research skills and gain a deeper understanding of the complexities of critical care research.

Caitlin Lewis, PhD Critical Care

Lab Overview

The research program led by Dr. Caitlin Lewis, PhD, aims to better understand how blood vessels in the lung change and remodel during pulmonary hypertension (PH) — a serious disease caused by high blood pressure in the lungs that currently has limited treatment options. Our lab focuses on how macrophages, a key type of immune cell involved in vascular disease, contribute to the development of PH, with the goal of identifying new therapeutic and diagnostic strategies.

Research Areas and Current Projects

We use a variety of models to study macrophage-driven mechanisms of PH, including the chronic hypoxia mouse model (which simulates high altitude), cell culture systems, and bio-banked human lung tissue. Our work examines how macrophages are reprogrammed in low-oxygen environments to interact with vascular cells and drive disease progression.

Current projects in the lab include:

- Investigating how antioxidant signaling influences platelet–macrophage interactions during PH
- Characterizing macrophage–vascular cell communication in vascular remodeling
- Defining the role of a vessel-associated macrophage subset that recognizes the extracellular matrix component hyaluronan in PH
- Developing primary cell and tissue culture models to study how hyaluronan–macrophage interactions contribute to pulmonary vascular disease

Learning Opportunities

Interns will have the opportunity to gain hands-on experience with molecular and cell-based techniques such as flow cytometry, immunohistochemical staining, qPCR and western-blotting, using samples collected from our experimental models of PH and/or human lung tissue. In addition to these technical skills, interns will build a strong foundation in lung and vascular biology, learn about the mechanisms that contribute to pulmonary hypertension, and develop their abilities in experimental design, hypothesis generation, and critical thinking.

Hui Zhang, MD, PhD, Critical Care Medicine

Lab Overview

Dr. Hui Zhang, MD, PhD, a key member of Dr. Stenmark's laboratory within the Section of Pediatric Critical Care and the Cardiovascular and Pulmonary Research Laboratory, was honored as a Senior Expert in Research in 2025 by the Pediatrics Instructor Recognition Committee. The group investigates the cellular and molecular mechanisms that contribute to structural remodeling of the pulmonary vasculature and right heart dysfunction in the context of pulmonary hypertension (PH), a progressive, life-threatening disease affecting both children and adults.

Research Areas and Current Projects

The laboratory conducts multiple projects focused on cardiovascular and pulmonary diseases, with a particular emphasis on understanding how pulmonary artery vascular cells become activated and contribute to vascular remodeling. To address these questions, the lab employs diverse models across species, including bovine, rat, and mouse models of PH induced by hypoxia or genetic modification, as well as cell and tissue cultures derived from both animal and human sources. Using cutting-edge spatial approaches that integrate high-resolution imaging with transcriptomic profiling at single cell level, the team investigates how cellular and molecular networks drive immune dysregulation, inflammation, metabolic programming, and structural remodeling within the pulmonary vascular wall.

Learning Opportunities
Interns in Dr. Stenmark's laboratory, mentored by Dr. Zhang, have a unique opportunity to actively participate in research that advances the understanding and treatment of PH. They will gain a solid foundation in the structure and function of the pulmonary circulation and learn key organoid, cellular, and molecular techniques using lung, heart, and blood samples from both animal models and human donors. This hands-on experience provides interns with valuable exposure to experimental methods and laboratory procedures in critical care and pulmonary vascular biology, building both practical research skills and a broader understanding of the challenges and opportunities in the field.

Bruce Appel, PhD Developmental Biology

Lab Overview
The Appel laboratory, led by Dr. Bruce Appel, PhD, focuses on understanding the formation of the nervous system during embryonic development. The ultimate goal is to provide insights that can aid in the repair of nervous systems that have been damaged due to disease or injury. To achieve this, the lab employs zebrafish embryos as a model system, given their unique characteristics such as transparency and development outside the mother's body. This enables the use of time-lapse microscopy to observe the dynamic processes of neural cell migration and differentiation into neurons and glia.

Research Areas and Current Projects
The lab is engaged in several areas of research, including:

1. Investigation of neural development in zebrafish and the effects of mutations that disrupt this process, which can offer insights into the genetic basis of neurological disorders in humans.
2. Study of zebrafish as a model system to understand how to promote the regeneration of neural cells that are lost as a result of birth defects or other conditions.

Learning Opportunities
Interns in Dr. Appel's lab will actively participate in research focused on the development of the nervous system and its potential for repair and regeneration. They will work with a unique model system, zebrafish, and leverage time-lapse microscopy to observe and understand the intricate processes of neural cell migration and differentiation. Students will delve into the effects of mutations on neural development, with direct implications for genetic diseases that lead to neurological disorders in humans. This experience offers students an opportunity to develop practical research skills and contribute to projects with the potential to advance our understanding of nervous system development and repair.

Emily Bates, PhD Developmental Biology

Lab Overview
Dr. Emily Bates is a prominent researcher in the field of Developmental Biology. The Bates lab specializes in the study of molecular mechanisms underlying abnormal fetal development. Dr. Bates is particularly interested in how ion channels contribute to embryonic and fetal development.

Research Areas and Current Projects
Dr. Bates' research focuses on how ion channels contribute to embryonic and fetal development. Ion channels are the targets of medications and recreational substances that can cause differences in development- like cleft palate, or abnormal brain development. For example, recent projects have defined how nicotine vaping during pregnancy disrupts craniofacial and skeletal development through inhibition of a potassium channel. Other studies have focused on how fetal cannabidiol (CBD) exposure disrupts brain and pancreas development in offspring.

Learning Opportunities
Interns in Dr. Bates' lab will have the opportunity to engage in research that explores the fundamental molecular basis of human genetic disorders. They will be actively involved in the process of identifying and characterizing mutations, both in humans and in model organisms. This hands-on experience will provide interns with a unique perspective on how genetic research can translate from the clinical to the laboratory setting. Additionally, involvement in research

related to structural birth defects, brain defects, and neurodegeneration offers an opportunity to understand the challenges and potential breakthroughs in addressing these complex issues. Working closely with Dr. Bates and team, students will contribute to ongoing projects that could have implications for the clinical practice. Some interns have had the opportunity to contribute to published papers as authors and to present their work at national and international meetings.

Stephen W. Santoro, PhD Developmental Biology

Lab Overview

The research interests of the Santoro Lab center on the molecular and cellular mechanisms by which the mammalian nervous system develops, adaptively changes, and is maintained throughout life, as well as how these processes can be disrupted with injury, disease, and advanced age. Studies within the Santoro laboratory focus on the mammalian olfactory system, which has a fascinating and complex organization that changes with experience and frequently exhibits functional decline with age through mechanisms that are poorly understood. Human olfactory function depends on the lifelong generation of new olfactory sensory neurons, each of which is categorized as one of hundreds of different subtypes that are specialized to detect a unique set of odors. As a model for investigating this process, we use the mouse olfactory system, which is similar in its organization and function to the human counterpart. Our recent studies have revealed that the neurogenesis rates of a fraction of the >1000 mouse olfactory sensory neuron subtypes can be selectively accelerated by exposure to odors that stimulate them (PMID: 33027656, 40531183). These findings oppose the conventional model that olfactory sensory neurogenesis is stochastic with respect to the neuron subtypes that are generated. Accordingly, these findings indicate that persistent olfactory sensory neurogenesis may serve an unknown adaptive function. Additionally, these studies have led to new insights about how neurogenesis is normally regulated to maintain olfactory sensory neurons in adequate quantities and stable subtype proportions throughout most of life, and how these processes fail in advanced age. Projects in the Santoro laboratory currently focus on elucidating the mechanisms and functions of life-long olfactory sensory neurogenesis. Long-term goals of this work are to provide insights that will enable the treatment of individuals who suffer from olfactory dysfunction.

Research Areas and Current Projects

- Does persistent olfactory sensory neurogenesis in mammals perform an adaptive function, in addition to a reparative one?
    - We have found that exposure of mice to specific odors selectively accelerates the birthrates of olfactory sensory neurons of subtypes that detect these odors. Our results reveal that current assumptions that olfactory neurogenesis is random with respect to neuron subtype are incorrect. Moreover, these findings indicate that this process performs an adaptive function in addition to a reparative one. We are currently investigating the mechanism and function of this process.
- What mechanisms govern regeneration of the olfactory sensory neuron population following injury?
    - Previous studies have found evidence that the regeneration of olfactory sensory neurons following injury to the olfactory epithelium may also not be random with respect to neuron subtype but rather depends on the specific subtype that have been lost. We are currently developing approaches to test these hypotheses in mice, as well as to investigate the molecular and cellular mechanism that regulate neuron regeneration.
- How do neurogenesis rates of the >1000 subtypes of olfactory sensory neuron change as a function of experience, age, and state?
    - We have developed a new method based on single nucleus RNA sequencing to simultaneously profile the birthrates of all neuron subtypes.
    - Using this approach we have identified sets of olfactory neuron subtypes whose birthrates differ significantly between male and female mice and between mice of different ages.
    - We plan to use this approach to investigate how neurogenesis rates of neuron subtypes change as a function of pregnancy, nursing, advanced age, and other states.
- How does olfactory experience affect the lifespans of olfactory sensory neurons of distinct subtypes?
    - Previous studies from our lab and others have found that the relative abundance of olfactory neurons of specific subtypes can be selectively altered by olfactory experience-dependent changes in neuron

lifespan. To investigate the scope of these changes, we are developing approaches to profile olfactory neuron lifespan in a subtype-specific manner.

Learning Opportunities
Interns in the Santoro lab will actively participate in research related to how the mammalian olfactory system develops, how it changes based on olfactory experience, how it can become dysfunctional due to age, injury, and disease, and how it regenerates following damage. Experimental approaches that may be learned include mouse genotyping, bulk and single-cell RNA sequencing, spatial transcript profiling, lineage tracing, RNA fluorescent in situ hybridization, immunohistochemistry, quantitative PCR, and quantitative microscopy. Concepts to be learned will include hypothesis development, experimental design, and experimental data analysis

Eric Simões MD, DCH Center for Global Health, Dept of Epidemiology, Pediatric Infectious Disease

Lab Overview
Our group does clinical trials and epidemiological studies of respiratory infections with current projects in the USA Indonesia, India and Ethiopia.

Research Areas and Current Projects
We have epidemiologic data from large scale field studies of respiratory infection in India and Philippines that can be analyzed. Both data sets have geocoded data if you have any skills in GIS, this might be a good fit for you. In addition some basic statistical knowledge is probably needed or at least good working knowledge of excel.

Learning Opportunities
About understanding problems in developing countries and finding solutions to address small parts of them, one step at a time. Some basic epidemiologic skills. How to think of a problem and try to figure out a solution using epidemiologic principles and statistics. Geospatial analysis if that is your inkling.

eXtraOrdinarY Kids Program (Interdisciplinary)

Nicole Tartaglia, MD, MS
Shanlee Davis, MD, PhD
Karli Swenson, PhD, MPH

Lab Overview
The eXtraOrdinarY Kids Program is dedicated to further understanding of the diverse phenotype of individuals with sex chromosome aneuploidies, including Klinefelter syndrome (47,XXY), Turner syndrome (45,X and variants), Trisomy X (47,XXX), 47,XYY, 48,XXYY, and more. Individually, these conditions are rare and underdiagnosed, however when taken together these conditions affect 1 in 400 individuals. Our translational research program seeks to improve the lives of individuals with sex chromosome aneuploidies throughout the lifespan by interdisciplinary collaboration, incorporation of diverse research methods, and development of robust and sustainable resources to support ongoing discovery.

Research Areas and Current Projects
The program's clinical-translational research focuses on various methodologies, including intervention trials, retrospective and prospective observational studies, translational science, secondary data analyses, patient reported outcomes (PROs), community-based participatory research, and more. These approaches are employed to address important clinical questions with the goal of improving patient outcomes in individuals with sex chromosome aneuploidies, with a specific emphasis on neurodevelopmental, endocrine, and health outcomes. The interdisciplinary team involved in this research program comprises experts in Developmental Pediatrics (Dr. Tartaglia), Pediatric Endocrinology (Dr. Davis), neuropsychology, psychology, genetic counseling, speech and occupational therapy, and clinical research professionals. Students are integral members of this team and are assigned projects tailored to their

experience and career aspirations. In addition to identifying and completing research projects, students will also assist with visits for ongoing clinical research studies.

Learning Opportunities
Interns in the eXtraOrdinarY Kids Program will actively participate in research dedicated to improving the lives of youth with sex chromosome aneuploidies. They will gain hands-on experience and education in clinical-translational research. Students will contribute to projects that aim to address critical clinical questions in the field, particularly in the areas of neurodevelopment, endocrine health, and overall well-being of affected individuals. Working within an interdisciplinary team, interns will have the chance to collaborate with experts in various fields, enhancing their understanding of the comprehensive approach to patient care. Additionally, students will have the unique opportunity to engage directly with participants in ongoing studies, actively contributing to research that has the potential to significantly impact the lives of youth with sex chromosome aneuploidies. All interns present their work at the annual eXtraOrdinarY Kids Research eXpo. Abstract submission for presentation at other local or national meetings is encouraged if the student is interested.

Kibrom M. Alula, Ph.D, MSc., MS-DS, Gastroenterology, Hepatology and Nutrition

Lab Overview
In the deZoeten lab, our research focuses on understanding how immune cells contribute to intestinal inflammation and fibrosis (scarring), particularly in pediatric inflammatory bowel disease (IBD), including Crohn's disease. We investigate how cellular stress responses influence immune cell function, with a particular emphasis on $CD4^+$ T cells and regulatory T cells (Tregs), which help control inflammation. Our research integrates molecular biology, immunology, animal models, and bioinformatics to identify mechanisms of intestinal disease and explore potential therapeutic strategies.

Research Areas and Current Projects
Our current projects investigate how cellular stress-response pathways, particularly the unfolded protein response (UPR) and heat shock response, regulate T-cell function, intestinal inflammation, and fibrosis. We focus on key molecular regulators, including PERK, XBP1, and HSF1, using experimental models of IBD. We also employ computational approaches, including bulk and single-cell RNA sequencing analysis, to understand changes in immune cell populations, gene expression, and metabolic pathways during intestinal inflammation. These studies aim to identify potential therapeutic targets for preventing chronic intestinal inflammation and fibrosis.

Learning Opportunities
Interns will have opportunities to participate in laboratory-based and/or computational research depending on their interests and experience. Laboratory activities may include immune cell isolation, cell culture, flow cytometry, PCR, Western blotting, immunohistochemistry, microscopy, and tissue analysis. Interns will also be introduced to statistical and bioinformatics tools such as GraphPad PRISM and R used for data analysis. Moreover, Interns will develop skills in experimental design, data analysis, scientific literature review, and research presentations. Finally, students will work closely with their mentor and contribute to ongoing research projects relevant to pediatric gastrointestinal diseases.

Kristina Malik, MD General Pediatrics

Lab Overview
I am a general pediatrician who specifically cares for children with medical complexity; my research focuses on improving primary and preventive care for this population.

Research Areas and Current Projects
Qualitative study on perspectives of weight management and obesity care for children with medical complexity.

Learning Opportunities
Qualitative research methods, working with lived experience research partner, primary care for children with chronic medical conditions and disabilities.

Tamim H. Shaikh, PhD, Genetics and Genomics

Lab Overview

The Shaikh lab studies the genetic underpinnings of rare, pediatric diseases. Our patient population includes children with intellectual disabilities and developmental delays, who may also have additional abnormalities like seizures, brain malformations, metabolic imbalances, heart defects, dysmorphic features, autism spectrum disorders or other behavioral issues. We use state-of-the art genomic technologies to detect genetic variants in the patients' DNA and apply computational analysis pipelines to analyze and annotate them to identify potentially pathogenic variants that may play a role in the patient's disease. We then use experimental approaches and functional analysis to correlate the candidate pathogenic variants to the observed phenotypes. Our long-term goal is to improve the yield of genetic diagnoses and elucidation of disease mechanisms for potential therapeutic interventions and treatment of rare diseases.

Research Areas and Current Projects

Current projects in the Shaikh lab include:

1. The application of long read sequencing (Oxford Nanopore) and optical genome mapping (Bionano Genomics) to the analysis of genomic DNA from patients. These new techniques allow for a comprehensive analysis of the genome to detect all forms of genetic variation, including cryptic structural variations, many of which are missed by techniques currently used in clinical diagnostic laboratories. We expect that this approach will help us solve rare diseases which remain undiagnosed.
2. Functional analysis and characterization of potentially pathogenic variants detected in patients with rare diseases. We use a combination of experimental approaches which include generation of induced pluripotent stem cells (iPSCs) derived from the patient's own cells, which can then be differentiated into cell types that are relevant to the patient's phenotype, followed by cellular and molecular analysis which include transcriptomics (to detect changes in RNA expression), 3D genomics (to detect changes in DNA folding and its effect on gene regulation). We expect that this approach will help us better understand how the genetic variants lead to the phenotypes we observe in the patients.

Learning Opportunities

Interns in the laboratory will have the opportunity to participate in the ongoing projects in our laboratory. Individual projects will depend on the intern's interest and the needs of the project and may include computational analysis of long read sequencing data for variant detection and annotation and/or wet bench experiments, including iPSC-based experiments, DNA and RNA extractions for RNAseq, Hi-C and other applications for the functional analysis of the genetic variants. Overall, our interns will learn the various aspects of genetic diagnosis in rare pediatric diseases.

Healthy Eating and Activity across the Lifespan (HEAL) Lab
Adult & Child Center for Outcomes Research & Delivery Science

Jerica Berge, PhD, MPH, LMFT, CFLE
Libby Bollinger, PhD, LP
Maggie Edgerley, BS

Lab Overview

Dr. Jerica Berge's HEAL (Healthy Eating and Activity across the Lifespan) lab examines how family relationships, daily experiences, and social and structural conditions shape eating, physical activity, and health across generations. Four NIH-funded studies connect research on the mechanisms underlying obesity and cardiometabolic risk with the development and testing of family-based interventions. Together, they address whole person health through physical outcomes, health behaviors, mental well-being, and the family and social relationships that support health.

Research Areas and Current Projects

1. **Stress Under the Skin:** This study examines how psychosocial stressors experienced across childhood relate to obesity and emerging cardiovascular disease risk. Drawing on the Family Matters cohort of 1,307 families, it investigates biological stress pathways, including hypothalamic-pituitary-adrenal axis activity, alongside parenting practices and children's behaviors. The study evaluates protective factors such as family resilience and diet quality and uses human-centered design with families to co-develop intervention targets.

2. **Food Insecurity and Cardiometabolic Risk:** This study investigates how the timing and severity of household food insecurity across childhood relate to adolescent obesity and cardiometabolic health. It examines nutrition and stress as potential pathways and identifies factors that may buffer adverse associations, including parenting practices, household resources, neighborhood opportunities, and school and community food supports. Findings are intended to inform interventions responsive to families' food access and daily circumstances.
3. **Structural Racism and Discrimination and Whole Person Health:** This study examines structural racism and discrimination at individual, neighborhood, institutional, and societal or policy levels among racially and ethnically diverse parents and children in rural Georgia and urban Minnesota. It connects daily experiences with momentary stress, mood, eating, and activity and examines longitudinal associations with mental health, cardiometabolic indicators, and health behaviors. Comparing geographic contexts helps identify where structural exposures and opportunities for intervention differ.
4. **Family Matters Intervention:** This study tests a family-based intervention in a three-arm randomized controlled trial designed to include 510 children ages 5–8 and their families. It compares ecological momentary intervention alone with the addition of home visits and, in the third arm, video feedback. Primary outcomes are child BMI percentile and diet quality; additional outcomes include family meals, parent feeding practices and coping, and sibling BMI percentile. The study also evaluates cost-effectiveness and feasibility for implementation in primary care.

Learning Opportunities
Interns working in the HEAL lab would gain hands-on experience in multidisciplinary health research focused on understanding and preventing obesity, cardiometabolic disease, and health disparities across childhood and adolescence. Through involvement in several NIH-funded studies, interns would learn how family relationships, psychosocial stress, food insecurity, structural racism, and daily life experiences influence physical and mental health outcomes. They would be exposed to a wide range of research methods, including survey design, dietary assessment, ecological momentary assessment (real-time data collection), and intervention evaluation through participation in a randomized controlled trial testing family-based approaches to improving child health. Across projects, trainees would develop skills in data collection, study implementation, participant engagement, health equity research, human-centered design, and the translation of research findings into practical strategies that support healthier families and communities.

Nathan Dahl, MD Hematology/Oncology

Lab Overview
Dr. Nathan Dahl is a Pediatric Neuro-Oncologist with a basic science lab that focuses on the study of epigenetics in childhood brain tumors.

Research Areas and Current Projects
The primary focus of the Dahl lab is the study of chromatin biology and how it is altered in cancer states. How DNA is packaged and modified determines how genes are activated, repressed, or modulated across normal development. These regulatory mechanisms are often hijacked in cancer, co-opting normal developmental programs. This creates the opportunity to study both fundamental mechanisms of cancer biology but also how specific proteins driving these epigenetic alterations can be targeted for new cancer treatments.

Learning Opportunities
Interns in the Dahl lab will have opportunities to engage with the spectrum of preclinical cancer research, tailored to the individual intern's interests and skill. A typical internship would include hands-on training with human tissue culture, direct measurements of RNA and protein, and preclinical pharmaceutical testing. Exposure to more advanced techniques in chromatin biology such as ChIP-seq, CUT&RUN, or RNA-seq will be integrated with an individual intern's project. We will also discuss fundamentals of scientific presentation and scientific careers according to the intern's own goals. Successful interns will be credited for their work in national and international presentations and may receive co-authorship on resultant publications, allowing for meaningful scientific contribution and advancement towards their own career goals.

Siddhartha Mitra, PhD Hematology/Oncology and Todd Hankinson MD, MBA Pediatric Neurosurgery

Lab Overview

Dr. Siddhartha Mitra, PhD, leads the Mitra lab, which is an integral part of the Morgan Adams Pediatric Brain Tumor Research Program within the Department of Pediatrics Hematology/Oncology/Bone Marrow Transplantation section at the University of Colorado School of Medicine. Dr. Mitra's research combines expertise in three distinct fields: Immuno-Oncology, neurodevelopment, and brain tumor oncology. The lab's primary focus centers on understanding the mechanisms of immune surveillance in brain tumors, particularly involving cells of the innate immune system.

Dr. Todd Hankinson, MD, is the head of pediatric neurosurgery at Children's Hospital Colorado and leads the Hankinson lab, which is also part of the Morgan Adams Pediatric Brain Tumor Research Program. His research focuses on the brain tumor, Adamantinomatous Craniopharyngioma (ACP. His lab uses a combination of laboratory and computational tools to translate biological discovery into clinical application. The have developed and work with patient derived cell culture models, machine learning models, and work closely with Dr. Mitra in the study of the immunobiology of ACP.

Research Areas and Current Projects

The Mitra/Hankinson labs are engaged in multiple areas of research, including:

1. Investigating the immune-surveillance mechanisms in brain tumors, particularly involving the innate immune system components such as macrophages and brain resident microglia. These immune cells play a vital role in the brain tumor microenvironment.
2. Exploring the inhibition of the myeloid checkpoint pathway, specifically the CD47-SIRPα signaling axis, to suppress the "don't eat me" signal and enhance the phagocytosis of various types of brain tumors. This research is significant in the context of immune-based approaches to combat brain tumors.
3. Focusing on translational Immuno-Oncology to better understand and harness mechanisms like efferocytosis and immunogenic cell death for the development of improved immune-modulating drugs targeting both adult and pediatric brain tumors.
4. Developing machine learning tools for the analysis and translation of large volume laboratory data

The Mitra/Hankinson labs collaborate with a broader brain tumor research program that encompasses seven labs, each specializing in various aspects, including single-cell RNA sequencing, autophagy, and oncogenic signaling pathways. This multidisciplinary approach enhances the collective expertise in the field.

Learning Opportunities

Interns joining the Mitra/Hankinson lab will be part of a brain tumor research program, offering a unique environment to gain experience and insights into Immuno-Oncology, neurodevelopment, and brain tumor oncology. Interns will have the opportunity to work on cutting-edge projects related to immune surveillance and immunotherapeutic approaches for brain tumors.

Jean Mulcahy Levy, MD Hematology/Oncology

Lab Overview

Dr. Jean Mulcahy Levy, MD, has a background in oncology research, with specific training and expertise in pediatric brain tumors. Dr. Mulcahy Levy's research primarily focuses on the development of new therapies for brain tumors, with a particular interest in understanding and addressing therapy resistance mechanisms.

Research Areas and Current Projects

Dr. Mulcahy Levy's lab concentrates on harnessing autophagy, a cellular recycling program, to enhance therapy for patients with central nervous system (CNS) tumors. The lab's research aims to unravel the mechanisms by which autophagy can be utilized to improve treatment outcomes, especially in cases of therapy-resistant brain tumors. Dr. Levy's lab has made significant contributions to this area, including identifying the connection between BRAF pathway alterations and autophagy addiction in brain tumors. Their work has demonstrated the effectiveness of autophagy inhibition when tumors become resistant to BRAF/MEK inhibitors. This research has led to the initiation of a first-in-pediatrics multi-institutional trial of autophagy inhibition in collaboration with the Pediatric Brain Tumor Consortium and

Novartis. Additionally, the lab has conducted extensive investigations into resistance mechanisms to BRAF/MEK inhibitors, with the publication of the largest series of paired pediatric CNS tumor samples. The lab is committed to the development of novel and rapidly translatable treatments for pediatric CNS tumors. Their research has also identified biologically driven therapies for AT/RT and other tumors through genome and pharmacologic screening. A key finding is the identification of CDK7 as a critical vulnerability in AT/RT, which forms the basis for further exploration into the mechanistic relationship between CDK7 and the SWI/SNF complex in AT/RT, and the potential for inhibiting CDK7 alone or in combination with existing AT/RT chemotherapies.

Learning Opportunities
Interns in Dr. Mulcahy Levy's lab will have the opportunity to actively engage in groundbreaking research with significant implications for pediatric oncology. They will play a pivotal role in ongoing projects related to autophagy and resistance mechanisms in CNS tumors, gaining hands-on experience in experimental techniques, data analysis, and translational research. This involvement provides a valuable opportunity for students to develop practical research skills and contribute to the development of novel therapies. Additionally, students may collaborate with a multi-institutional trial, offering a unique perspective on the clinical translation of research findings. Working closely with the experienced research team, interns can expect to contribute to research that has the potential to improve treatment outcomes for pediatric CNS tumors.

Adam Green, MD Hematology/Oncology

Lab Overview
Dr. Adam Green investigates novel targets and therapeutic strategies for aggressive pediatric brain tumors, specifically high-grade gliomas (HGG), including diffuse midline glioma (DMG). The Green Lab is committed to advancing knowledge and improving outcomes for children facing the formidable challenge of high-grade gliomas.

Research Areas and Current Projects
The Green lab is engaged in several areas of research, including:

1. Exploration of novel targets and therapeutic strategies for the treatment of high-grade gliomas.
2. Utilization of genomic, epigenomic, and drug screening techniques to identify vulnerabilities in these tumors.
3. Exploitation of identified weaknesses in preclinical models, including cell culture and mouse models, to develop and test the most effective new therapies.
4. Translation of promising therapies to rationally designed early-phase clinical trials in children, aiming to improve outcomes for patients with these challenging cancers.
5. Investigation into the mechanisms of action of new therapies, addressing the complexities of drug delivery to ensure effective treatment of pediatric brain tumors.

Learning Opportunities
Interns joining Dr. Green's lab will be actively involved in investigating and understanding the genomic and epigenomic landscape of high-grade gliomas, specifically preclinical research using cell culture and mouse models to test and refine novel therapeutic strategies. They will work with experienced lab personnel to learn cell culture and molecular biology techniques to investigate novel targets in these diseases, along with investigation of combination therapy approaches and drug delivery. Interns will be coauthors on any national/international presentations and publications to which they contribute.

Virginia (Ginger) Lijewski, PhD, MPH Maternal-Fetal Medicine, Dept of Obstetrics and Gynecology

Colorado Fetal Care Center, Children's Hospital Colorado

Lab Overview
Our research focuses on improving maternal, fetal, and neonatal outcomes through clinical and epidemiologic research. Working across the University of Colorado Division of Maternal-Fetal Medicine and the Colorado Fetal Care Center at

Children's Hospital Colorado, we collaborate with multidisciplinary clinical and research teams to investigate pregnancy complications, fetal conditions, and factors influencing perinatal outcomes.

Research Areas and Current Projects
Our research uses clinical data to better understand how maternal and fetal conditions influence pregnancy outcomes and how clinical care can be improved. Projects primarily involve retrospective medical record reviews, clinical database development, and analysis of maternal, fetal, and neonatal outcomes.
Current projects include:

- **Colorado Fetal Care Center Patient Registry:** Developing and expanding a clinical research registry to better characterize pregnancies complicated by fetal conditions, examine patterns of care, and evaluate maternal, fetal, and neonatal outcomes.
- **PARITY Data Linkage:** Linking data from the PARITY research database with Colorado Fetal Care Center clinical data to better understand pregnancy characteristics, clinical care, and outcomes among patients receiving specialized fetal care.
- **Myelomeningocele (MMC) Outcomes:** Evaluating maternal, fetal, and neonatal outcomes among pregnancies affected by myelomeningocele, a congenital condition affecting development of the spinal cord and surrounding structures. This research aims to better understand clinical outcomes and inform counseling and care for affected families.

Additional opportunities may include other ongoing maternal-fetal medicine research studies at the University of Colorado. Specific projects will be selected based on student interests, experience, and ongoing research needs.

Learning Opportunities
Interns will gain hands-on experience in clinical and epidemiologic research, including literature reviews, medical record abstraction, data collection and management, and interpretation of research findings. Students will work with multidisciplinary clinical and research teams, gaining an understanding of how clinical questions are translated into research studies and how findings can inform patient care. Depending on the project, students may also have opportunities to contribute to research presentations or manuscripts. Additional opportunities to shadow maternal-fetal medicine specialists and other clinicians involved in multidisciplinary fetal care may be available, depending on institutional requirements and clinical schedules.

Eileen I. Chang, PhD, MCR Neonatology

Lab Overview
Dr. Eileen Chang is a fetal physiologist specializing in cardiovascular development and striated muscle metabolism. Her lab investigates the physiological and molecular mechanisms underlying the “Developmental Origins of Health and Disease,” which links abnormal fetal growth patterns to an increased risk of adult-onset cardiovascular and metabolic diseases. Her research focuses on cardiomyocyte growth, maturation, contractility, and metabolism in both normally developing fetuses and those with placental insufficiency-induced fetal growth restriction (FGR), aiming to develop therapeutic strategies to support heart growth before or after birth.

Research Areas and Current Projects
About 10% of pregnancies in the U.S. experience reduced placental transport of nutrients and oxygen to the fetus, which can lead to FGR and low birth weight. Clinical studies in growth-restricted fetuses, children, and adults show impaired heart contractility, structural remodeling, and a higher long-term risk of high blood pressure and heart disease. We found that the hearts of FGR fetal sheep are more immature and exhibit lower expression of genes involved in calcium handling and contractile proteins, indicating compromised heart function compared with normally growing control fetuses. The current projects aim to investigate how FGR affects heart contractility through functional studies using fetal heart cells and muscle fibers. These studies will provide new insights into FGR-related cardiac dysfunction and help identify innovative targeted treatment strategies.

Learning Opportunities
Dr. Chang’s lab uses integrative approaches to study fetal physiology, from whole-animal studies to tissue, molecular, and cellular experiments. Interns in Dr. Chang’s lab will have the opportunity to engage in fundamental cardiovascular research, including RNA and protein analysis of heart tissues, as well as hands-on cell culture training. Working closely

with Dr. Chang and her team, interns may contribute to ongoing projects focused on cardiomyocyte growth, maturation, contractility, and metabolism. Any work that results in publication will lead to co-authorship and opportunities to submit abstracts for presentation at scientific meetings.

Stephanie Wesolowski, PhD Neonatology

Lab Overview

Our lab studies how altered nutrient supply programs fetal metabolism and how these changes may persist after birth, increasing susceptibility to adult metabolic disease, a concept termed developmental programming. Our primary research aims to understand the effects of fetal growth restriction (FGR) on liver metabolism and function, using integrative approaches in physiology and metabolism, combined with novel molecular techniques in cell biology, epigenetics, and metabolomics.

Research Areas and Current Projects

Current studies focus on understanding how hypoxia and lactate disrupt fetal hepatic metabolism, initiating hepatic insulin resistance and fibrosis. This is important because offspring born with FGR have increased susceptibility to diabetes and metabolic-associated steatotic liver disease (MASLD) across their lifespan. We also have projects investigating the effects of maternal high-fat consumption on offspring liver metabolism.

Learning Opportunities

Interns will gain hands-on experience with biochemical, molecular, and cellular techniques in the lab. They will be mentored by the PI and members of the lab. While guidance will be provided, the intern will be expected to take ownership of the project. Opportunities for abstract presentations at national meetings and co-authorship on publications are considered for interns who are interested and make appropriate contributions to the project.

Jessica Solomon Sanders, MD Neurodevelopmental Disabilities

Lab Overview

Dr. Jessica Solomon Sanders is Assistant Professor of Pediatrics, Section of Developmental Pediatrics, and Neurology at the University of Colorado School of Medicine. Her career focuses on enhancing the lives of patients with neurodevelopmental disabilities through the lifespan by utilizing her combined background of special education and medicine to improve access to and quality of age-appropriate, specialized healthcare. She completed the 6-year Neurodevelopmental Disabilities (NDD) residency, which included two years of pediatrics and four years of adult and child neurology and NDD at Boston Children's Hospital. Dr. Sanders founded an adult neurodevelopmental clinic within adult neurology at the University of Colorado, and she oversees the Transition-to-Adulthood Clinic in Developmental Pediatrics at Children's Hospital Colorado.

Research Areas and Current Projects

1. Joint Opportunities for Bridging Wellness, Integration of Community Services, and Supported Employment (JOBWISE) – 5-year HRSA-funded grant that is establishing a framework for transition-to-adulthood between medical and community settings that includes employment as a key piece of transition-to-adulthood. Currently in year 3 of 5.
2. Improving Health Care Communication and Engagement for Adults with Down syndrome – 5-year NIH-funded grant utilizing Conversation Analysis, a qualitative technique, to evaluate communication between Adults with Down syndrome and primary care providers. Currently at the start of year 2.

Learning Opportunities

1. Qualitative analysis
2. Recruiting patients and doctors for qualitative interviews
3. Poster creation and design

Russell Whelan MD, PhD Nephrology

Lab Overview
Complement is a critical part of the immune system that helps rapidly defend against infection, but can also contribute to tissue injury when dysregulated. The Whelan lab studies how inflammation, complement activation, and vascular injury contribute to kidney disease. Many forms of kidney disease involve injury to the kidney microvasculature and inappropriate activation of the immune system. Our work aims to understand these processes and to identify novel therapeutic strategies for children and adults with complement-mediated kidney disease.

Research Areas and Current Projects
The focus of our research is understanding how complement affects the small blood vessels of the kidney during health and disease. There have been significant advances in complement-targeted therapies in recent years, but much about complement biology remains poorly understood. Our work centers on three major areas:

1. FHR proteins and microvascular injury
We are particularly interested in complement regulators known as Factor H (FH) and the Factor H-related (FHR) proteins. Genetic variation in the FHR genes has been linked to several forms of kidney disease, and we are investigating the role of FHRs in regulating complement-mediated microvascular injury under static and flow conditions.
2. Activated endothelium in complement-mediated injury
Endothelial cells are not passive targets. Once activated, they recruit immune cells, adopt a prothrombotic surface, and alter complement regulation on their own membranes. We ask how this state changes the glomerular response to subsequent injury.
3. Shiga toxin and the glomerular endothelium
Infections with Shiga toxin-producing bacteria are a leading cause of hemolytic uremic syndrome in children. In this disease, glomerular endothelial injury drives microvascular thrombosis and kidney failure. We use Shiga toxin as a defined injury model to test how inflammatory pathways and endothelial complement regulation determine whether injury resolves or progresses.

Learning Opportunities
Our goal is to provide every lab member with opportunities for intellectual and technical growth, regardless of prior experience. We work with new members to identify projects that align with their interests and skills, and as a highly collaborative lab, we encourage input from all members in the planning, execution, and interpretation of studies. Techniques used in the lab include:

- Cell culture, including endothelial culture under flow
- Immunofluorescence/immunohistochemistry
- Flow cytometry
- Immunoblotting
- ELISA
- Live-cell microscopy imaging

Trainees have ownership of their projects from initial planning through data analysis, interpretation, and presentation, with mentorship and support throughout. Work contributing to publications results in co-authorship, and trainees have opportunities to present their research at scientific meetings.

Kristen Boyle, PhD Nutrition

Lab Overview
Dr. Kristen Boyle's lab investigates how early-life environments influence lifelong health, with a special focus on nutrition and metabolism. The lab uses cutting-edge techniques to study how conditions during pregnancy, such as maternal obesity, diabetes, and environmental exposures, can shape a child's future risk for metabolic diseases like obesity and type 2 diabetes.

Research Areas and Current Projects
The lab's research centers on mesenchymal stem cells (MSCs), which are collected from infant umbilical cord tissue. These cells offer a unique window into how maternal health affects fetal development. By using advanced cell culture

and molecular biology tools, including 3-dimensional cell culture and mitochondrial metabolism measures, the team explores how prenatal exposures change stem cell behavior and metabolism.
Current projects include:

1. **Maternal Stress and Infant Metabolism**: Studying how maternal stress biomarkers during pregnancy influence stem cell metabolism and a child's risk for obesity.
2. **Fat Cell Function**: Investigating how the size of fat cells affects their metabolic activity and inflammatory potential.
3. **Multi-Omics Analysis**: Using integrated data approaches to connect maternal health, stem cell characteristics, and long-term metabolic outcomes in children.

Learning Opportunities
Interns in Dr. Boyle's lab will be immersed in a collaborative research environment focused on early-life influences on metabolism. They will gain hands-on experience with core lab techniques such as cell culture, mitochondrial respiration assays, and confocal microscopy, while also learning how to analyze and interpret data. Throughout the internship, students will be introduced to the scientific method, including hypothesis development, experimental design, and data-driven inquiry. Interns will be mentored by lab members and encouraged to engage in scientific discussions, explore areas of personal interest, and present their findings in lab meetings or informal settings. This experience is designed to build foundational skills in biomedical research and foster curiosity about the connections between maternal health and child development.

Stephanie Gilley, MD, PhD Nutrition

Lab Overview
Dr. Gilley is a clinical-scientist focused on multiple areas of pediatric nutrition. The Gilley Lab's primary goal is to improve lifelong health by optimizing nutrition during infancy and early childhood.

Research Areas and Current Projects
Our main project centers on how fetal growth restriction changes development of the intestine and establishment of the gut microbiome which then contributes to adverse metabolic outcomes in a mouse model. Other projects look at the role of the gut microbiome in growth outcomes in children in low resource settings; the nutritional gaps of homemade infant formula recipes found across the internet; and the role of iron in infant formulas on development of the microbiome.

Learning Opportunities
Students in the Gilley lab can gain hands-on experience with cell culture, DNA/RNA extraction, PCR, and DNA and protein blots. All new members of the lab will learn techniques and data analysis with appropriate supervision and support with increasing independence as mastery is demonstrated. Undergraduate and medical students with a background in epidemiology, statistics, or public health could have an opportunity to analyze existing datasets to ask novel questions. Motivated medical students could also have the opportunity to contribute to a peer-reviewed manuscript such as a case report, short review, or other. Dr. Gilley is also passionate about communication skills and the components of good presentations which will also be taught through practice.

Shelley Miyamoto, MD Pediatric Cardiology

Pediatric Cardiovascular Research Laboratory (PCRL)
Shelley Miyamoto, MD Kika Sucharov, PhD
Brian Stauffer, MD Katie Chatfield, MD, PhD

Lab Overview
Dr. Shelley Miyamoto, MD, leads a multidisciplinary research group with a mission to conduct translational and molecular research focused on children with heart disease. The laboratory brings together expertise spanning the

cardiovascular field, encompassing pediatric and adult disease, basic molecular biology, cardiovascular physiology, and clinical translation. The research conducted in the Miyamoto lab leverages a repository of pediatric and adult heart tissues, as well as animal and primary cell culture models.

Research Areas and Current Projects
The lab's current projects encompass a broad range of areas:

1. Investigation of mitochondrial function in the failing hearts of children with cardiomyopathy and single ventricle heart disease.
2. Exploration of the regulation of phosphodiesterase expression and activity in pediatric heart failure.
3. Profiling of tissue and circulating microRNAs for insights into heart disease.
4. Study of myocyte mechanics in the context of the failing heart.

The research undertaken in the Miyamoto lab is pivotal in understanding and addressing pediatric heart failure, a condition for which current treatment strategies are often extrapolated from trials conducted in adult heart failure patients. Dr. Miyamoto's findings reveal that children with heart failure exhibit unique molecular adaptive responses, indicating the need for specific, targeted therapeutic approaches.

Learning Opportunities
Interns working in the Miyamoto lab will have the opportunity to engage in research aimed at unraveling the molecular and translational aspects of heart disease in children. They will work with a diverse set of research tools and techniques, including RT-PCR, Western blotting, various activity assays, and basic biostatistics. This experience offers students the chance to develop practical laboratory skills and contribute to projects with direct implications for the understanding and treatment of pediatric heart failure. Interns will collaborate in a multidisciplinary environment, gaining insights into the translation of research findings into clinical practice.

Anastacia Garcia, PhD Pediatric Cardiology

Lab Overview
The overall focus of my current research program is to better understand the unique adaptations governing pathological cardiac remodeling and the progression to heart failure in pediatric patients with complex congenital heart disease (CHD), including hypoplastic left heart syndrome (HLHS) and other single ventricle defects. The ultimate goal of my research is to develop the critical knowledgebase and infrastructure necessary to identify efficacious therapies for improving outcomes in this vulnerable group.

Research Areas and Current Projects
By using human cardiac tissue and blood samples in combination with cell and animal models, we evaluate both the basic biology of complex congenital heart disease and interventions that have the potential to address the decline in myocardial function. Currently, a major focus of the lab is to elucidate the molecular mechanisms involved in the modulation of cardiac energy metabolism and altered immune cell signaling in single ventricle heart disease. This work will be important for the identification and development of drug therapies that improve cardiac function and enhance transplant-free survival in this population. We are actively investigating the role of specific glycolipids in modulating both cardiometabolic function and inflammation. We are also actively developing a high-throughput drug screening approach to identify novel therapeutic targets.

Learning Opportunities
Researchers in the Garcia lab will have the opportunity to engage in a spectrum of pre-clinical cardiovascular research utilizing in vitro cell culture-based models as well as in vivo murine based models. We utilize a variety of molecular biology techniques (DNA, RNA, protein) as well as high resolution respirometry functional analysis. A typical internship would include hands-on training with cell culture, direct measurements of RNA and protein, and preclinical pharmaceutical testing. We will also discuss fundamentals of scientific presentation and scientific careers according to the intern’s own goals. Promising research projects within the lab typically offer opportunities for presentations at national meeting and co-authorship on publications, allowing interns to make a tangible contribution to the scientific community and will advance their own career goals.

Stacy L. Simon, PhD, DBSM Pulmonary & Sleep Medicine

Lab Overview

Dr. Stacey L. Simon, PhD, is a pediatric behavioral sleep medicine provider with a research focus on mechanisms underlying the negative physical and mental health consequences of insufficient sleep and circadian misalignment (mismatch between the biological and social clocks) in adolescents. Adolescents are at high risk for insufficient and mistimed sleep due to biological, psychosocial, and environmental factors such as a physiological delay in circadian rhythms, high academic and social demands, and typically early high school start times. Dr. Simon's work has demonstrated associations between short sleep duration, late bedtimes, and circadian misalignment with insulin resistance, vascular impairments, and poor mood and behavior in adolescents including otherwise healthy youth and those with obesity, PCOS, and type 1 diabetes. The overall goal of the lab is to identify countermeasures to poor sleep and circadian health as a means of improving physical and mental health outcomes in adolescents.

Research Areas and Current Projects

Current ongoing studies include:
REST: a randomized clinical trial assessing the impact of a sleep and circadian health intervention for youth with high body weight and habitually short sleep duration on cardiometabolic health and energy balance.
T1Dream: a randomized clinical trial investigating the impact of improving sleep and circadian health on insulin sensitivity and glycemic control in adolescents with type 1 diabetes and habitually short sleep duration.
Quantitative and qualitative data from these and other studies are available for analysis.

Learning Opportunities

Interns in Dr. Simon's lab will have opportunities to engage in multidisciplinary, collaborative research across the fields of sleep medicine, pediatric psychology, endocrinology, cardiology, genetics, and pulmonology. Clinical shadowing in these areas is also possible. Opportunities for direct interaction with study participants as well as analysis of previously collected data are available. Interns will participate in weekly lab meetings with journal club and career development discussions. This research experience offers a valuable opportunity for students to develop practical research skills and contribute to a deeper understanding of the relationship between sleep and cardiometabolic health. Successful interns will have opportunities to submit an abstract for presentation at a national scientific conference and may receive co-authorship on manuscripts.

Ayelet Talmi, PhD, IMH-E®, Psychiatry-Harris Program and Pediatrics

Overview

CLIMB (Consultation Liaison in Mental Health and Behavior) provides integrated behavioral health services to pediatric populations in three primary care clinics at Children's Hospital Colorado: Child Health Clinic, Special Care Clinic, and Young Mothers and Families Clinic. The multidisciplinary team of psychologists, psychiatrists, behavioral health navigators, and behavioral health trainees provides the full continuum of integrated behavioral health services in the context of a pediatric medical home. Our research program uses clinical informatics and a mixed methods approach (quantitative and qualitative) to track, characterize, and evaluate the impact of integrated behavioral health services in pediatric primary care settings. Examples of ongoing projects include evaluating: adolescent depression, anxiety, substance use, sleep, psychosocial risk and adversity on child health outcomes, early childhood interventions, weight management and healthy lifestyle, neurodevelopmental disorders, ADHD, gender affirming care practices, health services and systems utilization based on medical and behavioral health diagnoses, and health disparities on service utilization and health outcomes.

Research Areas and Current Projects

1) **Early childhood population**: evaluating the HealthySteps intervention – a birth to three, evidence-based intervention pairing a developmental specialist with a primary care provider to see families at all well child visits in the first three years of life; examining child health and health systems outcomes including breastfeeding duration, parent-child relationship quality, child development, adherence to well child visits, utilization of emergency and urgent care, pregnancy related mood and anxiety disorders, and family psychosocial stressors
2) **Adolescent population**: evaluating adolescent depression and suicidality, gender identity and sexual orientation, substance use, sleep hygiene, and family psychosocial stressors impacting adolescent well-being

3) **Health equity and access**: examining socio-demographic and programmatic factors that impact access to integrated behavioral health services; language equity in ADHD treatment in primary care; language and socio-demographic factors influencing enrollment in integrated behavioral health services

Projects recently presented or accepted for presentation at national conferences:

- *Optimizing intensive health behavior and lifestyle treatment for children with obesity: A hybrid approach*.
- *"S" is for sex: Discussing sexual activity, sexual orientation, and gender identity in primary care*.
- *A step in the right direction: Exploring equity and access to the HealthySteps program.*
- *Pay Attention! Integrated behavioral health supporting ADHD management in pediatric primary care*.
- *If you snooze you lose: Detecting adolescent sleep problems in pediatric primary care*.
- *It's all in your HEADSS: Primary care provider response to adolescent substance use*.
- *Don't worry, be happy: Assessing and addressing pediatric anxiety in primary care*.

Silent struggles: Examining trauma and adversity in the context of adolescent depression in pediatric primary care.

Learning Opportunities

The research intern will join a research team that includes a data scientist, a biostatistician, a research manager, a research assistant, and principal investigators to develop a project based on interest. The intern will learn about electronic health record data collection, clinical informatics as a driver for clinical decision-making, assessment of health outcomes to determine program impact, and enhancing clinical care through research and quality improvement efforts. In addition to developing an individualized project, the intern will be included in ongoing research projects and have the opportunity to collaborate on publications and presentations to national meetings. The intern will also have opportunities to shadow clinical services (weekly if desired) and participate in weekly lab/team meetings where research, clinical care, and policy and advocacy efforts are discussed.

Masanori Hayashi, MD Solid Tumor Program

Lab Overview

The Hayashi lab is dedicated to investigating the biology of pediatric sarcoma metastasis. The primary research objectives are to develop targeted anti-metastasis therapies and identify biomarkers that can predict treatment failures and relapses with metastasis. The lab conducts a comprehensive program focused on liquid biopsies, including the detection of circulating tumor cells and circulating tumor DNA in pediatric sarcoma patients. Dr. Hayashi and team actively engage in preclinical investigations, concentrating on specific targets to disrupt the metastatic process in high-grade sarcomas.

Research Areas and Current Projects

The Hayashi lab is involved in the investigation of the biology of pediatric sarcoma metastasis, with the aim of developing precise anti-metastasis therapies. Specifically, there are multiple projects aimed at testing novel therapeutic targets in pediatric sarcomas using cell culture models and mouse models of sarcomas. We use a variety of molecular biology tools, such as RNA-seq, whole genome sequencing, single cell RNA sequencing, CUT&RUN, among many standard experimental techniques. The second goal of the lab is to develop novel biomarkers to identify patients at risk of conventional therapy failure and relapse with metastasis. The lab is the correlative biology sample center for multiple national trials, testing this rich library of samples with who genome sequencing, single cell RNA sequencing, and ddPCR. There are multiple stages of investigations ongoing for biomarker testing, ranging from early-stage discovery studies to late (closer to clinical implementation) validation studies.

Learning Opportunities

Interns in the Hayashi lab will be assigned specific individual projects, where the intern is expected to have full ownership of their specific project. Projects are determined prior to the start of the internship through multiple meetings, to meet the experience level and career interests of the student. Under guidance of the lab members, interns are expected to study the background prior to starting the internship, learning specific experimental techniques pertinent to their projects through repetition, and to be able to present a completed result at the end of the internship. The main focus will be on having a complete experience that can contribute to the career development of the intern. The

experience is designed to offer students opportunities to develop practical laboratory skills, gain confidence to work semi-independently in the lab, and to learn the fundamentals of scientific presentations. Previous successful interns have been credited for their work in national and international presentations and have received co-authorship on resultant publications.