2020 MS1 INTRO Summer Research Program

List of Mentors with projects

Agmon, Ariel, Ph.D., Department of Neuroscience

- "The role of different subtypes of cortical interneurons in associative learning" In our lab, we study how cortical circuitry, i.e. the synaptic "wiring diagram" between identified cell types in the cerebral cortex, gives rise to sensory perception and cognitive abilities. We use multiple strains of genetically-modified mice as our experimental models. The summer student will train a cohort of mice on a sensory discrimination task and will test if the learned behavior can be disrupted by activation or inactivation of specific neuronal subtypes.

Anderson, Charles, Ph.D., Department of Neuroscience

- "Targeting zinc transporter proteins to affect neural function" This project is focused on the identification and design of small molecules that target these brain-specific zinc transporter proteins using rational drug design, *in silico* modeling, and experimental assays. Such compounds will be the first-in-class tools to directly target this important zinc regulation machinery and may offer the potential for new therapeutic approaches for the treatment of neurological and mental conditions.

Andress, Lauri, J.D., Ph.D., Department of Health Policy, Management and Leadership

- "Qualitative research on infant mortality rates in WV" This is a digital public health-humanities archival project established for the purpose of documenting, analyzing, and archiving first-person narratives from women of child -bearing age in West Virginia to examine the role of adverse circumstances in shaping reproduction and the likelihood that a mother and her infant will survive after birth.

Bardes, James, M.D., Trauma, Acute Care Surgery and Surgical Critical Care

- "Disparities in rural trauma – outcome differences based on time, distance and access to care" WVU has partnered with several other similar trauma centers, all level 1 tertiary centers that serve large rural catchment basins. Through the development of a large shared database we will be investigating the differences in outcomes that occur when trauma victims have delays in care due to time and distance.

Boone, Brian, M.D., Department of Surgical Oncology/Surgery

- "Impact of RAGE in Sterile Inflammation Induced Hypercoagulability" Sterile inflammatory diseases, including pancreatitis and cancer, result in a hypercoagulable state and a high propensity for blood clot formation. The receptor for advanced glycation end products (RAGE) has also been implicated in these disease processes. Using RAGE knockout mice and small molecule inhibitors and measuring hypercoagulability using thromboelastography, we will determine whether targeting RAGE reverses the hypercoagulable state associated with sterile inflammation.

Damron, Heath, Ph.D., Department of Microbiology, Immunology, and Cell Biology

- "Development of next generation pertussis vaccines" The main goal of the lab is to develop improved pertussis vaccines that decrease the incidence of pertussis. This project is funded by NIH to investigate a method of nasal immunization with novel vaccine formulations. Students working on this project would learn about bacterial pathogenesis, pre-clinical models of vaccine evaluation, immunology and etc.

- "Discovery of therapeutic antibodies to combat bacterial infectious diseases" Today antibiotics are failing and no new antibiotics are in the pipeline. In the future, we may not be able to treat simple infections. We are developing a platform to discover novel antibodies that can be used as drugs to treat infections by multi-drug resistant infections such as Pseudomonas aeruginosa or Serratia marcescens.

Dietz, Matthew, M.D., Department of Orthopedics

- "Advancing the treatment of prosthetic joint infection through an In vivo model" Utilizing new and innovative techniques for debriding and identifying infectious organisms of prosthetic joint infections. Assist in researching the effects of various innovative debridement and treatment strategies for prosthetic joint infections using a rat and/or biofilm reactor model. To assess the success of the debridement and/or treatments, the presence of bacterial will be analyzed to determine the amount and species of bacteria present.

Driesschaert, Benoit, Ph.D., Department of Basic Pharmaceutical Sciences

- "Development of probes to image reactive oxygen species"

Du, Jianhai, Ph.D., Department of Ophthalmology and Visual Sciences

- "Identify early metabolic markers in the eye for neurological disorders" Many neurological disorders such as Alzheimer's disease has early pathology in eyes. We use metabolomics approach to investigate early biochemical changes in the eyes and brains from mouse models with neurological diseases. Our ultimate goal to identify early biomarkers and potential targets for neurological diseases.

Frisch, Steven, Ph.D., Department of Biochemistry

- "Determinants of radiation sensitivity in glioblastoma" We are investigating how cell adhesion signaling mechanisms regulate the response of glioblastoma tumors to radiation treatment. These studies utilize state of the art molecular, cell and in vivo mouse methods.

Griffin, Peter, M.D., Emergency Medicine

- "Pain Medication Prescription Patterns in response to WV SB273 (Opiate Prescription Patterns) Pain Medication Prescription Patterns in response to WV SB273 (Opiate Prescription Patterns)" The project is a retrospective chart review to look at how Emergency Medicine provider prescription patterns have changed in response to the new law passed by the West Virginia legislature limiting how opioids are prescribed in the state.

Hayanga, Heather, M.D., Department of Anesthesiology

- "Utilize the National Anesthesia Clinical Outcomes Registry to assess current practices in anesthetic management of cardiovascular and thoracic surgeries"

Hayanga, J.W. Awori, M.D., Department of Cardiovascular and Thoracic Surgery

- "Outcomes research and extracorporeal support using national data"

Hollander, John, Ph.D., Department of Exercise Physiology

- "Dysregulated Bioenergetics in the Diabetic Heart" The diabetic heart displays disruption in bioenergetics as a result of mitochondrial dysfunction and is a contributing factor to the enhanced propensity for subsequent cardiac events. Projects in our laboratory focus on addressing mitochondrial dysfunction in the diabetic through the development of therapeutic interventions designed to lessen bioenergetic disruption and identify biomarkers for disease progression.

Hussain, Salik, D.V.M, Ph.D., Department of Physiology and Pharmacology

- "Reprogramming of alveolar stem cells by environmental exposures during lung regeneration" This translational project will mechanistically evaluate cellular and biochemical markers of alveolar stem cell reprograming using in 3-D organoids, in vivo models and clinical samples.

- "Gene-environment interactions in pulmonary diseases" Role of single nucleotide polymorphisms in innate immune receptors (TLRs and NLRs) in dictating pulmonary disease susceptibility will be elaborated using human cohorts.

- "Mechanistic basis of lung function decline by environmental exposures" Inhalation exposures induced changes in lung function will be assessed using state of the art airway physiology measurements in rodents and role of innate immune pathways will be evaluated.

Hu, Michael, Ph.D., Department of Microbiology, Immunology and Cell Biology

- "Collect information of drugs/compounds against transcription factors and work with computational biologists to build a public database" Most traditional drugs target surface receptors. Transcription factors (TFs) play central role in gene expression program regulation of cancers. Targeting TF is challenging due to its broad interference with transcription regulation and potential toxicity. However, the last decade has witnessed major developments on drug and biochemical compounds against TFs. The internship is to review literature and browse public database to identify drugs/compounds for transcription factors and to build a public database with computational biologists in the lab.

Ivanov, Alexey, Ph.D., Department of Biochemistry

- "Breast cancer cell dissemination, dormancy and reactivation at the metastatic site in mouse xenograft model" Cancer cell dissemination can occur before primary breast tumor diagnosis. Most disseminated cells stay dormant for years and are resistant to therapy. Tumor recurrence from these reactivated cells accounts for metastatic outgrowth and

subsequent patient death. The goal of this project is to understand the mechanisms of tumor cell dormancy using a mouse xenograft model.

- "Negative control of EMT and metastasis by epithelial-specific transcription factors" EMT promotes cancer cell invasion, metastasis and drug resistance. Primary breast tumors largely maintain inherent epithelial status. However, cancer cells on the tumor periphery are believed to undergo partial EMT and disseminate to distant organs. The goal of this project is to define the roles of several transcription factors responsible for the maintenance of the epithelial state in suppression of EMT.

- "Role of the TGF-beta pathway in EMT and drug resistance of triple-negative breast cancer" Transforming growth factor beta (TGF-beta) acts as a tumor suppressor at the early stages of cancer development. Cancer cells evolve various mechanisms to overcome TGF-beta inhibitory effects, including silencing and mutation of TGF-beta receptors or silencing and deletion of TGF-beta target genes involved in growth suppression. The latter mechanism is often observed in triple-negative breast cancer (TNBC). TNBC cells show increased TGF-beta signaling leading to partial EMT and resistance to certain drug therapies.

Leonardi, Roberta, Ph.D., Department of Biochemistry

- "Regulation of energy metabolism by CoA-degrading enzymes" Coenzyme A (CoA) is an essential cofactor that regulates the oxidation and synthesis of fatty acids, amino acids and carbohydrates. Enzymes that degrade CoA modulate the concentration of this cofactor and, in turn, are poised to regulate energy metabolism. Several projects in the lab aim at characterizing the metabolic processes controlled by these enzymes using a wide range of approaches, from classical enzymology to metabolomics and animal models.

Lewis, James, Ph.D., Department of Neuroscience

- "Neuroimaging of the human brain." Mechanisms of multisensory and hearing perception, and spoken language processing, using either evoked response potential (ERP) methods or 3 Tesla functional magnetic resonance imaging (fMRI).

- Epilepsy research: In epilepsy patients who have heterotopic masses of brain tissue (which often contribute to seizure disorder), we are mapping such heterotopia for cognitive function as well as characterizing functional connectivity patterns and characteristics to advance pre-surgical treatment workups and inform potential treatment options.

- Drug addiction research: In opioid use disorder (OUD) patients, we are characterizing brain network functional connectivity patterns through different stages of suboxone treatment with the goal of understanding neuronal network mechanisms behind addiction and to objectively assess treatment efficacy.

- Chronic pain research: We are functionally mapping brain regions associated with the perception of chronic headache pain in individuals with diagnoses of new daily persistent headache (NDPH) disorder. One goal is to identify brain networks associated with pain perception unique to a given individual and then to inspire/develop methods to reduce pain through neuromodulation.

Lindsey, Brock, M.D., Department of Orthopedics

- "Dual Combination Immunotherapy for the Treatment of Osteosarcoma in a murine model" researching the effects of various immunostimulatory cytokine nano-therapeutics on progression and metastasis of osteosarcoma in a murine model. The tumor model uses complex surgical procedures to closely mimic clinical progression of disease in human patients.

Lockman, Paul, Ph.D., Basic Pharmaceutical Sciences, Translational Research, Experimental Therapeutics

- "Modulating the blood-brain barrier to improve drug uptake in brain metastases" This project will utilize focused ultrasound and or radiation therapy in preclinical models of brain metastases to open the blood-brain barrier and allow increased chemotherapy penetrance. Both modalities are clinically used and the project lies between the bench and the bedside. The student will need to be able to work with both scientists and clinicians on the project.

Luchey, Adam, M.D., Department of Urology

- Utilizing the National Cancer Database to detect optimal treatment after adjuvant therapy for metastatic bladder cancer

- Reviewing our 10 year prospective Renal Trauma Database/Guidelines to optimize trauma care

Minardi, Joseph, M.D., Department of Emergency Medicine

- Point of care ultrasound first for appendicitis. Saving time, cost, and radiation in emergency department patients with acute appendicitis.

Olfert, Mark, Ph.D., Department of Exercise Physiology

- "Cardiovascular Health effects of Vaping: Are they really safer?"

Patel, Rusha, M.D., Department of Otolaryngology/Head & Neck Surgery

- "Reconstructive Preference in Head and Neck Surgery" The study uses a discrete choice analysis (DCE) to look at what patients consider to be the most important factors in deciding on a method of reconstruction with locoregional or free tissue transfer. The study would be clinic based and involve administering surveys to eligible patients.

Rudisill, Toni, Ph.D., Department of Epidemiology

- "An injury epidemiology study using a secondary data source" Primary research is in injury epidemiology. My research usually involves transportation or work-related injuries, the impact of substance use on injuries, or how policies impact injury rates.

Santrock, Robert, M.D., Department of Orthopedics

- "Hallux Valgus correction outcomes: Hallux Valgus correction outcomes" A novel surgery for Hallux Valgus (bunion) correction involves tri-planar correction with 1st TMT joint

arthrodesis. This study is evaluating intraoperative images to determine the impact of the angle of resection prior to joint fusion on clinical and radiographic outcomes.

- "First Metatarsal Rotational Position on Weight Bearing CT" Rotational deformities are a major contributor of hallux valgus deformity. This project is designed to evaluate the position of the first metatarsal on weight bearing CT in patients without foot pathology to determine the desired position of the first metatarsal during hallux valgus correction.

Sedney, Cara, M.D., Department of Neurosurgery

- "Long-term outcomes of spinal cord injury patients with public vs private insurance" This research study expands upon previously published research examining short term outcomes for spinal cord injury patients. This experience includes telephone survey methods and statistical methods to compare the scores of a validated survey measurement tool, for private and public insurance.

- "Social media interactions and impact on perceptions of spinal disease" This project focuses on the impact of social media sites especially in terms of what patients with spinal disease derive from their social interactions on these sites. This study involves survey research and statistical analysis of data.

- "Validation of a surgical scar rating system for posterior cervical surgery" Our ultimate goal is to conduct a study regarding the effect that different techniques may have on PMA and posterior cervical scarring. The current project will serve as ground work for that future study. This study requires the administration of scar assessment scale to patients in the neurosurgery clinic, data input and analysis.

- "Long term outcomes of low lumbar burst fractures" This is a retrospective review of patients who sustained a low lumbar injury with a minimum of 5 years follow-up including patient contact through telephone questionnaire. We intend to explore any significant relationships between various predictive variables related to lumbar burst fractures with the ultimate goal of developing a usable predictive model for clinician decision making, surgical management, and patient guidance and education.

Sharma, Sunil, M.D., Section of Pulmonary/Critical Care & Sleep Medicine

- Sleep disordered breathing is a highly prevalent condition with fatal cardio-pulmonary implications. It is also under-recognized and under-diagnosed condition. Our novel Hospital sleep medicine program provides cost effective early screening, diagnosis and intervention of sleep disordered breathing in hospitalized patients.

Sraj, Shafic, M.D., Department of Orthopedics

- "Distal Biceps Tendon Rupture" Distal Biceps Tendon Rupture is diagnosed using a combination of physical examination and advanced imaging (MRI and or MRI) and frequently requires surgery. Once in surgery, the findings may differ from expectations, leading to a change or apportion of the surgery. This study will assess the accuracy of pre-operative advanced imaging and pre-operative exam findings compared to surgical findings.

- "Application Based Follow Up: Effective for Surgical Treatment?" Application based follow up following hand surgery is a new and convenient approach. This study will look at the successes and failures of the patient experience for hand surgical patients who accepted the option to conduct their follow up visits using an app and determine their compliance with instructions, using the MyChart application. The goal is to learn from and enhance the app-based interaction and insure a successful implementation.

- "Cubital Tunnel Syndrome Assessment in Carpal Tunnel syndrome Patients" Carpal Tunnel syndrome Patients present with numbness and tingling in certain fingers, and they are likely to develop Cubital Tunnel Syndrome, which affect the rest of the fingers. This study will look at the patients undergoing surgery for Carpal Tunnel syndrome and determine whether their exam suggests cubital tunnel syndrome even before they are diagnosed.

Tucker, Eric, Ph.D., Department of Neuroscience

- "Autism Spectrum Disorder (ASD) has many causes, and identifying specific genetic mutations that can predispose individuals to the disease will help improve treatment efforts. In order to uncover novel genetic features of ASD, we will survey medical records of patients from WV to identify individuals with Copy Number Variations (CNVs), and attempt to link these CNVs to patient phenotypes."

Umer, Amna, Ph.D., Department of Pediatrics

- "Examining perinatal risk factors and infant outcomes."

Vona-Davis, Linda, Ph.D., Department of Surgery

- "Tumor-associated adipocytes support breast cancer in obesity"

Yakovenko, Sergiy, Ph.D., Human Performance, Exercise Physiology

- "Man-machine interfaces for performance and rehabilitation using wearable sensors" The research project will develop the use of wearable technology to monitor human movement in real-time. These signals will be further processed using physiological and statistical models to quantify performance in the context of rehabilitation.