



COLLEGE OF
CHARLESTON

2024 Research Matchmaking Session

October 8th, 2024 4:00 pm – 6:00 pm

Located in the SSMB Atrium

Fields of Interest

Biology

Chemistry and Biochemistry

Computer Science and Engineering

Geology and Environmental Geosciences

Human Health

Marine Biology

Mathematics

Psychology/Neuroscience

Biology

Michael Bouchard (boucharm@musc.edu)

Research Topic: Hepatitis B Virus and Liver Cancer

Liver cancer is one of the most prevalent cancers worldwide, with hepatocellular carcinoma (HCC) accounting for approximately 80% of cases. Several risk factors have been identified include exposure to environmental toxins and drugs, alcohol consumption, and chronic liver infections, particularly those caused by viruses such as hepatitis B virus (HBV).

HBV primarily targets hepatocytes, altering their physiology to support viral replication. While the exact mechanism by which HBV induces liver cancer is still unclear, it is thought to involve immune-mediated destruction of infected hepatocytes, subsequent liver regeneration, and the actions of viral proteins, such as the HBV X protein (HBx). HBx is a multifunctional protein involved in regulating HBV replication and influencing key cellular processes, including transcription, proliferation, apoptosis, and signal transduction pathways. Our research specifically seeks to understand the role of HBx in controlling cellular metabolism.

Joe Delaney (delaneyj@musc.edu)

Research Topic: Ovarian cancer genetics, cell biology, and novel therapeutics

We discover new oncogenes, new tumor suppressors, and new drugs using in silico, in vitro, in vivo, and clinical trial approaches. Cutting-edge techniques including live cell fluorescent microscopy, CRISPR-Cas9 gene editing and screening, drug screening, next-generation sequencing, genetically engineered mouse models, and, for those who are unusually computer savvy, bioinformatics using R and Bioconductor. Our main model is ovarian cancer, in part due to its exceptionally high rates of aneuploidy and copy-number alterations: attractive new genetic targets and vulnerabilities for the next generation of precision oncology.

Denis Guttridge (guttridg@musc.edu)

Research Topic: Cancer Biology

Our lab is interested in the mechanisms driving pancreatic cancer, one of the most deadliest cancer types, and how patients with these tumors undergo severe weight loss (cachexia) due to depletion of their skeletal muscle mass. The lab is divided between mechanisms in the tumor vs in the muscle.

Lu Han (hanl@musc.edu)

Research Topic: Pancreatic cancer

We investigate the cellular and molecular mechanisms of pancreatic cancer formation. We use genetically engineered mouse models, human patient samples and cells as research platforms. Our goal is to elucidate fundamental biology of pancreatic cancer, which may lead to improved treatment of patients.

Melissa Hughes (hughesm@cofc.edu)

Research Topic: Animal behavior, communication and social behavior

I study birds (especially sparrows) and marine crustaceans (especially snapping shrimp). I am currently working on (a) how plumage variation may be a signal of dominance in song sparrows; (b) social behavior in wintering sparrows; and (c) social behavior and perception in snapping shrimp.

Andrew Jakymiw (jakymiw@musc.edu)

Research Topic: Drug delivery; Cancer; AMD; Organ transplantation (MUSC)

My laboratory research is focused on the development of cell-penetrating peptide (CPP)-mediated targeted delivery strategies for therapeutic nucleic acid-based drugs in the treatment of varied diseases, including cancer and age-related macular degeneration (AMD), as well as in the prevention of early ischemic injury in organ transplantations. Moreover, my laboratory is also involved in the study of cell entry mechanisms that peptide carriers employ to deliver various nucleic acid-based cargos into cells, which could prove instrumental in informing new peptide designs toward the advancement of more efficacious peptide carriers for human therapies.

David Kay (kayd@cofc.edu)

Research Topic: Comparative evolutionary functional morphology

My current research program is studying teeth to address the role of tissue mechanics in shaping phenotypes and phenotypic variation. I apply quantitative methods such as shape analysis, microCT reconstruction, multivariate statistics, and materials and dental biomechanics across multiple domains—from sub-cellular to whole organisms—to address how teeth are shaped, particularly the role that tooth sockets play in enabling crown functional morphologies.

Antonis Kourtidis (kourtidi@musc.edu)

Research Topic: Cell-cell junctions recruit and regulate miRNAs and RNA interference (RNAi) to suppress tumorigenesis and maintain cell homeostasis

Please check our lab's website: <https://medicine.musc.edu/departments/regenerative-medicine/research/kourtidis-lab>

Casey Langdon (langdonc@musc.edu)

Research Topic: Pediatric cancer biology and therapeutic development

The Langdon Lab at MUSC is dedicated to finding new therapies for pediatric sarcomas by digging deeper into the mechanisms that drive these devastating diseases. My laboratory has initially focused on Ewing sarcoma, a bone cancer that affects 200-250 children each year in the US. These patients are treated with an intensive regimen of combination chemotherapy, surgery, and radiation. These toxic therapeutic options are little changed in decades. Our lab is investigating new, targeted therapies for Ewing sarcoma which inhibit specific proteins or pathways critically important for these cancers. We are also very interested in examining why these combinations work and how that information can further tweak these therapies for even more effective and less toxic therapies in the future. I am deeply committed to mentoring early career scientists, including undergraduates; I am mentoring a PhD student, two rotating PhD students, and several College of Charleston students now.

Eric McElroy (McElroye@cofc.edu)

Research Topic: Animal Locomotion, Ecology, Evolution.

I have current projects examining the ecology of reptiles and amphibians at Stono Preserve and the Biology of several local lizard species. I also work collaboratively to study how parasites affect marine organisms.

Courtney Murran (Murrenc@cofc.edu)

Research Topic: Plant Ecology

I have several project on ecological genetics of plants using model system Arabidopsis and a local system on carnivorous plants, approaches from growth chamber experiments, to data analyses to field experiments. Look forward to discussing with students interested in plant biology and the environment.

Michael Ostrowski (Ostrowsk@musc.edu)

Research Topic: Genetic Analysis of Tumor Microenvironment in Pancreatic Cancer

Pancreatic ductal adenocarcinoma (PDAC) is one of the most lethal solid tumors. A defining characteristic of PDAC is its dense stromal response, including activated fibroblasts, an abundant extracellular matrix (ECM), immune cell infiltration, and abnormal blood vessel formation. This has led to the hypothesis that targeting the tumor stroma along with the cancer might enhance treatment effectiveness. However, our understanding of the TME's influence on tumor progression and how to strategically target it in PDAC remains limited. Fibroblasts are the predominant cell type constituent of the PDAC stroma. The cancer-associated fibroblasts (CAFs) play complex and contradictory roles in both promoting and inhibiting cancer. Our research uses innovative mouse models and human samples to dissect the genes, pathways and mechanisms, which mediate crosstalk between CAFs, immune cells, and tumor cells.

Moshe Rhodes (rhodesme@cofc.edu)

Research Topic: Aerobiology of extreme microbes

Project 1: Genomic analysis of a microbe isolated from the Great Salt Lake that might offer a path toward carbon sequestration.

Project 2: Are there extreme microorganisms floating in the air and water around us.

Project 3: Biochemical development of prenatal disease diagnostics (With Dr. Forsythe in Chemistry).

Natalie Saini (sainina@musc.edu)

Research Topic: Understanding how environmental DNA damage leads to cancer

Our work aims to understand how environmental contaminants cause DNA damage, mutagenesis and genome instability and further lead to cancer.

Brent Wilkerson (wilkersb@musc.edu)

Research Topic: Hearing loss, inner ear development

We are seeking motivated students interested to conduct mechanistic research on hearing loss in the Wilkerson Lab at the Medical University of South Carolina. Our lab investigates maladaptive processes and developmental defects that contribute to hearing loss. Our research leverages the strengths of mouse models to evaluate new risk factors for hearing loss and to answer etiological questions. We study pathophysiological and neurobehavioral correlates of hearing loss to understand the functional consequences. We use single-cell genomics analysis to identify new cell subtypes and markers as well as the underlying gene networks.

Chemistry and Biochemistry

Menny Benjamin (benjamim@musc.edu)

Research Topic: A Prospective Solution to the Opioid Epidemic; Novel Alkaloids for Pain management and Opioid Use Disorder without β -arrestin Recruitment

The search for effective pain management solutions remains a critical challenge, particularly with rising concerns over the use of conventional opioids. In the United States, the mortality rate from opioid overdoses has surged dramatically over the last decade, reaching up to 80 per 100,000 people in certain states. This crisis has an estimated economic impact of \$1.5 trillion annually, surpassing the GDP of many sectors.

In response, the discovery of indole and oxindole alkaloids as novel therapeutic agents, particularly those produced by the plant Tribe Naucleaeae, offers a promising research avenue. These compounds have demonstrated potential in managing various types of pain, including neuropathic, inflammatory, nociceptive, visceral, and central pain syndromes, with

a particular emphasis on cancer pain. Unlike traditional opioids, these alkaloids do not recruit beta-arrestin-2, a pathway linked to adverse opioid effects such as respiratory depression, constipation, and tolerance. This research focuses on optimizing and selecting the most effective alkaloids within *Mitragyna speciosa* for therapeutic use. A combination of molecular modeling, chemical informatics, receptor binding, and in vivo pharmacology studies is being employed to identify potential drug leads from the indole and oxindole classes for controlling pain and opioid use disorder (OUD).

Kratom (*Mitragyna speciosa*) is currently used by approximately 15 million Americans as a botanical product for pain management and OUD, and related plant species are used globally for similar purposes. The ideal molecules identified are agonists of the MOR and potential antagonists of KOR without beta-arrestin recruitment. Optimized drug leads will also exhibit no agonism for 5HT2B receptors and demonstrate comparable or superior antinociception relative to morphine, without respiratory depression or dependence. Several molecules meeting these criteria have been identified, isolated from plant material, and synthesized for further development.

Amy Cuthbertson (amy.cuthbertson@nist.gov)

Research Topic: Chemicals of Emerging Concern

I currently work as a Research Chemist in the Chemical Sciences Division at NIST in Charleston, SC with a focus on persistent organic pollutants (POPs), chemicals of emerging concern (CECs), plastic additives and non-target analysis (NTA) using high resolution mass spectrometry.

Marcello Forconi (Forconim@cofc.edu)

Research Topic: Reaction mechanisms -from enzymes to small molecules

In one project, we will look at the reactivity of a recently discovered bacterial endonuclease, called YloC. This hexameric enzyme shows some structural similarities with the SARS-CoV Nsp 15 endonuclease, and may play a role in small RNA regulation in bacteria. We will start our analysis by determining the substrate specificity and the divalent metal ion requirements for YloC. This research will be done in collaboration with Dr. Mike Harris at the University of Florida Gainesville, who will provide the protein and some preliminary results, and Dr. Meredith Frazier at the College of Charleston, who is interested in solving the structure of this enzyme by cryo-EM.

In another project, we aim to expand the knowledge on the mechanism of a reaction called Kemp elimination. The Kemp elimination is a ring-opening reaction that is usually base-catalyzed. Kemp elimination of benzisoxazoles (heterocyclic compounds that contains a labile N-O bond) has been studied since the 1970s, and we recently determined that also benzisothiazoles (which are compounds analog to benzisoxazoles, but with a labile N-S bond) can undergo this reaction. In 2018, a paper reported the Kemp elimination-like ring opening of 1-sulfonyl-1H-indazoles (which contain a labile N-N bond) in particular conditions, but no work has been done to determine the kinetics and the mechanism of this

reaction. Students will study the reactivity of 1-sulfonyl-1H-indazoles in different conditions, and will use computation to guide future experiments.

Lu Han (hanl@musc.edu)

Research Topic: Pancreatic cancer

We investigate the cellular and molecular mechanisms of pancreatic cancer formation. We use genetically engineered mouse models, human patient samples and cells as research platforms. Our goal is to elucidate fundamental biology of pancreatic cancer, which may lead to improved treatment of patients.

Lalima Katyayani Madan (madanl@musc.edu)

Research Topic: Protein Chemistry, Enzymology, Structural Biology

We work on Protein Tyrosine Phosphatases and explore their structures, dynamics, allostery and regulation. More information is available on our lab website:
www.MadanLaboratory.com

Yuri Peterson (Petersy@musc.edu)

Research Topic: Applied pharmacologic sciences

Research focus is in applied pharmacologic sciences using in vitro, cell based, and in silico approaches to quantitate protein and small molecule functionality to bridge between chemical biology and pathobiology. Current research projects include therapeutic development in epigenetics for periodontal disease and cancers, G-protein signaling, high-content microscopy to study cellular protein kinetics, predictive bioinformatics, and a variety of clinical targets.

Tracey Schock (tracey.schock@nist.gov)

Research Topic: Metabolomics and Lipidomics

Metabolomics is the closest real-time representation of a phenotype or functional state. Where genes and genomics tells us what CAN happen, the metabolome tells us what IS happening. This study of small molecule metabolites uses analytical chemistry tools like nuclear magnetic resonance (NMR) and mass spectrometry (MS) to evaluate health status.

Daniel Sprague (spragued@musc.edu)

Research Topic: Drug Discovery, Synthetic Chemistry, Signaling Pharmacology

We are a drug discovery lab that focuses on understanding different signaling pathways across a variety of diseases. We employ many different screening assays, cell culture models, genomic techniques, and synthetic and medicinal chemistry to discover new molecules and better illuminate un(der)studied pathways. We also have strong collaborations in different animal models, and other techniques. Mentoring is also one of Dan's priorities! Some scientific interests are below!

(1) We have strong interest in neglected tropical diseases (NTDs). Astonishingly, 1-in-6 people in the world are infected with an NTD, in some of the most impoverished communities in the world. New drugs are desperately needed to treat these diseases, but 'Big Pharma' has little interest. Thus -- there is a special niche for academic drug discovery to make an important difference. We are studying GPCRs, epigenetics, and other interesting signaling pathways in parasitic flatworms, with the goal of taking what we know about human pharmacology and applying it to learning about worm targets.

(2) We are interested in better understanding oncogenic pathways in difficult to treat cancers, including, but not limited to, bladder and renal cancer. We are currently applying synthetic lethality as an approach in these and other settings to learn more about pathways, and ultimately discover new small molecule treatments. In line with our interests in NTDs, several parasitic flatworms are also class I carcinogens (e.g., *S. haematobium*, bladder cancer; *Clonorchis* spp., cholangiocarcinoma).

(3) We are also interested in biased signaling in neurotransmitter receptor pathways such as the serotonin and opioid receptors. This can be applied to psychedelics, anti-depressants, and other indications. Similarly, we are interested in deorphanizing orphan GPCRs (receptors with no known ligand, and very little-known physiology).

Checkout our website for more information, and please reach out if you'd like to chat: The Sprague Lab

Computer Science and Engineering

Parvez Rashid (rashidp@cofc.edu)

Research Topic: AI for Education and Social Good

My research goal is to improve and analyze the efficiency and accuracy of assessments in open-ended responses using AI and Natural Language Processing (NLP) in conjunction with qualitative and quantitative methods. My research focuses on measuring, collecting, analyzing, and reporting data about learners to facilitate enhanced learning and teaching environments. My research interests extend from using AI and data science for advanced learning to any aspect of social good and real-life problems. In my research studies, I'm thrilled to utilize advanced machine learning and large language models (LLMs) while prioritizing ethical considerations such as transparency, fairness, and social responsibility.

Qian Zhang (zhangq@cofc.edu)

Research Topic: Stress monitoring for maternity

The purpose of this project is to couple the capabilities of wearable sensors and artificial intelligence to provide continuous stress monitoring and prediction for maternal and fetal well-being. This will be achieved by the following objectives: integrating physiological data from various sensors and developing an AI algorithm to predict stress levels from the physiological data. These objectives align with the research theme of biomedical AI and address the three research challenges of small data size, multimodal data, and unannotated data. The usage of multimodal data can be seen in the physiological data that will be collected, which includes heart rate, cortisol levels, blood pressure, and galvanic skin response. The AI algorithm will then integrate the physiological data to identify and predict the maternal stress level. This objective addresses the third research challenge of unannotated data as the algorithm will learn to identify and predict stress patterns without relying on historical physiological data labeled with stress levels

Geology and Environmental Geosciences

Steven Jaumé (jaumes@cofc.edu)

Research Topic: Earthquakes in South Carolina

Over the past several years there has been an increase in earthquake activity in South Carolina and an increase in the number of recording instruments. Which means there is an enormous amount of data and many potential projects. I am looking for students from a variety of departments (geology, physics, computer science, etc.) to help me analyze this data. And there may be (fingers crossed) funding from the National Science Foundation to pay summer research students at the College of Charleston.

Haley Cabaniss (cabanisshe@cofc.edu)

Research Topic: Seafloor Mapping, [Submarine] Volcanism, Finite Element Modeling

I am a physical volcanologist, specializing in submarine volcanism, who uses numerical modeling as a tool to understand the mechanical stability of the Earth's crust in volcanically active regions. I'm interested in understanding the relationship between magmatic activity and crustal stress, and ultimately the reasons that the Earth's crust breaks, triggering volcanic eruptions. To investigate submarine volcanism, I use a combination of cabled seafloor instrumentation, campaign-style (battery powered) sensors, and high-resolution maps produced from autonomous underwater vehicles.

Norm Levine (levinen@cofc.edu)

Research Topic: Community Resilience - GIS modeling

Multiple projects focused on Climate change related hazards and building regional resilience.

Marisa Them (themmk@cofc.edu)

Research Topic: NASA SC Space Grant Opportunities

Various programs, which have a wide range of research possibilities, and provide the opportunity to work with some of the PIs at this event.

Human Health

Sundar Balasubramanian (balasubr@musc.edu)

Research Topic: Mechanisms and applications of breathing regulation practices (yogic breathing)

Our lab works on yogic breathing. We identified molecular changes using proteomic approaches upon acute and long-term practices. We study yogic breathing in cancer survivorship, aging, scleroderma, and in wellness. This area of study is called integrative health, and is an emerging field encompassing clinical science, physiology, neuroscience, and traditional wisdom.

Michael Bouchard (boucharm@musc.edu)

Research Topic: Hepatitis B Virus and Liver Cancer

Liver cancer is one of the most prevalent cancers worldwide, with hepatocellular carcinoma (HCC) accounting for approximately 80% of cases. Several risk factors have been identified include exposure to environmental toxins and drugs, alcohol consumption, and chronic liver infections, particularly those caused by viruses such as hepatitis B virus (HBV).

HBV primarily targets hepatocytes, altering their physiology to support viral replication. While the exact mechanism by which HBV induces liver cancer is still unclear, it is thought to involve immune-mediated destruction of infected hepatocytes, subsequent liver regeneration, and the actions of viral proteins, such as the HBV X protein (HBx). HBx is a multifunctional protein involved in regulating HBV replication and influencing key cellular processes, including transcription, proliferation, apoptosis, and signal transduction pathways. Our research specifically seeks to understand the role of HBx in controlling cellular metabolism.

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Mindy Engevik (engevik@musc.edu)

Research Topic: The gut microbiota

Our lab studies how bacteria and fungi in the gut impact gut health and ultimately human health. We use several models to address this cross-talk, including bacterial cultures, bioreactors, cell lines, patient derived intestinal organoids, mouse models and human tissue.

Amy Engevik (engevika@musc.edu)

Research Topic: Gut epithelial cell biology

Our lab studies motor proteins called Myosins. We are particularly interested in Myosin 5b, which helps move important proteins to the surface of cells that line our organs, known as epithelial cells. These cells form protective barriers and are critical for maintaining the health and function of the gut. Myosins are decreased in diseases like Inflammatory Bowel Disease and our lab is very interested in understanding the processes of cellular trafficking because it could potentially lead to new treatments for diseases linked to cell transport issues.

Kristen Engevik (engevikk@musc.edu)

Research Topic: Cell signaling

My lab studies receptors that sense purines (like ATP and ADP) and we monitor how gut cell signal to each other using genetically modified calcium sensors and live cell imaging. Purine receptors are altered in cancers and we are interested in understanding how these receptor signals are altered and finding ways to stimulate them to improve cancer outcomes.

Kevin Gray (graykm@musc.edu)

Research Topic: Youth substance use and mental health

As a physician-scientist co-leading the MUSC Youth Collaborative, Dr. Gray conducts National Institutes of Health (NIH) supported clinical research, contributing novel advances to understanding and addressing substance use and mental health in adolescents and young adults.

George Hanna (hannag@musc.edu)

Research Topic: Natural Products

Discovery and development of natural products for therapeutic applications

Jessica Hartman (hartmanj@musc.edu)

Research Topic: Biochemistry and Metabolism

Research in the Hartman lab focuses on lifestyle factors such as diet and exercise and their impact on metabolism, mainly in the liver and brain. We are interested in metabolic changes that occur with fasting, different diet regimens, and exercise and how those changes impact alcohol intake and toxicity, toxicity from environmental chemicals, and the overall health of the organism. Our work utilizes human tissue samples, mouse models, *C. elegans* roundworms, and cell culture. Training is provided for all researchers, and preference is given to sophomore and junior level students.

William Hill (hillwi@musc.edu)

Research Topic: Mechanisms of Aging

Current Research Interests – Senescence & the Kynurenine Pathway in Aging Bone & Brain: My lab is centered on understanding mechanisms of aging. We are looking at multiple systems including both musculoskeletal and brain. My lab is strongly focused on clinical translation related to aging. We have identified increased kynurenine (KYN, a metabolite of the essential amino acid tryptophan) levels with age as a unifying pathway that links epigenetic changes in miRNAs, histone deacetylases, decreased SDF-1, increased BMSC lipogenesis and decreased osteogenesis and increased bone resorption with age-related bone loss. This also has implications for other aging systems such as brain, the immune system, and cancer biology. Over the last several years we have focused on the role of KYN metabolites signaling through the Aryl hydrocarbon receptor (AhR) pathway in aging and disease in multiple systems. Importantly for bone we have linked KYN signaling via the AhR receptor to both inhibition of osteogenic pathways in human and murine BMSCs, as well as to up-regulation of osteoclast differentiation and activity. Suggesting KYN alters both bone formation and resorption. We have shown that increased levels of KYN and other KP metabolites in vitro, and in vivo, block autophagy and induce senescence in stem cells and osteogenic/muscle cells disrupting cell and tissue function. These changes lead to an aging/disease phenotype that can be rescued by blocking the signaling pathway for the primary KP metabolite receptor, the Aryl Hydrocarbon Receptor (AhR), or by inhibiting key KP enzymes such as indoleamine 2,3-dioxygenase (IDO) or kynurenine monooxidase (KMO). We have been focusing on the role of sub-KMO derived KP metabolites as being the actual drivers of senescence and the disruption of bone homeostasis. We are also focused on inhibition of KMO as a novel therapeutic target to prevent or rescue age-related bone loss and osteoporosis. More recently we have taken this approach and applied it to the Brain, in particular examining the role this mechanism may play in cognitive decline with age and the development of Alzheimer's disease and other dementias. We have been successful in

showing this pathway is potentially a novel significant factor in brain aging.

We are using cutting edge techniques including CITE-Seq (Cellular Indexing of Transcriptomes and Epitopes by sequencing) a single-cell genomics method that simultaneously profiles individual cells' transcriptomes and cell surface proteins, tissue culture, and the use of Knock out mice, as well as standard biochemical and molecular biological techniques. We use an interdisciplinary approach and collaborate with multiple MUSC investigators and investigators at other institutions. We are also interested in development of intellectual property and entrepreneurial commercialization of research findings. We are seeking in students who can commit significant laboratory effort and are interested in graduate or medical school, or in roles in biotech startup companies.

I am a Professor in the department of Pathology and Laboratory Medicine, Director of Fundamental and Discovery Research in the MUSC Center for Healthy Aging, Director of the Histology and Immunohistochemistry Laboratory (HistoCore), I am a Staff Scientist, in the Ralph H. Johnson Veterans Administration Medical Center, and the Chief Scientific Officer for SpheroFill, LLC.

Andrew Jakymiw (jakymiw@musc.edu)

Research Topic: Drug delivery; Cancer; AMD; Organ transplantation (MUSC)

My laboratory research is focused on the development of cell-penetrating peptide (CPP)-mediated targeted delivery strategies for therapeutic nucleic acid-based drugs in the treatment of varied diseases, including cancer and age-related macular degeneration (AMD), as well as in the prevention of early ischemic injury in organ transplantations. Moreover, my laboratory is also involved in the study of cell entry mechanisms that peptide carriers employ to deliver various nucleic acid-based cargos into cells, which could prove instrumental in informing new peptide designs toward the advancement of more efficacious peptide carriers for human therapies.

Melanie Jefferson (sweatma@musc.edu)

Research Topic: Collaboration with CofC and Hollings Cancer Center for Pathway Programs in Cancer Biology

Pathway programs for CofC students in Cancer Biology at the Hollings Cancer Center.

Lu Han (hanl@musc.edu)

Research Topic: Pancreatic cancer

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Casey Langdon (langdonc@musc.edu)

Research Topic: Pediatric cancer biology and therapeutic development

The Langdon Lab at MUSC is dedicated to finding new therapies for pediatric sarcomas by digging deeper into the mechanisms that drive these devastating diseases. My laboratory has initially focused on Ewing sarcoma, a bone cancer that affects 200-250 children each year in the US. These patients are treated with an intensive regimen of combination chemotherapy, surgery, and radiation. These toxic therapeutic options are little changed in decades. Our lab is investigating new, targeted therapies for Ewing sarcoma which inhibit specific proteins or pathways critically important for these cancers. We are also very interested in examining why these combinations work and how that information can further tweak these therapies for even more effective and less toxic therapies in the future. I am deeply committed to mentoring early career scientists, including undergraduates; I am mentoring a PhD student, two rotating PhD students, and several College of Charleston students now.

Eric Meissner (meissner@musc.edu)

Research Topic: Interferon signaling, liver immunity, hepatitis B virus infection

The Meissner lab studies how innate immune system in the liver, in particular interferon lambda signaling, is regulated and how this regulation impacts chronic viral infections. The lab uses inducible pluripotent stem cells that have been differentiated into hepatocytes or macrophages to mechanistically explore how manipulation of the lambda interferon receptor (IFNLR1) influences the innate immune cellular response to viral infection and lambda interferon exposure. The overall goals of the research include improving our understanding mechanisms of disease pathogenesis, exploring mechanisms of acute and chronic inflammation mediated by interferons, and assessing whether manipulation of endogenous interferon signaling pathways can be employed to enhance inhibition of viral replication.

Michael Ostrowski (Ostrowsk@musc.edu)

Research Topic: Genetic Analysis of Tumor Microenvironment in Pancreatic Cancer

Pancreatic ductal adenocarcinoma (PDAC) is one of the most lethal solid tumors. A defining characteristic of PDAC is its dense stromal response, including activated fibroblasts, an abundant extracellular matrix (ECM), immune cell infiltration, and abnormal blood vessel formation. This has led to the hypothesis that targeting the tumor stroma along with the cancer might enhance treatment effectiveness. However, our understanding of the TME's influence on tumor progression and how to strategically target it in PDAC remains limited. Fibroblasts are the predominant cell type constituent of the PDAC stroma. The cancer-associated fibroblasts (CAFs) play complex and contradictory roles in both promoting and inhibiting cancer. Our research uses innovative mouse models and human samples to dissect the genes, pathways and mechanisms, which mediate crosstalk between CAFs, immune cells, and tumor cells.

Sophie Paczesny (paczesns@musc.edu)

Research Topic: Biomarkers of for leukemia treatment

Dr. Paczesny's laboratory is internationally recognized for its expertise and achievements in the Hematopoietic Stem Cell Transplantation (HSCT) field. She has pioneered the study of proteomics/biomarkers for complications post allogeneic HSCT and is now transitioning the laboratory work into clinical practice. She also has extensive expertise in the cancer immune tumor microenvironment, inflammation and alarmins, T lymphocyte biology and mechanisms of immunity and tolerance as well as translating novel drug-targetable biomarkers to treatment.

Shannon Phillips (phillipss@musc.edu)

Research Topic: Access to quality care among individuals with sickle cell disease

1) development, testing, and implementation of mHealth self-management interventions for adolescents and young adults with sickle cell disease; 2) improved implementation of guideline-based care for individuals with sickle cell disease across the lifespan.

Brent Wilkerson (wilkersb@musc.edu)

Research Topic: Hearing loss, inner ear development

We are seeking motivated students interested to conduct mechanistic research on hearing loss in the Wilkerson Lab at the Medical University of South Carolina. Our lab investigates maladaptive processes and developmental defects that contribute to hearing loss. Our research leverages the strengths of mouse models to evaluate new risk factors for hearing loss and to answer etiological questions. We study pathophysiological and neurobehavioral correlates of hearing loss to understand the functional consequences. We use single-cell genomics analysis to identify new cell subtypes and markers as well as the underlying gene networks.

Ozlem Yilmaz (oyilmaz@yilmazlab.com)

Research Topic: Oral Microbes (Oral Biology) and Their Relation to Systemic Health specifically Alzheimer's Disease

Dr. Özlem Yilmaz' laboratory focuses on oral opportunistic bacteria and host interactions. Her lab is particularly interested in the molecular aspects of a major pathogen, Porphyromonas gingivalis in intra-epimucosal colonization in gingiva using advanced human primary cell culture systems and transgenic mice-models. Dr. Yilmaz' lab is one of the few research teams in the US dedicated to uncovering the complex interplays between host and periodontal bacteria in the context of microbial symbiosis as well as pathophysiology of the oral cavity and other systemic locations.

Marine Biology

Tanya Darden (dardent@dnr.sc.gov)

Research Topic: SCDNR Marine Resources Research Institute

Our staff work year-round on the water and in our laboratories conducting research to better understand the fish, shellfish, sea turtles and other organisms that inhabit our coastal waterways to provide real time science for the management and conservation of our natural resources.

Jennifer Hoguet (Jennifer.hoguet@nist.gov)

Research Topic: Highlighting the NIST Biorepository as a valuable resource for scientific research

The National Institute of Standards and Technology (NIST) has been involved in archiving biological and environmental specimens for over 40 years through multiple projects of the former National Biomonitoring Specimen Bank (NBSB), established in 1979 (e.g., human livers, marine sediments, fish tissues, mussels, oysters, human diet samples) and the Marine Environmental Specimen Bank (ESB), established in 2002 (e.g. fish tissues, mussels, oysters, marine mammal tissues, bird eggs and feathers, and sea turtle tissues and eggs). Today, these biospecimens are archived as a part of the NIST Biorepository located at the Hollings Marine Laboratory in Charleston, SC. This national biorepository is a unique resource that processes and preserves biospecimens at cryogenic temperatures (<-150 °C), as well as the associated data, that are maintained through multiple partner projects. Biospecimens are available to NIST scientists, as well as stakeholders, collaborators, and external researchers through formalized tissue access policies. The NIST Biorepository is managed and maintained by the Chemical Science Division's Biospecimen Science Group.

Melissa Hughes (hughesm@cofc.edu)

Research Topic: Animal behavior, communication and social behavior

I study birds (especially sparrows) and marine crustaceans (especially snapping shrimp). I am currently working on (a) how plumage variation may be a signal of dominance in song sparrows; (b) social behavior in wintering sparrows; and (c) social behavior and perception in snapping shrimp.

Craig Plante (plantec@cofc.edu)

Research Topic: 1. Survey of Mycoplasma bacteria in marine mollusks, 2. Saltmarsh diatom communities

1) Perform molecular techniques (PCR and DNA metabarcoding) and bioinformatics to compare Mycoplasma bacteria in marine invertebrates and test for mutualistic relationship,

2) assist graduate students with field sampling and molecular biology work on NSF-funded project to characterize saltmarsh microbes along elevational gradient

Bob Podolsky (podolskyr@cofc.edu)

Research Topic: Environmental and functional biology of marine invertebrates

In my lab we ask questions about marine invertebrates—their ecology, evolution, functional biology, and environmental biology. My students and I have done work on most life history stages—gametes, embryos, larvae, juveniles, adults—with a special interest in how development unfolds in an environmental context. I am especially drawn to study life histories because early stages can experience such different environmental challenges and selection pressures than later stages. We have worked with a variety of organisms—echinoderms, molluscs, arthropods, sponges, bryozoans, cnidarians—and I am open to new organisms and interests. Many projects have focused on how environmental challenges like temperature stress, ocean acidification, salinity stress, pollutants, and microplastics influence early development. Other projects are concerned with reproductive investment by adults, behavior, and life-history patterns. I am happy to talk about your interests! Note: I will be able to attend only part of the research mixer--free to contact me if we do not have a chance to meet.

Demetri Spyropoulos (spyropdd@musc.edu)

Research Topic: Environmental endocrine disruptors (EDCs) in fetal development and age-related degenerative diseases.

Our research is at the interface between genetics and the environment through investigations that find common ground between embryonic development (fetal origins) and age-related adult diseases. EDCs studied include natural (e.g. heavy metals) and anthropogenic, the latter of which have increased in bulk (in the air, water, food, personal care and other products) parallel to rises in human health issues (cancer, metabolic/obesity, inflammation/immunity, cardiovascular and neurological diseases). Our model organisms are humans, arctic marine mammals and lab rodents. For the first two models we use ex vivo organ/organoid/assembleid/stem cell culture systems to measure/recapitulate the EDC burden and functional impacts. And in the rodents, we also manipulate and study genetic/exposure variables in vivo.

Mathematics

Jeff Guyon (jeff.guyon@noaa.gov)

Research Topic: How to incorporate mathematics, computer science, and AI into environmental research to support NOAA trust resources like marine mammals and corals.

I help with the mathematical analysis of stressor/biological data and the processing of visual data related to the scientific needs of NOAA trust resources impacting coastal ecosystems.

Stephane Lafortune (lafortunes@cofc.edu)

Research Topic: Differential equations applied to physics, chemistry, or biology

I study differential equations that describe phenomena in physics, biology, and chemistry. I am interested in the existence and the various properties of the solutions to those equations. The work I do is mathematical but it has applications to the different fields the equations come from.

Psychology/Neuroscience

Onder Albayram (albayram@musc.edu)

Research Topic: Translational Neuroscience - Neurodegeneration

Project 1: Mechanistic and Causative Role of p17 in Mediating Endogenous Neuroprotective Mitochondrial Stress Response in Neurodegeneration and Brain Injury.

Project 2: Mechanisms Underlying the Distinct Age-Dependent Effects of the Endocannabinoid Systems Activity in the Brain

Project 3: Mechanistic Role of Meningeal Lymphatic Vasculature and Immunity in the Brain, Aging and Neurodegenerative Diseases

Howard Becker (beckerh@musc.edu)

Research Topic: Alcohol addiction neuroscience

Mechanisms and neurocircuitry underlying alcohol-stress interactions; testing potential therapeutic medications in animal models

Delisa Brown (browndg@musc.edu)

Research Topic: Broadly mental health disparities among African Americans with a focus on identifying mechanisms to culturally tailor treatment for racial trauma and substance use disorders

Currently funded research examines the impact of race-related stress (RRS) on alcohol use disorder (AUD) in an African American (AA) sample. This project utilizes a well-controlled human laboratory paradigm to examine subjective (i.e., craving, stress), physiological (i.e., heart rate, galvanic skin conductance), and neuroendocrine (i.e., cortisol) reactivity to personalized imagery cues (i.e., RRS, alcohol, and neutral) among AA individuals with AUD. In addition, the relationship between racial identity, which may serve as a protective factor, and reactivity to RRS cues will be examined as this culturally salient factor may help inform the future development of more effective treatments for AA with AUD. Ecological momentary assessment (EMA) is also utilized to obtain real-time information on alcohol cravings, drinking behaviors, and affect following exposure to RRS.

Meghan Flanigan (flanigme@musc.edu)

Research Topic: Drug addiction, mood disorders, and social behavior in mouse models

Impaired social behavior is a common symptom across different neuropsychiatric, neurodevelopmental, and neurodegenerative disorders. However, there are currently no treatments available for normalizing social functioning in the context of any disorder. Research in the Flanigan Lab focuses on the neurobiological mechanisms mediating social behaviors in a healthy state and how these mechanisms may become disrupted in disease. In particular, we are interested in how exposure to stress, sleep deprivation, alcohol, or drugs of abuse alter social reward, aggression, social cognition, and social vigilance. To achieve this, we employ cutting-edge tools for monitoring and manipulating neural activity and gene expression in mouse models. We also employ machine learning based platforms for tracking and classifying mouse behavior, which allows us unprecedented unbiased insight into the specific behavioral motifs that are influenced by our manipulations. The lab is particularly interested in how a small epithalamic region called the lateral habenula (LHb) mediates social dysfunction. We hope that the scientific insights generated by our laboratory will contribute to the development of future treatments aimed at normalizing social behavior in the context of neuropsychiatric disorders like addiction, depression, and anxiety, and many others

Austin Hahn (hahna@musc.edu)

Research Topic: Brain mechanisms of alcohol and stress interactions

My program of research has primarily focused on the intersection of behavioral dysregulation and risk-taking behavior, with an emphasis on alcohol misuse and sexual risk taking. Specifically, I have focused on identifying malleable risk factors for alcohol misuse and sexual risk taking using complex methodological and statistical approaches and

developing and testing innovative intervention approaches. My work centers around studies focused on reducing substance use through both laboratory studies and randomized clinical trials (RCTs) among, adolescent, young adult, and college student samples. Specifically, a portion of my recent and ongoing federally funded work has focused on approach bias modification clinical research. I am currently conducting an RCT testing a mobile-delivered approach bias modification intervention to reduce co-occurring alcohol and cannabis use among treatment-seeking adolescents. An additional study that we are conducting is evaluating a mobile Health (mHealth) intervention aimed at decreasing alcohol use and increasing condom use among women sexual assault survivors.

Christina Lebonville (lebonvil@musc.edu)

Research Topic: Brain mechanisms of alcohol and stress interactions

We work with mice models of alcohol dependence and chronic stress to investigate how stress can increase dependence-related increased alcohol intake and how chronic alcohol can affect stress systems - contributing to the alcohol abuse cycle. In particular, we are interested in dynorphin expression in the central amygdala and other stress-responsive areas and biological sex differences.

Casie Morgan (morgacas@musc.edu)

Research Topic: child development, family dynamics, injury prevention, pediatric psychology, media psychology

My areas of research interest include family dynamics, disruptive behavior in children, and the influences of media and technology on family health outcomes. My dissertation examines the impact of superhero media on preschool children's risky play behavior and unintentional injury outcomes.

Leigh Ridings (ridingle@musc.edu)

Research Topic: Digital mental health solutions for children and parents after traumatic events

Dr. Ridings's research focuses on developing, rigorously testing, and scaling innovative, cost-efficient, evidence-based health technology resources to improve access and quality of care for trauma-impacted families in real-world settings (e.g., trauma centers, emergency departments, community mental health agencies). Her research has included the use of mixed-methods designs to increase access to evidence-based mental health services and improve treatment outcomes across family, provider, and director levels to enhance public health impact. She serves as PI or Co-I on several federally funded projects that aim to improve service quality and access for individuals impacted by traumatic events through development and dissemination of technology-based and mobile health resources. Dr. Ridings is PI of an active K23 career development award funded through the National Institute of Child Health and Human Development (NICHD) to develop, systematically

evaluate, and clinically test a technology-enhanced intervention to accelerate the emotional and behavioral health recovery of caregivers of children under age 12 hospitalized for pediatric traumatic injury. The K23 builds on a number of other complementary clinical and research initiatives she has led in pediatric traumatic injury assessing existing mental health services in US pediatric trauma centers, key stakeholders' perceived need for resources to address gaps in services, and mental health service implementation barriers and facilitators. Dr. Ridings plans to launch an NIH R01 to evaluate the effectiveness and explore implementation of her technology-enhanced intervention for parents of young children hospitalized for pediatric trauma in four sites across the US in fall 2024; volunteer research opportunities are available to support the launch and maintenance of this large scale RCT, as well as other ongoing and planned complementary projects.

Publications: <https://www.ncbi.nlm.nih.gov/myncbi/leigh.ridings.1/bibliography/public/>

Jen Rinker (Rinker@musc.edu)

Research Topic: Addiction Neuroscience

My lab studies the neurobiological mechanisms of stress and substance use, and the intersection of the two. We use cutting edge techniques to look at the cellular dynamics (calcium imaging, slice ephys) during drug seeking behaviors and use opto- and chemo genetics to manipulate discrete cellular populations.

Tanya Saraiya (Saraiya@musc.edu)

Research Topic: trauma, substance use, health disparities, race/identity

My research aims to understand and treat trauma and substance use with a particular focus on health disparities and ongoing inequities based on identity, culture, race, and context in this comorbidity. Projects in our lab include, testing a therapy for opioid use disorder and PTSD, understanding racial trauma, and developing a digital toolkit to assess trauma in opioid treatment programs. As a child of immigrants, I'm passionate about mentoring minoritized individuals and welcome you to reach out!