2017 Summer Research Program Mentors and Project Descriptions

Mentors: Drs. Arbi Ben Abdallah, Thomas Cox, Anshuman Sharma
Type of student: Undergraduate, graduate and medical
Required Skills: Communication, writing skills and some basic data analysis experience.

Project 1: Patient expectations as a predictor of outcome satisfaction: Retrospective data.
Location: St. Louis

Project 2: OSA, obesity and persistence pain after surgery: Retrospective data.
Location: St. Louis
Learning experience: Student(s) will learn 1) how to combine EMR & survey data, 2) how to design a research study using retrospective data, and 3) how to present and write the findings of a research study.

Mentor: Dr. Gaya Amarasinghe
Type of student: Undergraduate, graduate and medical
Required skills: Some training and experience in biochemistry is preferred and interest in host-pathogen studies is required.

Project 1: Structural and biochemical mechanisms of negative sense RNA viruses at the host-virus interface
Project description: A long term goal of the research in the Amarasinghe lab is to understand the structural basis for host-pathogen interactions that contribute to immune evasion and pathogenesis. Currently work is focused on characterizing proteins from several negative sense RNA viruses such as Ebola virus, Marburg virus, and influenza virus and the host immune signaling pathways. Seasonal and pandemic influenza infections and recent Ebola virus outbreak in West Africa suggest that these viruses are not only highly pathogenic, but they also have the ability to impact the global health landscape. Ongoing projects in the laboratory are investigating: 1) the role of Ebola and Marburg viral proteins in innate immune evasion, 2) mechanisms of negative strand RNA viral replication and transcription using influenza and respiratory syncytial viruses as model systems, and 3) structure-based approaches to develop antivirals. These projects utilize a range of techniques from structural biology and biochemistry, including x-ray crystallography, nuclear magnetic resonance spectroscopy (NMR) as well as kinetic and thermodynamic studies. Through these studies we expect to define regulatory mechanisms and identify previously unrecognized opportunities for antiviral development. We are interested in working with highly motivated students with a keen interest in using biophysical and biochemical techniques to define cellular signaling at the host-viral interface. Some training and experience in biochemistry is preferred and interest in host-pathogen studies is required.
Location: St. Louis
Learning experience: The student will learn basic scientific methods, how to design and implement experiments; and to analyze data and present results.

Mentor: Dr. Gerald Andriole
Type of student: Medical
Required skills: 1. Data Abstraction/Analysis and 2. Willingness to learn basic pathology/radiology interpretation.

Project 1: Correlation of MultiParametric Prostate MRI and Radical Prostatectomy
Project description: Multi parametric MRI of the prostate has recently emerged as an important tool to guide detection of prostate cancer. There is controversy in the literature on the false negative rate of MRIs performed in patients with
elevated serum PSA levels. Estimates of false negative scans range from 2 to 30%. In this study we will correlate preoperative MRI to co-registered step-section radical prostatectomy specimens to identify the true false negative rate of MRI to identify prostate cancer. Secondary endpoints will include the ability of MRI to identify extracapsular extension and/or seminal vesicle invasion.

**Location:** St. Louis

**Learning experience:** 1. Radiology and pathology skills; 2. Data analysis and 3. Writing/presenting.

---

**Mentor:** Dr. Megan Baldridge  
**Type of student:** Undergraduate, graduate and medical  
**Required skills:** Previous lab experience is a bonus but not necessary.

**Project 1: Study of the interactions between the microbiome and intestinal viruses**  
**Project description:** We have found that intestinal viruses depend on the commensal bacterial microbiome to successfully infect. We are interested in further defining this phenomenon by identifying specific bacteria that facilitate infection and studying how the virus responds to modifications in the microbiome.  

**Location:** St. Louis  
**Learning experience:** The student can help our lab explore how bacteria in the gut help intestinal viruses infect by learning how to conduct mouse experiments, learning how to analyze the microbiome, and learning how to quantify virus levels with infections.

---

**Mentor:** Dr. Dennis Barbour  
**Type of student:** Undergraduate, graduate and medical  
**Required skills:** programming skills, ideally MatLab but Java, C, R or the like would work; knowledge of applied statistics or machine learning would be a bonus.

**Project 1: Automated Behavioral Testing**  
**Project description:** Tests of perception and cognition proceed today much as they have for the past 100 years. Subjects are asked questions one at a time, and each answer is only used to clarify the question that was asked. We have developed an extremely general framework to infer the answers to unasked questions in behavioral tests. The result is a hyperefficient measurement tool that can enable more extensive tests. The summer trainee will assist computer scientists and engineers in the lab to develop and/or evaluate a version of this platform for our first application: advanced hearing tests.  

**Location:** St. Louis  
**Learning experience:** The student will learn how to work with computational and clinical experts to refine novel diagnostic procedures that have broad impact for anyone conducting subject evaluations of human perception and cognition.

---

**Mentor:** Dr. Drake Bettina  
**Type of student:** Undergraduate and graduate  

**Project 1: Prostate Cancer Prospective Cohort**  
**Project description:** Participant follow-up including possible chart review, phone calls, and mailings. May have opportunity to assist in manuscript development.  

**Location:** St. Louis  
**Learning experience:** Study protocols and management of large numbers of participants.

**Project 2: Prostate Cancer Biorepository**  
**Project description:** Participant follow-up including phone calls and survey completion/data entry. May have chance to shadow the recruiter to see how recruitment takes place.
Location: St. Louis
Learning experience: Study surveys, data entry, recruitment and consent process involving multi-institutional site study.

Project 3: Library Grant Project
Project description: If this grant it funded the student will be able to experience the implementation of a community outreach study and the process involved in disseminating information to the community at large.
Location: St. Louis
Learning experience: Community outreach, study implementation, and possibly data entry of community experience reviews.

Mentor: Dr. Laura Bierut
Type of student: Undergraduate, graduate and medical
Required skills: Research will require interaction with human research participants. Students should be comfortable interacting with patients and research participants from diverse backgrounds. Previous research experience is not required.

Project 1: African American Women Breast Cancer Genetics
Project description: Students will work on the IRB-approved research project ‘African American Women: Breast Cancer Genetics. Due to the generosity of participants in genetic studies, our understanding of genetic risk factors for cancer has improved exponentially over the past decade. However, the majority of these studies have been conducted with participants of European ancestry, and there is a lack of information regarding genetic risks for cancer among African Americans. This is despite the fact that African Americans have the highest death rate of any racial group in the United States for most cancers. This study will obtain genetic and clinical data from African American women who have been diagnosed with breast cancer. We will collect saliva samples from participants using DNA kits and send them to commercial companies for genetic testing. We will use 23andMe to obtain genome-wide genetic data and we will use Color Genomics to provide genetic results for 30 genes associated with risk for hereditary cancer. Genetic results will be shared with participants directly through 23andMe and Color Genomics. We will interview participants regarding personal and family history of cancer and health insurance and planning. We will conduct follow-up interviews after participants have received their genetic results to evaluate their experience of participating in the study and their response to receiving genetic results, how they used the information, and the impact it had on them. The data collected in this study will form the foundation for a database that includes comprehensive information for large-scale research into the genetic contributors to breast cancer in African American women.
Location: St. Louis
Learning experience: Students will learn skills for obtaining informed consent for participation in research studies, how to conduct computer-assisted structured interviews, and the importance of following detailed procedures when conducting research. Students will be asked to identify a research question related to this project, analyze the relevant data, and present their results. The collaborative environment at Washington University will provide the opportunity to interact with researchers at a wide variety of training levels, providing diverse perspectives on genetic research.

Mentor: Dr. Jacco Boon
Type of student: Undergraduate, graduate and medical
Required skills: Lab experience is preferred but not required.

Project 1: Influenza virus and the role of host genetic variation in severity of disease
Project description: Severe influenza virus infections are most common in children under the age of 5 years. World-wide it is estimated that nearly 1-2 million cases of severe influenza-associated acute lower respiratory tract infections occur annually. The goal of our research is to develop new treatment options to prevent influenza virus infections and reduce the burden of disease. Specifically, we are interested in (i) characterizing the effects of human genetic variation on virus infection and disease and (ii) identifying host proteins that restrict influenza infection and replication. These efforts will help us understand the molecular basis of severe influenza infections and provide opportunities to develop novel antiviral drugs.
Location: St. Louis
Learning experience: At the end of the summer, the student will understand the differences between avian, human and swine influenza virus and know how influenza pandemics occur. We will also train the student to perform state-of-the-art genome editing to test the effects of genetic variation or a host gene function on virus replication or host responses. Finally, at the end of the summer, the student will have a basic understanding of the scientific process that lead to the discovery of novel concepts, ideas, and ultimately new therapies to treat life-threatening diseases.

Mentor: Dr. Kathleen Bucholz
Type of student: Undergraduate, graduate and medical
Required skills: Basic statistics knowledge and quantitative aptitude, along with some familiarity with analysis packages (SAS, SPSS, Stata, R, etc.) would be helpful. Enjoyment of and some proficiency/experience in writing would be a plus.

Project 1: Pathways to substance problems in youth from high risk alcoholic families: race/ethnic and gender differences
Project description: Using longitudinal data from adolescents and young adults participating in an epidemiological high risk family study of alcoholism, pathways to increasing substance involvement (alcohol, cannabis, tobacco) will be explored using the major etiologic models in the literature. Differences by gender, and by race/ethnicity may be explored. Both risk and protective factors may be investigated using the comprehensive data collected from youth and their parents. Depending on the young scholar's interests, the investigation may focus on particular protective (or risk) factors from among the many constructs that are available.
Location: St. Louis
Learning experience: The student will become familiar with etiologic models of substance involvement (including risky problem use, and outright disorder) by reading classic (as well as current) literature, will hone critical thinking in formulating testable research questions grounded in the literature, will learn to manipulate large, longitudinal data sets, and will apply a variety of analytical techniques to a research question. Preparation of a manuscript is an ultimate goal (and realistic, based on past experience with summer interns).

Project 2: Resilience to substance problems in youth at high risk
Project description: Although having parents with substance use disorder is a potent predictor of substance problems in their offspring, not all high risk youth develop those problems. Resistance to addiction is a growing focus in the literature. Several data sets in our research group, identifying high risk youth using a variety of ascertainment strategies and designs (twins, siblings, offspring of twins), would permit exploration of this topic. A wide array of measures, ranging from parenting practices, youth personality, religiosity, peer influences, measured genes, etc., available in those data sets would support an investigation of this topic.
Location: St. Louis
Learning experience: The student will become familiar with new theories underlying resistance to substance problems put forth in the current literature, will hone critical thinking in formulating testable research questions grounded in this literature, will learn to manipulate large, longitudinal data sets, and will apply a variety of analytical techniques to a research question. Preparation of a manuscript is an ultimate goal (and realistic, based on past experience with summer interns).

Mentor: Dr. Patricia Cavazos-Rehg
Type of student: Undergraduate, graduate and medical
Required skills: 1. Ability to follow oral and written instructions; 2. Good verbal and written communication skills in English; 3. Excellent interpersonal skills; 4. Knowledge of various social media platforms; 5. Qualitative data analysis; 6. Survey development/administ

Project 1: Understanding health risk behaviors on social media and identifying ways to intervene
Project description: The student will be involved in cutting-edge research that examines mental health and substance use content across various social media platforms. Through this process, she/he will assist in assessing engagement, temporal trends and sentiment of this content. Additionally, the student will have the opportunity to assist with the
identification and recruitment of individuals posting about mental health and substance use on social media into an online study.

Location: St. Louis

Learning experience: This experience will introduce the student to how social media posts can be used for behavioral insights. They will assist with data collection and analysis as well as initial manuscript development.

---

Mentor: Dr. Gautam Dantas  
Type of student: Undergraduate  
Required skills: Some molecular biology (wet lab) or bioinformatics (dry lab) skills would be beneficial but are not strictly required

Project 1: Dynamics of gut microbiota-pathogen interaction during travel to high infectious burden regions.  
Project description: It is estimated that ~100 million people travel each year from industrialized countries to developing nations, and 40 - 55% among them develop travelersâ€™ diarrhea (TD) every year. Existing studies on TD have neglected the role of the gut microbiota that plays a critical role in host susceptibility to GI infection due to permissive or protective architectures. Our project aims to study the impact of travel on the host gut microbiome as well as the role of gut microbiota on the initiation and progression of diarrhea among international travelers using microbiologic, genomic, metagenomics and bioinformatics methods.

Location: St. Louis  
Learning experience: The student will learn shotgun sequencing protocol and use computational tools to analyze the sequencing data. Given the interest, student can also get involved in developing computational pipelines to analyze metagenomics data.

Project 2: Understand the process of acquisition, persistence and transmission of antibiotic resistance genes during international travel to resource-limited developing regions.  
Project description: International travel is considered to be a significant risk factor for the spread of antibiotic resistance (AR). The acquisition and spread of multidrug resistant organisms in travelers has been particularly intense in developing countries, especially tropic regions, likely owing to poor hygiene and lack of antibiotic stewardship. In this project, we will longitudinally analyze AR genes present in travelerâ€™s gut using functional metagenomics selections and computational tools to 1) characterize diversity and abundance of AR genes in the gut over time and 2) identify risk factors associated with acquisition and persistence of AMR genes.

Location: St. Louis  
Learning experience: The student will learn functional metagenomics protocol and use computational tools to analyze the sequencing data. Given the interest, student can also get involved in developing computational pipelines to analyze sequencing data.

---

Mentor: Dr. Todd Druley  
Type of student: Graduate and medical  
Required skills: 1. modest wet lab / bench experience and 2. modest data analysis / statistics.

Project 1: Developmental anomalies and pediatric cancer viral studies.  
Project description: We have shown that children with developmental or congenital birth defects have an increased risk of cancer. One theory is that previously undetectable viral infections in utero contributed to both outcomes. We will prepare DNA sequencing libraries from banked pediatric cancers and submit for a highly specialized viral sequencing analysis.

Location: St. Louis  
Learning experience: 1. Next generation sequencing library preparation; 2. Understanding the link between pediatric cancer and developmental disorders and 3. Compare to existing databases of developmental anomalies and cancer against a healthy population.
Mentor: Dr. Tonya Edmond  
Type of student: Graduate  
Required skills: literature review and data entry.

Project 1: Implementing Cognitive Processing Therapy into Rape Crisis Centers  
Project description: This research project will use a randomized controlled trial to assess the feasibility and effectiveness of a learning-collaborative as an implementation strategy to advance the use of CPT for treating PTSD in 15 Texas RCCs. A Hybrid III design will be used to allow the simultaneous testing of an implementation strategy (learning collaborative) and the effectiveness of CPT within the context of RCCs. Fifteen RCCs will be randomly assigned to one of three training conditions: (1) CPT training + a learning collaborative; (2) Standard CPT training; and (3) No CPT training. This design will also allow for the documentation of the level of effectiveness of typical RCC counseling services, which is absent from the literature. Data will be collected from five directors and 20 counselors from each training condition and 180 adult survivors who consent to participate and receive counseling services (CPT n=120; routine counseling n=60). This study will assess whether uptake and fidelity of CPT differ by staff and organizational characteristics to identify potential implementation challenges that could inform strategies for future scale-up efforts. Mixed methods will also be employed to capture qualitative data about provider and survivor perceptions of CPT and the implementation process. This translational feasibility study is the first investigation of this magnitude to be conducted within this service sector.  
Location: Texas  

Mentor: Dr. Brad Evanoff  
Type of student: Graduate and medical  
Required skills: Data analytic experience would be optimal. Lab experience not relevant. Would prefer med or grad student over an undergrad.

Project 1: Worksite Interventions to Reduce Obesity and Diabetes Risk in Low SES Populations  
Project description: The student will participate in an ongoing project examining determinants of obesity in a low income working population (R01 DK103760-02 â€œWorksite Interventions to Reduce Obesity and Diabetes Risk in Low SES Populations). We are now collecting baseline data in this study of a novel weight loss intervention among lower income healthcare workers. A student will analyze these baseline data to perform a descriptive study of the baseline characteristics, attitudes, behaviors, and health concerns among this population. Results of these analyses will help guide portions of the two year intervention.  
Location: St. Louis  
Learning experience: Field data collection; data analyses; understanding the complexity of health determinants, the effects of work environment on health, and the difficulties of changing health behaviors.

Project 2: Determinants of health and health behaviors among blue collar workers  
Project description: The student will work to evaluate the impact of work organization and work environment factors on the health and health behaviors of apprentices in three construction trades. We will test the hypothesis that work organizational factors common in the construction sector (multiple employers, commuting, job hazards, lack of prevention programs) will be associated with adverse outcomes, including unhealthy behaviors, musculoskeletal symptoms, and unsafe work practices. The student will analyze baseline data from a study of construction workers to identify both cross-sectional relationships between work organization and environmental factors, and health behaviors and outcomes. The student will also participate in primary data collection on this or a related construction study.  
Location: St. Louis  
Learning experience: Field data collection; data analyses; understanding the complexity of health determinants, the effects of work environment on health, and the difficulties of changing health behaviors.
Mentor: Dr. Mario Feldman
Type of student: Undergraduate, graduate and medical
Required skills: We are looking for a self-motivated individual with a strong interest in molecular microbiology and bacterial physiology. Lab experience, in particular in molecular biology and/or microbiology will definitely help the student in getting the most out of the summer research project.

Project 1: Screening for genes involved in sorting of OMV-specific proteins in Bacteroides
Project description: Outer membrane vesicles (OMV) are spherical membranous structures released from the outer membrane (OM) of Gram-negative bacteria. Bacteroides thetaiotaomicron is an important member of the human gut microbiota. We found that there is active cargo selection of proteins into OMVs in Bacteroides sp, in particular acidic hydrolases (Elhenawy et al., 2014). The summer student project will consist of finding genes that contribute to the process of OMV-associated protein sorting by screening a library of B. theta mutants for enzymatic activities in culture supernatants.
Location: St. Louis
Learning experience: The student will be immersed in a rich and diverse microbiology lab. In terms of skills, the student will learn how to culture microorganisms in anaerobic conditions, perform enzymatic assays and sequence transposon-inserted mutants.

Project 2: Investigation of the regulation of the type VI secretion system of clinical isolates of Acinetobacter baumannii.
Project description: As an emerging nosocomial pathogen, Acinetobacter baumannii is notorious for its ability to become multidrug resistant. The type VI secretion system (T6SS) is found in many Gram negative bacteria and is a contact-dependent secretion apparatus which targets and kills neighboring cells. A. baumannii carries a functional T6SS, however the regulation of this system is poorly understood. The summer student project will consist of screening for T6SS secretion regulators throughout A. baumannii by using a high-throughput screening of T6SS mutants using extracellular colony blots.
Location: St. Louis
Learning experience: The student will be immersed in a rich and diverse microbiology lab. In terms of skills, the student will learn how to culture strains of Acinetobacter, perform extracellular colony blots and sequence transposon-inserted mutants.

Mentor: Dr. James Fleckenstein
Type of student: Undergraduate, graduate and medical
Required skills: no prior experience is required. However projects will be commensurate with the level of experience of the student.

Project 1: Molecular characterization and vaccinology of enterotoxigenic E. coli
Project description: Our laboratory works on enteroxigenic E. coli (ETEC) a major cause of diarrheal illness among young children in developing countries. While these pathogens cause millions of cases of diarrheal illness year and are associated with important sequelae including growth stunting, malnutrition, and poor intellectual development there is currently no vaccine which can prevent these infections. Projects in the lab involve molecular pathogenesis and pre-clinical vaccinology studies. The overall premise of these studies is that a more thorough understanding of the pathogens can inform an improved approach to rational vaccine design and testing.
Location: St. Louis
Learning experience: Students may get involved in a number studies that involve molecular cloning and antigen characterization, and the determination of the conservation of candidate vaccine antigens among hundreds of strains that we have collected with our collaborators worldwide.
**Mentor:** Dr. Stephanie Fritz  
**Type of student:** Graduate  
**Required skills:** Statistical analysis skills and experience would be extremely helpful.

**Project 1: Epidemiology of Staphylococcus aureus**  
**Project description:** Staphylococcus aureus is a common pathogen in children. Methicillin susceptible S. aureus has been treated successfully with many types of Beta lactam antibiotics. Most notably, the semi-synthetic penicillins, oxacillin and naftillin, have been shown to have rapid killing of MSSA and have traditionally been the preferred agent in treating MSSA bacteremia and endocarditis. Other beta lactams in the cephalosporin category have also been shown to be effective in treating invasive MSSA infections including bacteremia. Recent data in adults have suggested that cefazolin is equally as effective as oxacillin/naftillin in treating invasive MSSA including bacteremia and endocarditis. Data is limited in regards to the types of antibiotics that are being utilized to treat invasive MSSA. Using data from 6 pediatric centers, we will investigate the effect of antibiotic use on clinical outcomes in children with methicillin-susceptible Staphylococcus aureus bacteremia.  
**Location:** St. Louis  
**Learning experience:** The student will learn infectious disease epidemiology, use of administrative data, and antimicrobial stewardship. The student will be invited to attend clinical case conferences and shadow on the pediatric infectious disease clinical service if desired.

**Project 2: Eradication of Staphylococcus aureus in the Household**  
**Project description:** Staphylococcus aureus can be spread from person-to-person and infections often occur in multiple members of the same household. S. aureus can also exist on household surfaces for prolonged periods of time. The Staph Hygiene Intervention for Eradication (SHINE) study is a comparative effectiveness trial evaluating several decolonization strategies in patients with MRSA infection, their household contacts, and household environmental surfaces to interrupt transmission of S. aureus among household members and prevent S. aureus infections. The central hypothesis of this trial is that an integrated approach of periodic personal and household environmental hygiene will reduce MRSA transmission in households and subsequently decrease the incidence of skin and soft tissue infections. The data generated by this study will inform clinical practice for physicians treating patients with S. aureus infections.  
**Location:** St. Louis  
**Learning experience:** The student will gain experience conducting human subjects research interacting with pediatric patients and their families and will become familiar with basic microbiology techniques.

---

**Mentor:** Dr. J. Gill  
**Type of student:** Graduate  
**Required skills:** Data manipulation, programming in any language, basic statistics or better.

**Project 1: Measurement of Disease Propogation Across Boundaries and Levels: A View From the Bayesian Spatial Approach**  
**Project description:** We study micro-level geographic disease propogation based on Bayesian hierarchical spatial modeling with kriging. The output of our current models gives not only nuanced regional differences and relationships between states, but more robust state-level aggregations that update the work done in the 1990s. We rely here on the spatial relationships among observations and units of measurement in order to extract measurements of prevalence as geographically narrow as measured covariates. Our next challenge is to produce efficient algorithms and software such that a wide variety of biomedical scientists can make automated queries at their geographic tessellation of choice. This proposal focuses on developing more efficient algorithms and software for public distribution now that we have demonstrated that the model is demonstrated to work. Planned extensions include epidemiological spatial effects by geographic of interest.  
**Location:** St. Louis  
**Learning experience:** Acquiring and working with spatial data, coding in R, statistical modeling, Bayesian inference.
**Mentor: Dr. David Gutmann**

**Type of student:** Undergraduate, graduate and medical

**Required skills:** Project 1: Familiarity with basic science laboratory, molecular/cell biology techniques, willingness to work with mice.

Project 2: Excel spreadsheet, basic statistics, familiarity with medical electronic medical records.

**Project 1: Alternative splicing creates a brain neuron-specific regulator**

**Project description:** Children with the common neurogenetic condition, neurofibromatosis type 1 (NF1), are prone to the development of learning disabilities, attention deficit, and autism spectrum symptomatology. We have identified a novel alternatively-spliced isoform of the NF1 gene which is exclusively expressed in brain neurons. The goal of this project is to define the temporal and spatial expression pattern of this unique NF1 isoform, and to initiate studies aimed at defining its potential function in neurons.

**Location:** St. Louis

**Learning experience:** This project will provide the trainee with an opportunity to work in a fundamental basic science laboratory focused on human disease. The trainee will become versed in mouse brain dissection, quantitative RT-PCR, immunohistochemistry, and data analysis.

**Project 2: Defining the spectrum of brain tumors in children with a cancer predisposition syndrome**

**Project description:** Children with the common nervous system tumor predisposition syndrome, neurofibromatosis type 1 (NF1), are prone to the development of low-grade brain tumors. The majority of these tumors arise in children under the age of ten, and most are confined to the optic pathway. To define the spectrum of these tumors in children with NF1, we aim to develop a database to catalog these tumors, their age of onset, their clinical course, and potential associated risk factors. Over 150 children with brain tumors will be analyzed and the data compiled to define their temporal and spatial distribution.

**Location:** St. Louis

**Learning experience:** This project will provide the trainee with exposure to clinical research, database management, and statistical analyses. The trainee will work with a team of clinical researchers.

---

**Mentor: Dr. Erik Herzog**

**Type of student:** Graduate

**Required skills:** Data analysis experience.

**Project 1: Chronochemotherapy for GBM.**

**Project description:** The student will analyze medical records from physicians who treated patients with glioblastoma medulliforme (GBM), the most common brain cancer. They will test the hypothesis that treatment in the morning has improved outcomes compared to treatment in the evening.

**Location:** St. Louis

**Learning experience:** Chronobiology, cancer biology, statistics, IRB procedures, working with physicians and scientists, medical records.

---

**Mentor: Dr. Lori Holtz**

**Type of student:** Graduate and medical

**Required skills:** Lab experience

**Project 1: Characterization of novel astrovirus**

**Project description:** We discovered a novel astrovirus, MLB1, in stools of children with diarrhea. This has now been found across the world and we know that people develop antibodies to it. In order to study it better, we would like to develop more tools (ie. full length clone).

**Location:** St. Louis

**Learning experience:** The student will learn basic bench science skills, molecular biology methods, and basic virology as well.
Mentor: Dr. Lora Iannotti  
**Type of student:** Graduate and medical  
**Preferred skills/experience:** Field research or programming experience; data analysis experience; grant writing; strong writing and research (literature review) skills; and Spanish (Ecuador) or French language (Haiti).

**Project 1:** The Lulun Project: nutrition and child development (Ecuador)  
**Project description:** Support field-based teams to conduct research related to nutrition and early child development. Mixed methods are applied in both sites including qualitative and quantitative surveys, interviews, and focus groups, and the collection of anthropometric measures on children. Other activities might include coordinating with local partners (USFQ), grant writing, literature reviews, and regular communication with the PI.  
**Location:** Pastocalle, Ecuador  
**Learning experience:** Students will acquire skills related to conducting field-based research, administration of surveys, focus groups, and in-depth interviews. Potentially, a community-based system dynamics exercise will also be carried. Student will ideally strengthen existing grant-writing, research, and language skills.

**Project 2:** Nutrition, disabilities, and child development (Haiti)  
**Project description:** Support field-based research teams to conduct research to nutrition, disabilities, and child development. Mixed methods are applied in both sites including qualitative and quantitative surveys, interviews, and focus groups, and the collection of anthropometric measures on children. Other activities might include coordinating with local partners, grant writing, literature reviews, working with students from UPNCH university, and regular communication with the PI.  
**Location:** Cap Haitien, Haiti  
**Learning experience:** Students will acquire skills related to conducting field-based research, administration of surveys, focus groups, and in-depth interviews. Potentially, a community-based system dynamics exercise will also be carried. Student will ideally strengthen existing grant-writing, research, and language skills.

---

Mentor: Dr. Sanjay Jain  
**Type of student:** Undergraduate, graduate and medical  
**Required skills:** Lab or data analysis experience is preferable.

**Project 1:** Gene expression changes during normal and abnormal development of the kidney and the nervous system  
**Project description:** A typical project a student may work on is analyzing bulk and single cell RNA sequencing data to determine specific genes and pathways that control differentiation of progenitors and validate them. Alternatively, a student may also examine the role of pathogenic mutations in birth defects by using human iPSC cells, with or without mutations, and differentiating them to kidney lineages.  
**Location:** St. Louis  
**Learning experience:** Fundamentals of the field, critical questions that need to be answered, the process of designing experiments, rigorous testing and critical analysis of findings.

---

Mentor: Dr. Shabaana Khader  
**Type of student:** Undergraduate, graduate and medical  
**Required skills:** Lab experience

**Project 1:** Mycobacterium tuberculosis lipids drive host immune responses  
**Project description:** We have isolated lipids from different strains of Mycobacterium tuberculosis. The summer student will carry out the biochemical and immunological characterization of the lipid extracts to better understand host pathogen interactions in TB.  
**Location:** St. Louis  
**Learning experience:** Biochemical assays and immunological assays.
Mentor: Dr. Allison King
Type of student: Undergraduate, graduate and medical
Required skills: Ability to write. We can teach them how to do qualitative work or other skills. If someone has quantitative skills, we can direct them to another project.

**Project 1: Needs Assessment for Adolescents and Young Adults with Sickle Cell Disease**
**Project description:** We are completing a needs assessment of patients with sickle cell disease, their families, providers, and educators. The purpose of the needs assessment is to better understand facilitators and barriers of successful transition and healthcare. The results will inform a future intervention.
**Location:** St. Louis
**Learning experience:** Survey and qualitative research skills. The student will also get an introduction to implementation science.

**Project 2: Infant and Toddler Activity Card Sort**
**Project description:** Card sorts facilitate collaboration between clients and therapists by relying on client input to identify problem areas and establish goals (Baum et al., 2008). However, there is no existing card sort for children under the age of 3, leaving a gap in the assessment of participation in the context of early intervention (Berg & LaVesser, 2006). With the input of parents, our team has identified several activities of daily living for infants and toddlers. Experts in OT have validated these activities, and we now seek to pilot the card sort as a measure of participation.
**Location:** St. Louis
**Learning experience:** Recruitment, child development, methods of a card sort assessment, qualitative and quantitative skills.

---

Mentor: Dr. Douglas Luke
Type of student: Graduate
Required skills: 1. Intermediate level quantitative data analysis skills (using SPSS, or R is preferable); 2. Experience conducting literature reviews; 3. Knowledge of qualitative data collection and analysis (e.g., key informant interviews) and 4. Interest in public health

**Project 1: Tobacco Town**
**Project description:** We use agent-based modeling to create Tobacco Town, a dynamic systems simulation of realistic communities that models tobacco retailer density and tobacco use behaviors. The model serves as a retail policy laboratory to explore and compare the potential behavioral effects of various real-world retailer reduction policy approaches for health policy and implementation scientists, and evaluators as they develop evidence-based policies to counter the effects of tobacco industry activities in the retail environment.
**Location:** St. Louis
**Learning experience:** Student will learn about tobacco control research and policy approaches, including how innovative modeling methods can be applied to test effectiveness of retail and other policies. Student will employ knowledge gain from literature reviews to their work, and learn about quantitative analysis, and approaches for dissemination of findings.

**Project 2: Evaluation of the ND Center for Tobacco Prevention and Policy**
**Project description:** This is a mixed-methods evaluation of a statewide tobacco control program. The team will collect and analyze new data collected using quantitative methods (e.g., social network analysis, surveys, surveillance data, sustainability assessment) and qualitative methods (key informant interviews) to assess the degree to which the program is meeting its goals around tobacco prevention and decreased use in the state.
**Location:** St. Louis
**Learning experience:** The student will learn how to employ mixed methods evaluation design, including some quantitative and potentially qualitative data collection and analysis methods. Student will also learn about dissemination approaches for varied audiences. Student will also have an opportunity to learn about presenting and visualizing data.
**Project 3: Raising St. Louis Evaluation**

**Project description:** Raising St. Louis is a BJC Healthcare initiative that aims to utilize two well-established early childhood programs "Nurses for Newborns and Parents as Teachers" to improve the health, developmental, and school outcomes of St. Louis children pre-natal to

**Location:** St. Louis

**Learning experience:** The student will learn about implementing an evaluation of a public health related initiative, specifically that focuses on health and well-being of children. Student will support data collection and analysis efforts and development of evaluation reports.

---

**Mentor:** Dr. Mark Manary

**Type of student:** Undergraduate

**Required skills:** Statistics & mathematics background taken basic chemistry and biology

---

**Project 1: Nutrition and growth**

**Project description:** The student will analyze previously collected datasets from malnourished children in Malawi, Ghana and Sierra Leone that participated in feeding trials, to determine the relative performance of foods and treatment regimens

**Location:** St. Louis

**Learning experience:** skills in public health data management, data presentation, and data interpretation.

---

**Mentor:** Dr. Wade Martin

**Type of student:** Undergraduate

**Required skills:** Familiarity with medical terminology; computer and data analysis skills.

---

**Project 1: Arm Exercise versus Other Stress Test Modalities for Clinical Outcome Prediction**

**Project description:** Exercise variables are robust predictors of mortality and other health outcome measures but many people cannot perform treadmill exercise because of lower extremity disabilities. For these individuals, we are comparing arm exercise versus pharmacologic imaging stress test variables as predictors of clinical outcome.

**Location:** St. Louis

**Learning experience:** Clinical exercise testing in a cardiac stress testing laboratory; methods of clinical and outcomes research; data analysis.

---

**Mentor:** Dr. Timothy McBride

**Type of student:** Undergraduate, graduate and medical

**Required skills:** Quantitative skills would be helpful. An interest in either policy or economics.

---

**Project 1: Assessing the impacts of the Transition in the Affordable Care Act**

**Project description:** The researcher will work on projects related to the Affordable Care Act, using the data we have to focus on questions. The questions may be in the realm of studying the marketplaces, Medicaid or Medicare. We analyze changes in access, outcomes, costs.

**Location:** St. Louis

**Learning experience:** The Affordable Care Act, economics or policy expertise, methods.
Mentor: Dr. Amy McQueen
**Type of student:** Undergraduate, graduate and medical
**Required skills:** Coursework in research methods and introduction to statistics as well as exposure to social/behavioral science through psychology, anthropology, sociology or public health courses is preferred. Experience collecting or analyzing self-report data from human subjects is preferred, but not required.

**Project 1:** Characterizing barriers to colorectal cancer screening among participants in an educational intervention
**Project description:** Study participants were provided information promoting colorectal cancer screening. Follow-up surveys were completed at 1, 6, and 12 months post-intervention. The student will finish categorizing participant reported barriers to colorectal cancer screening (qualitative data), compare with quantitative measures, then use basic statistics to explore socio-demographic and psychosocial factors that may be associated with reported barriers. Additionally, the student will explore the stability of reported barriers among participants over time.
**Location:** St. Louis
**Learning experience:** The student will learn about the preventive services guidelines regarding colorectal cancer, different screening modalities, patient reported barriers to adherence with guidelines, and other factors associated with barriers. The student will learn research methods, content analysis, basic data analysis and interpretation, and manuscript development.

**Project 2:** Developing a brief online tool for recommending pharmacologic cessation aids to smokers
**Project description:** The student will adapt and streamline an existing web-based tool that recommends pharmacologic cessation aids to smokers using the Qualtrics online survey platform. Smokers in the community will be recruited to use and evaluate the new tool to demonstrate the feasibility of its use in a future, larger treatment trial. No prior experience with Qualtrics is necessary.
**Location:** St. Louis
**Learning experience:** The student will learn about clinical practice guidelines regarding treatment for tobacco dependence, and the different pharmacologic cessation aids recommended to smokers who want to quit. The student will learn how to use the Qualtrics survey platform to deliver a new version of a web-based tool, and how to export data collected from smokers who complete the Qualtrics survey. The student will gain experience recruiting and interviewing study participants.

**Project 3:** Secondary data analyses available for students with analysis experience
**Project description:** For students with quantitative data analysis experience, they can work with the PI to develop a secondary data analysis using existing data from several completed studies related to colorectal cancer screening, multimorbidity and illness perceptions, and
**Location:** St. Louis
**Learning experience:** The student will gain experience identifying research questions and/or hypotheses, planning and conducting secondary data analyses with real study data, and developing manuscripts for publication.

---

Mentor: Dr. Makedonka Mitreva
**Type of student:** Graduate and medical
**Required skills:** sequence data analysis

**Project 1:** Genetic and functional gut microbiome assemblages in humans infected soil transmitted helminthes
**Project description:** The human intestine is a complex ecosystem colonized by commensal microbes (microbiota), and it is also the most common site of infection for soil-transmitted helminths (STHs), which affect approximately 2 billion people worldwide and cause significant health impacts. We are studying interactions between the human gut microbiome and STHs by precisely defining the microbial ecology underlying the STH infections and after worm clearance using both targeted and shotgun metagenomic approach. We will study the strain-level resolution of the gut microbiome by de novo assembly of the genomes of the community members, calling genes and evaluating variations at a gene level.
**Location:** St. Louis
Learning experience: The student will obtain bioinformatics skills that are required to perform micorbiome related analysis. Will learn how to use tools to de novo assembly shotgun metagenomic data, call genes and variants.

Mentor: Dr. Celeste Morley
Type of student: Undergraduate, graduate and medical
Required skills: lab experience - PCR, cell culture, etc. We can teach a lot of our techniques but it is helpful if students know how to use a pipette.

Project 1: Evaluating a human variant allele in pneumococcal pneumonia in bench model systems
Project description: We have identified a genetic variant in a gene called coenzyme Q6 in the population of Papua New Guinea that may be associated with increased susceptibility to pneumococcal pneumonia. We are working to create a yeast and mouse model to test if this variant allele is dysfunctional in these model systems. We are also working to collect more samples in PNG to see how widespread this variant is. The student may be asked to work on the yeast, mouse or human aspect of this work.
Location: St. Louis
Learning experience: The student will learn to use whole exome sequencing to identify a gene of interest, to evaluate a candidate gene for functional relevance in model organisms, and wet lab techniques (PCR, flow cytometry, mouse handling, biochemistry).

Mentor: Dr. Nancy Morrow-Howell
Type of student: Undergraduate, graduate and medical
Required skills: Interested applicants should have strong verbal, written, organizational skills as well as an interest in learning about aging and working with older adults.

Project 1: A Crash Course in Aging
Project description: Our summer experience will provide an opportunity to work with one of the many labs and centers based at Washington University that focus on aging-relevant issues. We will pair up applicants that have been accepted to the program with a project that best fits their interests and experiences. Applicants do not need to have prior experience in aging, but must have an interest in exploring issues relevant for older adults and aging societies.
Location: St. Louis
Learning experience: The selected summer program participant will receive faculty mentorship, an introduction to community-based aging services, further development of research skills, as well as skills in translating data and information for various audiences.

Mentor: Dr. Eric Mumford
Type of student: Graduate
Required skills: Ability to do historical research and to write clearly in English.

Project 1: Public health issues in urban design and human settlements: a historical perspective
Project description: The student will continue historical research on post-1945 efforts to shape urban neighborhoods for recently arrived residents to provide healthier housing, recreation, and transportation options. Much of the work involves library and internet research, as well as possibly some travel to archives.
Location: St. Louis
Learning experience: The student will gain a better understanding of relatively recent efforts to shape human settlements in a more balanced way, engaging issues highly relevant to current challenges of environmental sustainability in fast-growing world urban environments.
Mentor: Dr. Audrey Odom
Type of student: Undergraduate
Required skills: I would be willing to accept undergrad, grad, or medical students. The ideal student will have a strong background in fundamental biological and chemical principles, as well as an excellent intellectual curiosity and scientific fearlessness. Previous "wet lab" experience is ideal but not required.

Project 1: Drug resistance in malaria parasites
Project description: We study the malaria parasite, Plasmodium falciparum. We have been using drug resistance as a tool to understand the underlying biology of the parasite. Possible projects include generating resistant parasite strains, next-generation sequencing, and molecular biology projects.
Location: St. Louis
Learning experience: We expect that students will learn a variety of modern molecular genetics techniques and will be introduced to fundamental aspects of malaria parasite biology, in a global health context.

Mentor: Dr. Shanti Parikh
Type of student: Undergraduate and graduate
Required skills: Preferred and helpful, but not required: 1. Living in poorer settings; 2. Quantitative data set analysis, and 3. Qualitative methods (interviewing & observational) and analysis; coursework or familiarity with anthropology or ethnography; and 4. survey cre

Project 1: Gender, HIV Continuum, Unemployment, and Transactional Sex along the TransAfrica Highway
Project description: This project examines how the engagement with HIV risk reduction and care continuum in Iganga, Uganda is shaped by gender, economic conditions, and institutional practices of various agencies involved in AIDS control efforts. This study takes place mainly along the Iganga, Uganda portion of the TransAfrica Highway, a major transportation artery in East Africa that reports high rates and a convergence of HIV prevalence, mobility, poverty, and sexual networking. In order to understand factors that shape the gendered engagement with the HIV risk reduction and care continuum, qualitative and survey data will be collected in three main study sites: community-based HIV groups, HIV care centers, and long distance truck stop and commercial sex towns.
Location: Iganga, Uganda
Learning experience: Students will gain experience in a dialectical analysis that involves working between (1) an analysis of a large health data set on HIV testing and (2) theoretically-driven analysis of social contexts, inequalities, and landscapes that shape engagement with HIV risk reduction and HIV care.

Mentor: Dr. Jennifer Philips
Type of student: Undergraduate, graduate and medical
Required skills: Previous lab experience in molecular biology, tissue culture, and/or microbiology is preferred.

Project 1: Host-pathogen interactions in Mycobacterium tuberculosis pathogenesis
Project description: Mycobacterium tuberculosis (Mt) causes tuberculosis (TB), the world’s most deadly infection. The goal of the Philips lab is to understand why the immune system can not eradicate Mt. We study host-pathogen interactions that allow Mt to alter cellular trafficking, lipid metabolism, cytokine responses, and antigen presentation by infected macrophages. Summer projects will focus on characterizing Mt virulence factors that allow the bacteria to survive and grow in macrophages, cells that normally kill bacteria.
Location: St. Louis
Learning experience: Students will gain experience in molecular biology, protein-protein interaction studies, tissue culture, growth of mycobacteria, and/or macrophage infections. The students will develop an understanding of TB infection, macrophage biology, and Mt pathogenesis. In studying the molecular mechanisms by which Mt sabotages host cellular functions, students will contribute to a better understanding of the deadly infection.
Mentor: Dr. Mary Politi
Type of student: Undergraduate, graduate and medical
Required skills: experience required depends on the project selected. strong organizational and communication skills, attention to detail, sensitivity to patient and participant needs are essential. other skills depend on the project.

Project 1: shared decision making and health communication research
Project description: Options:
1. decision making about whether or not to treat hepatitis C among patients with chronic kidney disease (usability testing of a patient decision tool which involves stakeholder engaged and a summary of the process for developing this tool)
2. decision making about cancer clinical trials participation among rural residing individuals (exploring barriers unique to rural populations and analyzing data about their needs and preferences for information)
3. disseminating information about a previously developed tool to support health insurance in the ACA marketplace, helping tailor information to specific states.
Location: St. Louis
Learning experience: Background on shared decision making and health communication research. Exposure to mixed methods research (qualitative and quantitative research) and manuscript writing experience if desired.

Mentor: Dr. Rumi Price
Type of student: Undergraduate, graduate and medical
Required skills: basic biostats, experience in working in dry lab, interested in research with some social justice elements

Project 1: Human trafficking quantitative studies in the St. Louis region
Project description: Two sub-studies are suitable to complete in a 8-week period: (1) compile and recompile Department of Justice press release information over 3-4 year period; organize primary variables; plot locations on the existing sex trafficking risk marker map. (2) work and assist other team members to compile and complete a systematic review of labor trafficking in the US.
Location: St. Louis
Learning experience: Students will learn how to compile large and small research data sets; learn how to organize analysis themes; apply data to the geographic information system (sub study 1); learn how to systematically organize the existing literature; learn how to organize the literature; learn how to write a scientific literature review articles.

Project 2: PTSD-Mindset mHealth study
Project description: Students will help the team to implement a mobile health study to assess the feasibility of conducting a larger study targeting Veterans with combat experience.
Location: St. Louis
Learning experience: Students will learn how to implement a study using an mental health app and physiological monitor; how to conduct interviews; how to compile study data sets; understand the stress mechanism and how to translate such indicators to stress monitoring.

Mentor: Dr. Jason Purnell
Type of student: Graduate
Required skills: Verbal and written communication, basic quantitative data collection and analysis, group facilitation, and interpersonal skills with diverse individuals.

Project 1: For the Sake of All: Community Based Participatory Research in College Hill
Project description: For the Sake of All has partnered with Grace Hill Settlement House to bring tools and resources to the College Hill neighborhood. This project entails “grassroots” community work and will use a community-based participatory research (CBPR) approach for community collaboration. Our goal is to help build proactive and trusting partnerships with community members and to create an infrastructure that supports additional work across the region.
Our approach to creating community action will be to: a) engage community residents and identify their health concerns; b) develop assessment tools for residents to use; c) build residents’ capacity to determine how data can be used to inform actions to improve community health; d) assist community groups in designing, implementing, and evaluating interventions; and e) disseminate findings to be used in future planning and implementation.

**Location:** St. Louis

**Learning experience:** The student will help For the Sake of All plan and implement the community-based participatory research process in partnership with Grace Hill Settlement House. Student will learn 1) to facilitate community and small group meetings, 2) to teach community members how to use literature databases, conduct interviews, and access publicly available data, 3) to help community members identify the cause of an issue and develop an action plan for intervention.

---

**Mentor:** Dr. Elizabeth Quinn

**Type of student:** Undergraduate

**Gender preference:** Female

**Required skills:** Experience with survey data, working with people.

**Project 1:** Understanding women’s views on menstruation in ethnic Tibetans.

**Project description:** This project will be focused on the analysis of survey data from Tibetan women living in Nepal. In November 2016, a pre-intervention survey was administered to 70 women living in one village. Women were then provided with reusable menstrual products. In May 2017, follow up surveys will be conducted with participating women regarding use and acceptance of the reusable menstrual products. The student working on this project would conduct data entry, survey analysis, and use statistical methods to evaluate the intervention. Finally, the student will participate in scale up efforts for the intervention provided the intervention has met the criteria for success.

**Location:** St. Louis

**Learning experience:** Statistical methods, data management, public health.

---

**Mentor:** Dr. Laura Schuettpelz

**Type of student:** Undergraduate, graduate and medical

**Required skills:** No particular experience required

**Project 1:** Role of toll like receptor signaling in the regulation of hematopoietic stem cells

**Project description:** Student will work alongside postdoctoral fellow to elucidate the role of TLR2 in regulating both normal and premalignant hematopoietic stem cells. Will work with mouse models of myelodysplastic syndrome (MDS), a pre-leukemic stem cell disorder with aberrant TLR2 signaling. Techniques employed will include flow cytometry, cell sorting, cell culture, Western blotting and others.

**Location:** St. Louis

**Learning experience:** Techniques as described above, using mouse models to study hematopoiesis, data analysis, and others.

---

**Mentor:** Dr. Haina Shin

**Type of student:** Undergraduate, graduate and medical

**Required skills:** cell culture, pipetting, flow cytometry

**Project 1:** T cell migration during viral sexually transmitted infection

**Project description:** This project will examine the requirements for T cell migration into the genital tract during different viral sexually transmitted infections.

**Location:** St. Louis
Learning experience: The student will learn about migratory patterns of T cells, which are an important component of the antiviral response. The student will also learn how to set up in vivo experiments and learn techniques such as qPCR and flow cytometry.

Mentor: Dr. Laurence Sibley
Type of student: Graduate and medical
Required skills: Basic computer skills, good record keeping, and organizational skills.

Project 1: Imaging host-parasite interactions
Project description: We work with a parasite Toxoplasma that causes infections in the brain - often with serious outcomes. Our studies focus on defining how the parasite crosses the blood brain barrier. We are using time lapse video microscopy to image the interaction of infected blood monocytes with an in vitro model for blood-brain-barrier epithelium, combined with molecular tools for tagging specific proteins of interest with fluorescent reporters. Our findings could help define the pathway for entry into the brain and lead to better treatments.
Location: St. Louis
Learning experience: Time lapse video microscopy including quantitative analysis digital images. You will learn to operate a highly sophisticated time lapse microscopy that provides laser illumination to detect specific host and parasite proteins. Training will be provided in quantitative image analysis.

Mentor: Dr. Christina Stallings
Type of student: Undergraduate, graduate and medical
Required skills: It would be great if the student had lab experience, particularly with pipetting and other molecular techniques.

Project 1: Finding new strategies to treat mycobacterial infections
Project description: The Stallings Laboratory studies mycobacterial pathogenesis, with an interest in identifying new antibiotics to treat mycobacterial infections. Of particular importance is the current global health crisis involving the Mycobacterium tuberculosis epidemic. As arguably one of the most successful pathogens in the world, M. tuberculosis infects one third of the world’s population and leads to 1.5 million deaths a year. The rise in drug-resistant cases has made it clear that we are not equipped to battle this epidemic. The Stallings Laboratory has identified drug-like small molecules that inhibit M. tuberculosis growth by an unknown mechanism of action. The summer research project will involve characterization of the growth inhibitory properties of these compounds and investigate possible bacterial targets of the compounds. The objective is to eventually apply these compounds as new antibiotics to treat M. tuberculosis infections and as new tools to dissect M. tuberculosis pathogenesis.
Location: St. Louis
Learning experience: The student will learn a combination of microbiology, cell biology, and molecular biology approaches. The student will also learn how to function as a team to gain new understanding of the biology of mycobacterial pathogens.

Mentor: Dr. Siobhan Sutcliffe
Type of student: Undergraduate, graduate and medical
Required skills: No experience necessary. I can tailor a project around the student's skills and previous training.

Project 1: Asymptomatic prostate inflammation and prostate cancer risk: a systematic review and meta-analysis
Project description: A growing body of evidence from both animal and human studies suggests that inflammation may contribute to prostate cancer risk. However, not all human studies support this hypothesis. For instance, molecular-pathological-epidemiologic studies have tended to observe a protective association between the presence the asymptomatic inflammation and foci of prostate cancer in pathologic specimens from men biopsied for prostate cancer. Although not previously described in the literature, this apparent protective association may be the result of limiting investigations to men with high levels of prostate-specific antigen, a non-specific biomarker that rises with both
inflammation and prostate cancer. Therefore, if a man has high values because of prostate cancer, he is unlikely to have high values because of inflammation, and vice versa, leading to an apparent protective association. With the proposed systematic review and meta-analysis, we intend to document this phenomenon, and to present meta-analysed results by prostate-specific antigen level to illustrate our point.

**Location:** St. Louis

**Learning experience:** The summer student will learn epidemiologic concepts, and how to review manuscripts, extract data from manuscripts, organize a large amount of extracted data, perform the statistical analysis, and prepare a manuscript for publication. If the student has additional time, he/she can also participate in other projects that involve analysis of existing quantitative or qualitative data, and preparation of the results of these analyses for publication.

---

**Mentor:** Dr. Adetunji Toriola  
**Type of student:** Undergraduate  
**Required skills:** Some data analysis experience and writing skills will be desirable.

**Project 1: Determinants of mammographic density**  
**Project description:** This project will evaluate the determinants of mammographic density in 385 premenopausal women. This includes lifestyle, reproductive factors as well as genetic variations. This data will contribute to our understanding of mammographic density and how it might be related to breast cancer development. Mammographic density is the most promising intermediate phenotype/marker for breast cancer. Mammographic density reflects breast tissue composition mainly epithelial and stromal cells, collagen and fat. An increased breast density on mammogram is one of the strongest risk factors for breast cancer. Women with percentage breast density >75% have a 4-6-fold increased risk of breast cancer compared to women with percentage breast density <10%.  

>27 million women aged 40-79 years in the US have increased breast density, defined as heterogeneously or extremely dense breast, on the Breast Imaging Reporting and Data System (BI-RADS) and it is estimated that 28% of breast cancer cases are attributable to increased breast density.  

**Location:** St. Louis  
**Learning experience:** Project management, research methodology, working in a group to achieve overall lab goals, data analyses, and manuscript draft. The student will also learn how research findings can be translated to population needs.

**Project 2: ColoCare**  
**Project description:** Colorectal cancer will affect one in 20 individuals over the course of their lifetime. The ColoCare Study is a prospective cohort of men and women newly diagnosed with a first primary invasive colorectal cancer (stage I-IV) with repeat data and biospecimen collection beginning prior to surgery. The goal of this study is to uniformly collect comprehensive sets of data and biospecimens from over 4,000 multiethnic colorectal cancer patients at multiple time points (prior to surgery and 3, 6, 12, 24, 36, 48 and 60 months post-surgery), including detailed treatment and risk factor data, fresh and fixed tumor and normal tissue, visceral adipose tissue, blood, stool, urine, saliva, and quantitative accelerometry data to assess physical activity. Each ColoCare Study site leverages existing infrastructure, including access to electronic medical records and NCI comprehensive/designated cancer center cores, while utilizing well-established protocols for recruitment, data collection, and biospecimen ascertainment that are consistently applied across all sites. Patients are followed up both actively and passively by study staff (in-person and through medical record reviews), as well as via linkages to cancer registry and vital status records.

**Location:** St. Louis  
**Learning experience:** Working on clinical research, data management and study coordination.

---

**Mentor:** Dr. David Wang  
**Type of student:** Undergraduate, graduate and medical  
**Required skills:** Molecular biology laboratory experience, such as PCR, cloning a plus but not required

**Project 1: Characterization of novel viruses from endangered species**  
**Project description:** The project entails characterization of novel viruses identified in collaboration with the St. Louis Zoo Institute for Conservation Medicine. These viruses derive from different animal species such as lemurs or Galapagos
tortoises. Molecular biology techniques will be used to define the sequences of viruses found in these animals. Further sequence analysis will define the phylogenetic relationships of these viruses to other known viruses.

Location: St. Louis

Learning experience: Molecular cloning, sequencing, phylogenetic analysis, and Concepts of One Health, viral emergence.