1. Role of Hdac3 during Cardiac Development

PI: Chinmay Trivedi, MD PhD, Assistant Professor, Medicine

Interview required – please contact PI at 508-856-6947 or chinmay.trivedi@umassmed.edu

Description:
Congenital and adult heart diseases are the leading causes of mortality in the developed world. The underlying pathology is improper development of cardiomyocytes that leads to the heart defects in 1% of newborn children and loss of diseased cardiomyocytes that leads to heart failure in adults. Unfortunately, heart is one of the least regenerative organs in the body with negligible endogenous capacity to repair or replace affected cardiomyocytes. Ability of pluripotent stem cells and cardiac progenitor cells to progressively and restrictively differentiate into various lineages, like cardiomyocytes, smooth muscle cells and endothelial cells, provides tantalizing promise for exogenous cell-based therapy. However, lack of thorough understanding of the mechanisms governing lineage commitment and differentiation of these progenitor cells to mature cardiomyocytes significantly limits our ability to harness its therapeutic potential. My lab is interested in understanding the roles of chromatin and epigenetic modifications during cardiac development and diseases. Specifically, we study the roles of chromatin modifying enzymes, like histone deacetylase 3 (HDAC3), in cardiac progenitor cells. Using various genetic murine models, we investigate how cardiac progenitor cells differentiate into various lineages to form functional heart in developing embryo. We have demonstrated that Hdac3 acts as a key regulatory switch within primary heart field cardiac progenitor cells to promote cardiomyocyte lineage specification.

Student's role:
About two-thirds of human congenital heart disease involves second heart field- derived structures; however, role of histone deacetylase enzymes within the second heart field progenitor cells remain elusive. Recently we demonstrated that histone deacetylase 3 (Hdac3) orchestrates epigenetic silencing of Tgfβ1, a causative factor in human congenital heart disease pathogenesis, in a deacetylase-independent manner to regulate development of second heart field- derived structures. In murine embryos lacking Hdac3 in the second heart field cardiac progenitor cells, increased Tgfβ1 bioavailability is associated with ascending aortic dilatation, outflow tract malrotation, overriding aorta, double outlet right ventricle, aberrant semilunar valve development, bicuspid aortic valve, ventricular septal defects, and embryonic lethality. Using various molecular biology / biochemistry and histology related techniques (performed routinely in our lab), student will characterize functional relationship between Hdac3 and TGF-β in disease samples.

Required Skills:
Microsoft office, Prior research experience in histology or cell and molecular biology / biochemistry is desired but not required.

Location of research:
Albert Sherman Center
AS7-1016

2. Autoreactive T cells directly from islets of human individuals with Type 1 Diabetes

PI: Sally C. Kent, PhD, Assistant Professor, Medicine

Interview required – please contact PI at 508-856-2044 or sally.kent@umassmed.edu

Description:
Understanding the pathogenesis of Type 1 Diabetes (T1D) has benefited greatly from the study of the non-obese diabetic mouse (NOD) model of human T1D. By necessity, the study of human autoreactive T cells has been limited to T cells in the periphery and while much has been learned about the phenotype of autoantigenic reactivity and HLA restriction of these T cells, the extent of immunopathologic involvement represented by these circulating is T cells is unknown. Until recently, it was thought that the recovery of islets from human subjects with T1D was not possible; however, this has been accomplished. There are now three initiatives in the United States to recover and study islets from subjects with T1D: the Islet Pilot Programs from the Network of Pancreatic Organ Donors with Diabetes (nPOD), the Integrated Islet Distribution Program (IIDP) at the City of Hope and by Drs. Al Powers at Vanderbilt University and David Harlan at the University of Massachusetts Medical School. To date, we have received 10 islet isolations from subjects with T1D from these 3 initiatives and we have directly grown or directly sorted >140 T cell lines/clones, both CD4 and CD8 T cells. We have determined autoantigen reactivity and HLA restriction for 7 CD4 lines and 3 CD8 T cell lines. The goal of this project is to determine the autoreactivity, HLA restriction and functional phenotype of as many of these islet infiltrating T cells as possible, using a variety of techniques. The study of islet-reactive T cells isolated directly from human islet isolates from subjects with T1D has the distinct potential to inform us about the immunopathology of human T1D.

Student's role:
The student would work directly with me on this project and be involved in discussions of experimental design, execution and analysis.

Required Skills:
Interest in exercise as medicine and musculoskeletal medicine. Basic interpersonal skills and musculoskeletal anatomy knowledge. CITI training completed for IRB. Knowledge of basic media in making and posting video would be helpful, but not necessary.

Location of research:
Albert Sherman Center
ASC-2012

3. Helminths as disease and as cures

PI: Raffi V. Aroian, Professor, Molecular Medicine

Interview required - submit via email - CV and a 3-4 line statement of interest with current contact information for an interview (raffi.aroian@umassmed.edu)

Description:
Our lab works on intestinal parasitic worms (helminths). We are developing new cures and also studying how these parasites interact with their host (in rodents). There are opportunities to either participate in developing new cures or in studying host interactions.

Student's role:
Screen for new bioactive compounds against helminths; engineer bacteria to produce anti-helmintics; study rodent-helminth interactions

Required Skills:
Great love of infectious diseases and desire to change the world

Location of research:
Biotech 2
Suite 219

4. Creating a Decision Aid Prototype for Goals-of-Care Decisions for Critically Ill Traumatic Brain Injury Patients

PI: Susanne Muehlschlegel, MD, MPH, FNCS, Associate Professor, Neurology

Interview required - submit via email - CV including prior research experience and a 3-4 line statement of interest with current contact information for an interview (susanne.muehlschlegel@umassmemorial.org)

Description:

Moderate-severe traumatic brain injury (msTBI) continues to be the leading cause of death and disability after trauma accounting for most of the 52,000 TBI-related deaths in the U.S. annually. **Withdrawal of care** is by far the most common cause of death in msTBI but occurs at a highly variable rate (45-89%) at different trauma centers. Since msTBI patients are rendered comatose or minimally responsive, health care proxies ("proxies") as the patients' decision makers routinely face the life-or-death ("goals-of-care") decision about continuation or withdrawal of care. Proxies' insufficient understanding of projected outcomes, risks and patient values, physician bias, and underlying disease severity all confound this decision. Remedying these issues through a decision support intervention may lead to better-informed goals-of-care decisions in msTBI patients. **Shared decision making** is a collaborative process that enhances patients' and proxies' understanding about prognosis, encourages them to actively weigh the risks and benefits of a treatment, and match them to patient preferences, thereby decreasing decisional conflict and improving decision quality and health outcomes. **Decision aids (DAs)** are shared decision making tools which have been successfully implemented and validated for many other diseases to assist difficult decision making. **No DA exists for goals-of-care decisions in msTBI.** Such a patient-centered DA has the potential to improve decision-making for msTBI patients by ensuring proxies receive consistent, evidence-based prognostication while also addressing patients' preferences and values. We have received funding from the NIH (in form of a K23) **to develop and pilot-test a DA for proxies of msTBI patients.** The proposed DA will carefully explain uncertainties of the predicted outcome based on the validated IMPACT TBI prognostication score, and present goals-of-care treatment options with their risks/benefits while helping the proxy consider patient's values and preferences. Currently, we are use qualitative methods to identify key factors of goals-of-care decisions after msTBI in proxies and physicians (Aim 1). We anticipate that the data collection, and hopefully analysis, for this first step will be completed by the summer 2016. The next step will be to **develop a DA prototype for goals-of-care decisions** after msTBI using iterative improvement methods involving proxies, nurses, as well as physicians caring for msTBI patients (Aim 2). Finally, in the future, we plan to pilot test the DA in proxies of critically-ill msTBI patients in a feasibility trial (Aim 3).

Student's role:

- Complete Training for Human Subjects research (CITI Certification) several weeks in advance before starting the project, in order to prevent delay related to this.
- Understand principles of Shared Decision Making and building a DA by reading and firmly understanding literature and examples provided before the start of the rotation
- Understanding the components of a DA per the IPDAS criteria
    - http://ipdas.ohri.ca/

    - http://ipdas.ohri.ca/IPDAS_checklist.pdf
- assume an active role in creating the DA with frequent check-ins with and feedback from the PI
- create the DA initially on paper
- Take pictures (with permission) of 1-2 patients in the ICU with tracheostomy and feeding tube to incorporate into DA
- visit a TBI patient in a near-by rehabilitation and nursing facility to take pictures (with permission) to incorporate into DA
- Initiate the iterative improvement process by showing the DA to proxies of prior patients, ICU nurses and physicians; receive their feedback; and make changes as appropriate (guided by PI)
- Assist in manuscript preparation later (manuscript preparation is NOT anticipated during the summer months)
- If the analysis of Aim 1 has not been completed, the student will receive the opportunity to assist in the qualitative analysis. This will include training in NVivo Software. It is not anticipated that this would delay the creation of the DA prototype.
- Bring enthusiasm and creativity to the project

Required Skills:

- Intermediate to advanced computer skills with photo processing and creation of graphics
- Intermediate digital photography skills
- Exceptional Team Player
- Outstanding ability to work with independence (guidance and frequent feedback will be provided by PI and other lab members)
- Interest in ICU and outcomes after ICU stay
- Ability to approach and communicate with multiple players, including patient family members in stress, ICU and surgical attendings, ICU nurses, and TBI patients in rehabilitation (with guidance by PI).
- Excellent professional communication skills in person and per email.
- *OPTIONAL:* computer programming skills to create a web-based DA online or even iPhone app. Even referral to a friend/colleague with these abilities would be appreciated.

Location of research:
Department of Neurology, University Campus
Neuro-Trauma ICU (Lakeside2, University Campus
Potentially few visits to near-by rehabilitation centers surrounding Worcester

5. Development of a Novel Trauma Symptom Screening Tool for Use in Pediatric Primary Care

PI: Heather Forkey, MD, Associate Professor, Pediatrics

Description:
Expanding evidence from molecular biology, genomics, immunology and neuroscience links the early experience of toxic stress with subsequent mental and physical illness. As recognition of the consequences of toxic stress has expanded, so too has interest in identification of affected children. However, it is difficult to predict individual consequences of toxic stress in children and, significantly, no single gold standard exists for the diagnosis of trauma symptoms in children. The tools that are currently available are too time consuming and cumbersome for the primary care setting, assess symptoms in only one domain, or are specific to PTSD, which, as described, is now thought to be only one of the manifestations of trauma exposure.

In order to address these current limitations, we are developing a screening tool through secondary analysis of large data sets of well validated assessment tools allow us to provide predictive values for the likelihood of a trauma diagnosis for any given child, and reducing the number of questions necessary to create a shorter screening tool with significant predictive value.

Student involvement in the project will be to work with PI to continue efforts to identify significant screening questions through factor analysis of data sets, and then testing the questions identified against de-identified patient data. This summer project will then provide the preliminary data for a larger study to validate the tool developed.

Student's role:
Student will participate in this statistical analysis of large data sets to develop screening tool under guidance of statistician and PI.

Required Skills:
Familiarity with statistical analysis, and programs including SPSS, SAS.

Location of research:
Benedict Building

6. Impact of surgical wait times of clinical outcomes in endometrial cancer

PI: Leslie Bradford, MD, Assistant Professor, Obstetrics and Gynecology

Interview required – submit CV with current contact information for an interview (leslie.bradford@umassmemorial.org)

Description:
Data from Canada and Europe indicate that surgical wait times are increasing, generally due to patient comorbidities and surgeon availability. In Canada, for instance, this was shown to have a negative impact on overall survival in endometrial cancer if the surgical wait times exceeded 12 weeks. In the United States, most comprehensive cancer centers strive to perform surgery within 2-4 weeks of initial consultation with a gynecologic oncologist. Current studies performed in the US have found no impact on survival for tumors of endometrioid histology, but have not specifically addressed the impact of surgical wait times among patients presenting with more aggressive histologies, such as clear cell or serous subtypes. This project will further explore factors that contribute to surgical wait times, including mode of surgery and patient comorbidities, and the impact these may have on progression free and overall survival, stratified by tumor histology. No specific research skills are required, but research skills gained will include familiarity with

- querying the UMass EMR and Tumor Registry
- using REDCap as a secure data repository
- working with large databases/datasets, including our institutional QI databases and UMass data collected for the NSQIP (American College of Surgeons National Surgical Quality Improvement Program)
- basic biostatistics as applied to clinical research
- writing a manuscript

Student's role:

- Shadow Dr. Bradford in Gynecologic Oncology Clinic
- Shadow Dr. Bradford in the operating room, which will include exposure to Surgical Pathology
- Attend weekly Tumor Board conference
- Assist with data entry and analysis
- Assist with writing/editing manuscript

Required Skills:
N/A

Location of research:
Memorial Campus
Levine Ambulatory Center

7. A quantitative analysis of the 3D printed models as a tool for teaching gross anatomy compared to the cadaveric prosection approach

PI: Yasmin Carter, Assistant Professor, Radiology

Interview required – please contact PI at 508-856-2182 or yasmin.carter@umassmed.edu

Description:
Cadaveric materials such as prosections, have been standard components in gross anatomy education. However, the cost and time associated with cadaveric-based programs and a trend to incorporate methods that reflect continuous scientific advancements has put the role of cadaveric-based teaching methodologies into question. Proposed 'cost effective' 3D printed models and imaging systems such as CT, MRI and advanced technological visualization platforms, are becoming commonplace; in some cases, replacing cadaveric material altogether. This progression towards 'cadaverless' anatomy programs has led to much debate regarding the effect this has on the preparedness and quality of medical students. That said, analysis of modern teaching methodologies as a replacement to cadaveric material teaching methodologies has been largely qualitative and quantitative analyses have been met with mixed results. Thus, the goal of this study is to quantitatively test the hypothesis 3D printed models are an equivalent method to the cadaveric prosection method for preparing students for standardized testing of anatomical knowledge. First year medical student participants with little to no prior knowledge of human anatomy (i.e. have not taken any undergraduate anatomy courses) will be randomly assigned to either Group 1 (prosection) or Group 2 (Models). Each participant will be given a one hour overview of the test structure – the shoulder joint and associated soft tissue structures via the study material of their respective group along with the learning objectives of the study. Assessment will be administered using multi-level tests designed to test participants' level of anatomical comprehension of the Shoulder Joint beyond basic identification skills. To replace cadaveric materials such as prosections, 3D printing methods must surpass, or at a minimum, equal its application as a method of teaching anatomy, which has yet to be proven. This study is novel in quantitatively assessing 3D printed models as an equivalent platform for learning human gross anatomy and in identifying the degree to which anatomical knowledge acquired through the standard study of cadaveric prosection can be transferred and applied to modern, technologically advanced imaging systems. Such analyses will provide objective insight into the effects of current educational trends and what role cadaveric materials, such as prosections, should play in the teaching of human gross anatomy.

Student's role:
The student will be engaged with all stages of this study and will be provided with the necessary training and supervision. Their involvement will include: 1. Design and Creation of Anatomical teaching models in the virtual environment; 2. 3D printing of models for use in the educational environment; 3. Study design and Data analysis; and 4. Contribution to the preparation of a manuscript.

Required Skills:
While the specific skills required to design and print the models will be taught, this project would ideally suit someone with graphic design, imaging and or computer modeling backgrounds. Artistic or creative skills are an asset.

Location of research:
Innovations Lab at iCels and Division of Translational Anatomy, Department of Radiology

8. Ultra-high resolution bone imaging of the cellular spaces of human bone

PI: Yasmin Carter, Assistant Professor, Radiology

Interview required – please contact PI at 508-856-2182 or yasmin.carter@umassmed.edu

Description:
In recent years there has been a resurgence in interest surrounding the functional significance of bone cell (osteocyte) density and its relation to osteoporosis. This interest has, in part, arisen from the availability of increasingly high-resolution 3D imaging modalities such as synchrotron radiation (SR) micro-CT. Through a long standing collaboration with researchers at the University of Saskatchewan and the Advanced Photon Source synchrotron, Illinois, Dr. Carter's research has focused on synchrotron-based imaging of differences in the cellular morphology of human bone with age and sex.
Bone is not only a mechanical structure, but also serves as a reserve for calcium. This dual function is particularly significant in female mammals and birds, as they face increased physiological demands associated with reproduction. Dr. Carter has recently found differences in both the density and size (volume) of cellular spaces within cortical bone of women of different ages (Carter et al., 2014). That said, the network of osteocytes also represents the bulk of surface area within bone for the exchange of nutrients and wastes, including calcium. The objective of the current project is to expand this sample to both men and women. The hypothesis that osteocyte density and size varies significantly about the femoral diaphysis and that this variation is different between men and women will be tested. Bone samples derived from the anterior, posterior, medial and lateral aspects of the femoral cortex of both sexes will be imaged by synchrotron radiation micro-CT at the Advanced Photon Source synchrotron. A novel high resolution approach developed by Dr. Carter will be employed to assess osteocyte density in 3D - counting 10's of thousands of cellular spaces (lacunae) in each sample. A repeated measures ANalysis Of Variation (ANOVA) will be utilized to test for differences between the cortical regions while controlling for intra-individual variation. These data will provide new insights into the functional adaptation of bone at the cellular level and have the potential to inform numerous areas of research in bone biology.

Reference: Carter, Yasmin, et al. "Femoral osteocyte lacunar density, volume and morphology in women across the lifespan." *Journal of structural biology* 183.3 (2013): 519-526

Student's role:
The student will be engaged with all stages of this study and will be provided with the necessary training and supervision. Their involvement will include: 1. Preparation (including removal and embedding) of samples; 2. Remote collection of ultra-high resolution 3D Imaging at the Advanced Photon Source synchrotron (Argonne National Laboratories, Illinois); 3. Data analysis; and 4) Contribution to the preparation of a manuscript.

Required Skills:
N/A

Location of research:
Department of Radiology, Division of Translational Anatomy

9. Comparison of 3D printed models and 3D virtual models for understanding the functional neuroanatomy and vasculature relevant to stroke

PI: Eustathia Lela Giannaris, PhD, Assistant Professor, Radiology

Interview required – please contact PI at 508-856-7898 or eustathiaLela.giannaris@umassmed.edu

Description:
A strong foundation in functional neuroanatomy and its blood supply is essential for identifying and interpreting stroke symptoms. Educating future physicians to localize lesions using clinical imaging requires an understanding of the three---dimensional (3D) anatomic relationships of brain and vascular structures. Studies assessing the effectiveness of student learning using 3D physical and virtual reality models in the setting of anatomy education have yielded mixed results. Therefore, it is important to assess which 3D visualization method will be most efficacious for viewing the clinical anatomy relevant to understanding stroke, especially given decreasing amounts of instructional time allotted for the preclinical curricula. Providing future physicians with additional opportunities to use 3D visualization methods to study these key clinical anatomic relationships early in their medical training has the potential to meaningfully improve the future of stroke care.

The overall goal of the proposed project is to develop an interactive educational module using 3D models for teaching key clinical anatomic relationships relevant to stroke. We hypothesize that Interactive sessions utilizing 3D physical models compared to 3D virtual models will be more effective in enhancing medical students' understanding of the clinical anatomy of stroke.

Aim 1: Create 3D physical and virtual models demonstrating brain regions and vascular supply using patient imaging data from normal and pathological cases
Computed tomography angiography (CTA)---derived imaging data will be used to create two identical representations: (1) 3D printed, physical models and (2) 3D virtual, computer---rendered models on an Anatomage virtual dissection table. During an interactive session, students will explore one of the models and identify brain and vascular structures, noting their relationships.

Aim 2: Evaluate the efficacy of using 3D physical versus virtual models in interactive teaching sessions using measures of student learning
The efficacy of the interactive sessions using 3D physical versus virtual models will be compared by evaluating student performance on pre-test, immediate post-test, and 8 week retention post-test assessments. Identification, function, and clinically focused questions will assess students' ability to use information on vascular anatomy and apply clinical reasoning in the context of lesion localization in stroke.

Aim 3: Utilize assessments of satisfaction to compare the efficacy of using 3D physical versus virtual models in interactive teaching sessions
A primary level of assessment of these teaching methods will involve students answering questions related to the effectiveness of the 3D model as a learning tool, ease of use, recommendation of future use, and overall satisfaction.

The 3D visualization methods determined to be most efficacious in this project proposal will be implemented in the second year clinical neuroanatomy curriculum. The proposed study is unique because of its use of multi---level models for stroke education. The field of clinical anatomy will benefit from the development of 3D multi---level models for use in medical education.

Student's role:
The student will be responsible for leading a side project of this research. He/she will mainly be involved in learning and conducting pulmonary function tests in mice including whole body plethysmography and lung resistance and compliance. They will be involved in collecting and analyzing data and will be first author on a poster.

Required Skills:
N/A

Location of research:
Albert Sherman Building
iCels

10. Dynamic imaging of human cancer cells in their native microenvironment

PI: Andrew H. Fischer, MD, Pathology

Interview required - submit via email - 3-4 line statement of interest with current contact information for an interview (andrew.fischer@umassmemorial.org)

Description:
In spite of years of progress, the diagnosis of cancer is still based on the microscopic appearance of cells and tissues. These diagnostic microscopic changes in cancer cells and tissues, based on over a century of observations, consist entirely of static, snap-shot images of fixed, dead cells. Within only the past few years, it has become possible to visualize the diagnostic anatomy of cancers at high resolution in living fragments of tissue, thereby collecting "movies" of human cancer cells in the cells native environment. If a picture is worth a thousand words, a movie speaks millions. Our research has shown surprising dynamic types of structural changes in cancer cells (e.g., nuclear rotations, and dynamic deflections of the nuclear lamina). These dynamic morphologic features include changes induced directly by the cancer genes that are active in human cancers. We believe the dynamic changes in various cancers will include a large variety of new criteria for diagnosis and prognostication. More important, dynamic changes in cell structure, mediated by cancer genes, expose new cancer cell physiologies that could not be discoverable using current static imaging, physiologies that are not expected based on our current understanding of cancer cell genetics. In collaboration with Dr. Michael Sanderson in the Dept. of Physiology at UMASS, we are beginning to establish the conditions for acquiring dynamic images of human tissue microbiopsies or vibratome sections of human cancers immediately after their surgical resection. We use two photon microscopy and cell-permeable vital dyes. Two-photon microscopy minimizes phototoxicity of the visualization process, and allows the capture of virtual "optical sections" at high resolution exactly translatable to the images pathologists currently obtain when performing physical sections of paraffin embedded (dead) tissues. This is a new field that will undoubtedly become more important in coming years.

Student's role:
A student will be supervised closely and taught to: help refine the platform for the collection and visualization of the living tissues, including thin sectioning of ex vivo cancer specimens using a vibratome; operate the two photon microscope to collect, edit and stack 2d images into a time lapse movie; quantify dynamic behaviors of the cancer cells; and maintain the reagents needed for the work. Work will focus on thyroid cancer development in which our lab has published the existence of oncogene-mediated dynamic diagnostic cellular behaviors that are still uncharacterized.

Required Skills:
N/A

Location of research:
UMMS 5th Floor

11. **1. Pilot – Gestational Diabetes Mellitus and Adipose Tissue Function (GEDMAT)**
    2. Collection of Biologic Specimens

(It should be noted that the primary study is GEDMAT. However if time allows, the student will be involved in collection of biologic specimens that are specific to L&D (e.g. placenta, umbilical cords and cord blood). These specimens help support research activities in numerous basic science labs both at UMass and WPI).

PI: Tiffany A. Moore Simas, MD, MPH, Med; Director, Ob/Gyn Research Division; Associate Director, Ob/Gyn Residency Program; Associate Professor of Ob/Gyn & Pediatrics

Interview required – please contact PI's assistant at 508-334-6678 or sharon.smith@umassmemorial.org

Description:
GEDMAT Description:

Affecting 3-8% of gravidas, Gestational Diabetes Mellitus (GDM) is one of the most common pregnancy complications. GDM is an important predictor of future health risk of mothers and their offspring. Mothers with GDM are at long term risk of T2DM (50% in 5 years), metabolic syndrome and CVD, and offspring are at risk of abnormal glucose intolerance, obesity and metabolic syndrome across the life course. Despite pregnancy being associated with weight gain and being an insulin resistant state promoted by diabetogenic placental hormone production, there are multiple other known and unknown contributors to GDM risk. Obesity is the single most powerful risk factor for GDM development; however the association between **gestational weight gain (GWG) and GDM is less consistent, raising the question of what factors distinguish non-pathogenic versus pathogenic weight gain in pregnancy.** It has been proposed that the expandability of SQ adipose tissue (SQAT) is a critical factor that links weight gain to T2DM risk, and that visceral AT (VAT) macrophage infiltration and inflammation are additional contributors to insulin resistance. **In this research project, we will leverage novel techniques established to perform a quantitative study of SQ and VAT stromal and vascular architecture and angiogenic expandability in pregnancy.** We will determine the degree of adipocyte hypertrophy, inflammatory state and angiogenic capacity, and compare these features between normal and GDM pregnancies. We hypothesize that insufficient SQAT expandability underlies GDM risk. A prospective cohort of pregnant women (GDM cases and non-diabetic controls) meeting inclusion/exclusion criteria, with plans for a scheduled Cesarean delivery for obstetric indications, will be enrolled. Biological specimens including SQAT, VAT, placenta and maternal serum will be collected at delivery. Regression models that control for potential confounders, including prepregnancy body mass index, gestational weight gain, GDM-treatment modality (i.e., diet, oral hypoglycemic agents and insulin) and pregnancy-induced hypertension, will be used to evaluate each of the study aims. **This line of inquiry has the potential to become a landmark study in our understanding of the role of AT in the development of GDM, a condition that significantly increases women's and their children's risk of cardiometabolic sequelae.** The mechanistic insights derived from this work will facilitate approaches for screening, monitoring, intervention and even prevention opportunities for mothers and children affected by GDM, especially in high-risk populations.

Student's role:

1. Prescreen surgical/clinical schedules and charts to identify eligible candidates
2. Assist in contacting attending physicians and getting permission for their patients to be approached for the study
3. Assist in mailing letters to potentially eligible candidates and maintaining contact logs and HIPPA relevant documents
4. Approaching patients to explain study and consenting them into study
5. Administering study-specific surveys and tools
6. Performing study-specific physical assessments including weight measurement, skin-fold thicknesses, waist/hip/arm/thick circumferences, BP measurements, etc
7. Attendance at surgeries for collection of biologic specimens; transport of specimen to Corvera lab (Biotech)
8. Chart review for study-specific data
9. Data collection, data entry and data cleaning
10. Maintenance of study stipend logs
11. Other study-related activities

Required Skills:

1. Socially comfortable people-person who is at ease in a clinical environment with multi-disciplinary, inter-professional team members.
2. Great communication skills – written and verbal.
3. Meticulous with consistent focus regarding detail.
4. Ability to follow protocol and navigating medical record systems.
5. Ability to drive/access to transportation
6. CITI certification

Location of research:

UMass Memorial Health Care – Memorial Campus
(transport of specimens to and lab meetings in Biotech 2)

12. Use of smartphone technology to improve communication between the patient, therapist and physician

PI: Marci Jones, MD, Clinical Associate Professor, Orthopedic Surgery

Interview required - submit via email - 3-4 line statement of interest with current contact information for an interview (andrew.fischer@umassmemorial.org)

Description:
This is a follow up to the project "Technology survey and text messaging pilot study for use of technology following distal radius fracture." The purpose of that study was to collect data regarding the use of smart phones in adults with distal radius fractures and demonstrate proof of concept for the use of mobile technology in these patients. This was a successful study and demonstrated that patient were willing to communicate with the treatment team via text messaging after being seen for a distal radius fracture. We had excellent follow up with the patients were able to instantly communicate with our team with minimal effort. In addition, a leveling feature, available as a preinstalled feature on a smartphone was used to measure joint range of motion. The values obtained were compared to goniometer measurements and demonstrated that the phone was as accurate and precise as the goniometer. Overall, this previous study demonstrated that we could use a smart phone as both a measurement device and a method of easy rapid communication with patients.

Our new study wishes to expand on these initial aims with the goal of validating this tool as a method of accurately communicating important clinical information between the patient and treatment team. We believe this will be a valuable tool to improve patient care and satisfaction.
Within this new proposal there are 4 specific aims:

1) To gather data on the use of smartphones in an outpatient clinical setting.
2) To test the accuracy and performance of a smartphone leveling feature to measure joint range of motion in patients with a variety of hand pathologies.
3) To determine ability of patients to accurately and independently use the leveling feature to record and report range of motion measurements.
4) To demonstrate proof of concept that this smartphone feature can be used in conjunction with patient text messaging to accurately measure progress from home between scheduled appointments.

Student's role:
Assist with patient recruitment, enrollment and data collection. Assist with development and testing of home therapy video protocol.

Required Skills:
Strong organizational and interpersonal skills are needed, as well as familiarity with use of a smartphone. Video editing and statistical experience would be helpful but not required.

Location of research:
Hahnemann and University Campus

13. EM Research (Emergency Medicine Research)

PI: Edwin D. Boudreaux, PhD; Professor Departments of Emergency Medicine

Interview required - submit via email - CV and a 3-4 line statement of interest with current contact information for an interview (edwin.boudreaux@umassmed.edu) and (donna.lesperance@umassmed.edu). Interview will be in person or by phone; after review of application materials.

Description:
Student can engage in a range of research, including: Patient reported outcomes; Behavioral health screening; Suicide prevention; other medical conditions and problems. Learn research methodology, design, and implementation. Assist with data collection, entry, and management for research studies. Interact with patients and healthcare personnel in the Emergency Room.

Student's role:
Assess eligibility of research subjects in accordance with HIPAA regulations for IRB approved protocols. Obtain patient consent as delegated by IRB protocols. Review medical records to prescreen subject eligibility. Collect, record, evaluate and update pertinent data in relation to the study protocol. Conduct chart reviews. Perform literature searches. Maintain patient and study subject confidentiality.

Required Skills:
Experience using computer-based tools, familiarity using databases and conducting data entry. Ability to interact professionally with a wide range of hospital patients, in addition to clinical and professional staff. Excellent organizational and time management skills.

Location of research:
University Campus – Level A

14. Pediatric Behavioral Screening Through a Trauma-informed Lens

PI: Valerie F. Pietry, MD, MS, Assistant Professor, Family Medicine and Community Health

Interview required - submit via email - 3-4 line statement of interest with current contact information for an interview (valerie.pietry@umassmed.edu)

Description:
Pediatric primary care populations are commonly screened for indicators of behavioral health conditions, needs and disparities in the setting of well child and problem-focused visits. The variety of screening tools available to providers in Massachusetts is in part determined and often mandated by agencies which support and insure the care of vulnerable populations. Such tools include the Child Behavioral Health Initiative (CBHI) list of behavioral screens, and the SBIRT Risk and Resiliency Questionnaire required by the Massachusetts Department of Public Health in the setting of School-Based Health Centers (SBHCs). Positive behavioral health screens become the basis for referral to primary care-based behavioral health and community resources in an integrated behavioral health model, both in traditional primary care medical homes and in SBHCs.

A growing body of evidence now points to the impact of traumatic exposures and chronic environmental psychosocial stressors in childhood on the developing brain. This phenomenon, known as "toxic stress", has been associated with identifiable alterations in physiologic functioning and genetic expression over time. There is further research in adult populations demonstrating that traumatic experiences and stressors in childhood, termed Adverse Childhood Experiences (ACEs), are associated with poor health outcomes in adulthood, examples of which include obesity, asthma, diabetes, and depression. The unifying conceptualization of these adverse experiences as an independent risk factor in childhood is an area in which further study is needed, ultimately to vet and validate screening tools in primary care settings, which in turn might prompt more proximal trauma-informed interventions. Furthermore, in urban underserved, culturally diverse populations such as those seen in Worcester, particularly in the public school community, there are additional potential disparities in access to appropriate screening tools for trauma and ACEs which take into account the experiences of refugees, immigrants, and patients whose first language may not be English.

The Family Health Center of Worcester cares for over 5000 children, including children from newly arrived refugee and immigrant families as part of our Refugee Health program. Additionally we extend access to the medical home model into six school-based health centers located across the City of Worcester in partnership with the Worcester Public Schools. Dr. Pietry has served as Medical Director for the FHCW SBHCs for over 10 years and during the same time has provided ADHD care in the SBHCs. It has become our experience that increasing numbers of behaviorally symptomatic children, as well as students from refugee and immigrant populations, are seen in the SBHCs and identified with medical and behavioral health care needs. Consequently, the partnership between Family Health and the Worcester Public Schools has grown this academic year to include access to integrated behavioral health services in 5 of these 6 SBHCs. This model is becoming increasingly relied upon as SBHCs are being seen, by virtue of addressing the medical and behavioral needs of at-risk and trauma-exposed youth on site, as a means to increase school performance, graduation rates and to address high rates of suspension. Additional opportunities are anticipated in the next year to establish an integrated behavioral health model in a trauma-informed school site and to provide behavioral health access in the New Citizens' Center, a school setting which specifically addresses the educational and support needs of resettled refugee and immigrant populations with disparate educational status.

We anticipate a need to broaden our expertise in delivering trauma-informed care to our pediatric populations, in part associated with the influx of refugee and immigrant families into Worcester, and their children into the public school system, eg, the New Citizen Center. We propose a project that will focus primarily on a goal of reorienting the existing processes of mandated pediatric behavioral health screening to incorporate a trauma-informed method of interpretation in vulnerable populations. This will be accomplished by assessing currently available screening tools for their ability to identify at-risk youth in need of behavioral intervention for indicators of possible trauma exposure, referring to primary care for consideration of a follow-up, specific, trauma assessment for those identified, and referring confirmed cases on to follow-up care with appropriate behavioral health providers and community resources.

Student's role:
The students will work closely with the faculty PI and affiliated faculty and SBHC staff to fulfill the project's specific aims:

1) Identify existing screens for trauma and/or ACEs in pediatric populations and their current validity status across diverse populations, including refugees, immigrants and patients with limited English proficiency or low health literacy.
2) Identify correlates from existing, required screening tool questions, such as CBHI and SBIRT screens, which may indicate a trauma history on the identified trauma and ACEs screens, including any applicable thresholds and norms.
3) Identify disparities in screening tools or correlated questions aimed at health risks specific to refugee and immigrant populations.
4) Identify a care pathway for referral for patients with positive screening questions within an integrated behavioral health care model.

Required Skills:

1) Understanding of the role of screening tests in a public health framework of primary, secondary and tertiary prevention.
2) Literature search skills
3) Understanding of the process of validation of screening tools.
4) Cultural competency.
5) Diplomacy among varying constituencies in the community

Location of research:
Family Health Center of Worcester and affiliated School-Based Health Centers
26 Queen Street

15. Group Prenatal Visits at a CHC: Making a Difference

PI: Sara G. Shields, MD, MS, FAAFP and Jennifer Averill Moffitt, CNM, Family Medicine and Community Health

Interview required – submit via email – prior lab experience preferred, not required
(sara.shields@umassmed.edu)

Description:
Group prenatal care has been shown to reduce preterm birth and improve breastfeeding and other postpartum outcomes, particularly in women traditionally at risk for poor perinatal outcomes such as urban, low-income minority women.[1] The Family Health Center of Worcester is an accredited site for the Centering Pregnancy program and has been doing group care including groups in Spanish, Portuguese, and Vietnamese since 2007 for 50-80 women annually, or about 20 percent of our overall prenatal population. Preliminary results indicate improved breastfeeding rates among our group women compared to women served through traditional individual visits. We have a database for our perinatal population to collect various demographic, clinical and outcome measures. We seek a summer student to help us review this database and analyze our retrospective data to understand if our outcomes match the published outcomes and to target further improvements in our program based on this analysis. We have qualitative patient satisfaction data about the groups and need to develop a similar survey for our overall perinatal population to address how to improve both group care and our overall care. We have four bilingual/bicultural perinatal community health workers ("advocates") who are an integral part of the logistics of our group program and with whom the student will work closely. We have also been piloting doing ongoing mother-baby well groups after delivery; the student will help us develop a plan for assessing the outcomes of this program as well.

Student's role:
1) assist with chart reviews to help clean up data;
2) set up data analysis to compare group women with individually-seen women for several birth outcomes including preterm birth, birthweight, breastfeeding at discharge;
3) assist with ongoing data collection for groups in 2016;
4) assist with coordinating group activity supplies and ideas;
5) assist with development of perinatal program patient satisfaction survey; assist with development of assessment tool(s) for mother-baby well groups.

Required Skills:
Basic Excel skills, biostatistics helpful

Location of research:
Family Health Center of Worcester
26 Queen Street

[1] Ickovics, J. R., Kershaw, T. S., Westdahl, C., Magriples, U., Massey, Z., Reynolds, H., et al. (2007). Group prenatal care and perinatal outcomes: A randomized controlled trial. *Obstetrics and Gynecology*, *110*(2 Pt 1), 330-339.

16. Ca2+ signaling in airway smooth muscles (ASMC) and its relevance to asthma

PI: Michael J. Sanderson, Professor, Microbiology and Physiological Systems

Interview required – submit via email – CV with current contact information for an interview (michael.sanderson@umassmed.edu)

Description:
Airway hyperresponsiveness is driven by excess ASMC contraction which in turn results from Ca2+ oscillations. Consequently, we need to understand how Ca2+ oscillations occur in ASMCs and can be modified to induce ASMC relaxation. However, Ca2+ oscillations appear to be greatly modified by cell culture – the common way to exam cell function. In this project, we will define how Ca2+ oscillations differ in cultured smooth muscle cells as compared to intact slices of lung tissue and intact trachea in response to contractile agonists. This definition will be extremely valuable in determining the best approach to understand ASMC Ca2+ oscillations and how they relate to asthma. The project will involve tissue culture of ASMCs and the cutting of precision cut lung slices with extensive advance fluorescence microscopy using a 2-photon microscope. Animal work is involved.

Student's role:
Perform all tissue preparations from mice and all microscopy experiments. Analyze and present data.

Required Skills:
Enthusiasm for basic research – research experience a plus

Location of research:
University Campus

17. Farm to Health Center Initiative

PI: Melanie Gnazzo, MD, Assistant Professor, Family Medicine and Community Health

Interview required – 3-4 line statement of interest with current contact information for a phone interview (melanie.gnazzo@umassmed.edu)

Description:
The Farm to Health Center Initiative is a collaboration between the Community Harvest, the Family Health Center of Worcester and UMass Medical School that was developed by medical students in 2011. The Community Harvest Project is a non-profit farm located in Grafton and Princeton MA dedicated to hunger-relief. The Family Health Center of Worcester is an urban Federally Qualified Community Health Center serving a diverse and medically underserved population. The goals of the initiative are to 1) provide free, local produce during the summer to patients at the Family Health Center of Worcester who have food needs 2) develop education about food insecurity for providers and staff at the Family Health Center of Worcester 3) use quality improvement methods to evaluate and improve on the program. Food insecurity can be defined as a lack of access to enough nutritious food for all household members to lead an active and healthy life.

Students have been key participants in developing this program, including:
- developed and completed a patient needs-assessment in the form of a survey
- presented proposals to the Family Health Center Board of Directors
- implemented a weekly, free farm-stand style produce distribution at the Family Health Center during the summer growing season, including coordinating volunteers from the Family Health Center and from the Community Harvest Project
- developed nutrition education about the produce available each week
- developed recipes and samples to provide at the distribution each week

Additionally, students have provided education about food insecurity to medical providers and the community, including:
- presented to Family Health Center providers during resident "Learning Lunches" and provider meetings
- discussed food insecurity on "Food Movement Radio" 91.3 Worcester community radio
- presented posters about the project at local and national medical conferences
- presented workshops at regional medical and public health conferences

Student's role:
During the summer of 2016, students will have an active role in implementing and coordinating a free produce distribution to patients in need at the Family Health Center of Worcester. As the distribution typically starts late-summer, depending on seasonal harvest variations, students will spend the initial weeks learning about food insecurity and its impact on health, developing a brief quality improvement tool and method for evaluation of the 2016 season, in addition to coordinating final details to make the distribution successful. New to the program, students will be working with specific patient clinics, such as school based health centers, obese youth, and pregnant women. Students will meet 1-2 times weekly during the summer with the faculty to review progress. Students will be expected to present a summary of the summer distribution to the providers, staff and patients at the Family Health Center of Worcester. Students are invited and encouraged, though not required, to engage in the program during the spring of 2016 when the majority of planning for the summer distribution takes place.

Required Skills:
The ideal student will be self-directed and an independent worker. Knowledge of Spanish or another language would be helpful, but not required.

Location of research:
Family Health Center of Worcester
26 Queen Street

18. Adolescent Self harm and Social Media

PI: Jennifer Carey, Emergency Medicine, Medical Toxicology

Interview required – Brief informal interview - please contact PI at Jennifer.carey@umassmemorial.org

Description:
The current study is to identify subjects who present to the hospital after a toxic ingestion in a self-harm or suicide attempt. Patients will be given a survey which will focus on two different areas. First, they will be questioned regarding pharmaceuticals used, where they were obtained, what their intended outcome was. Charts will be reviewed for comparison to gather data on severity of illness, treatments, and outcomes. Second, subjects will be asked questions in regard to their social media use, and whether they posted anything on social media in regard to their current attempt. Lastly, patients will be consented to allow us to review their social medial posts. Content posted by the subject will be analyzed with the goal of determining if we are able to predict adolescents at risk for self-harm attempts based on their social media postings.

Student's role:
Enroll patients in study and administer patient survey, review chart for relevant clinical information, review, analyze data from social media posts.

Required Skills:
N/A

Location of research:
Emergency Department

19. A historical examination of the side effects of certain drugs used in anesthesia – was information disclosed or suppressed?

PI: Manisha Desai, MD, Anesthesiology

Interview required – CV with current contact information for a phone interview (manisha.desai@umassmemorial.org)

Description:
The introduction of new drugs into the US market is a long and complicated process. Some of the drugs used during general anesthesia were introduced into clinical use during the last century, and regulations may not have been as stringent during that time. We wish to study one drug from each of the major categories of perioperative medications – morphine, thiopental, d-tubocurarine, halothane, and succinylcholine. The plan is to obtain information about side effects that were reported to government authorities when approval was sought. In addition, we will examine discussion of side effects in original articles and advertisements related to the drug's properties. This information will be compared to side effects reported when drug use became common. We wish to determine whether there was any evidence of deliberate suppression of side effects. Such suppression would help introduce the drug to the market, however, it is possible that the limited studies carried out to obtain permission may not have detected these side effects.

Student's role:
Gain familiarity with background information about the drugs, research original articles related to the introduction of the drugs, examine advertisements that accompanied the introduction of the drugs, get information about reports of side effects reported to authorities at the time of introduction and those reported subsequently in the literature.

Required Skills:
Use of library and internet based medical literature.

Location of research:
University Campus

20. Cognitive Training for Word-finding difficulty in Parkinson disease

PI: Kara Smith, MD, Assistant Professor, Neurology

Description:
Cognitive impairment is common in Parkinson's disease (PD) and is associated with more severe disease course and worse quality of life, but treatment of cognitive symptoms remains a huge gap in our clinical arsenal. Early cognitive symptoms, including speech changes such as word finding difficulty, are common but research has been limited by a lack of sensitive assessment tools. Since spontaneous speech requires multiple simultaneous cognitive processes occurring in real-time to attain fluency, speech may be a sensitive tool to detect subtle cognitive impairment.
In previous work, I found that in linguistic analysis of a speech sample, PD participants indeed demonstrated more pauses within utterances than age-matched controls, in particular before verbs, and these pauses correlated with word finding difficulty symptoms.

The first goal of this study is to expand on our prior preliminary research on linguistic markers of early cognitive impairment in PD. This work will further explore the cognitive processes underlying word finding difficulty by focusing on pausing before verbs. We will utilize technologies such as signal processing software to detect cognitive changes as early as possible. We will also evaluate the impact of early cognitive changes on quality of life using a newly validated questionnaire.

Our second goal is to improve early cognitive symptoms using an online cognitive training program. Study participants will perform cognitive training using Brain HQ in their home environment for 3 months. We will evaluate the performance metrics on Brain HQ tasks, and changes in speech, neuropsychological tests, and cognitive symptoms after completion of this program.

Student's role:
The student will be exposed to all steps of the study design and implementation process. The student will be involved in study participant screening and consent. They will perform assessments of speech and cognition. They will assist in monitoring performance and adherence to the online cognitive training program, and will assist in interpreting performance metrics from Brain HQ. They will participate in validating methods for linguistic analysis of speech samples. The student will learn clinical research skills including clinical trial design, logistics such as obtaining IRB approval, and database management.

Required Skills:
Interest and enthusiasm for patient-centered clinical research

Location of research:
University Campus

21. Visual detection of AAV-vector transgene integration by guide-RNA strategies

PI: Guangping Gao, PhD, Professor, Microbiology and Physiological Systems

Interview required – CV with current contact information for an interview (Guangping.gao@umassmed.edu) and (Phillip.tai2@umassmed.edu)

Description:
Recombinant adeno-associated viruses (rAAV) are regarded as a highly robust platform for the delivery of therapeutic gene products to treat genetic disorders. Development of rAAV vectors, which are non-replicating and non-pathogenic, is well-documented and show great promise in numerous clinical trial programs. With the recent development of highly efficient gene-editing tools, such as CRISPR/Cas9 methodologies, the interest in rAAV as a clinically safe vehicle for the expression of gene-editing enzymes has gained immediate interest. Therefore, it is increasingly critical to demonstrate that current and future rAAV vectors in development do not cause genotoxic events in tissues they are delivered to. There is recent evidence that certain rAAV vectors can result in tumorigenic lesions in the liver. The mechanism underlying genotoxicity is not fully understood, but the prevailing theory is that rAAV transgenes that carry powerful expression cassettes can trans-activate critical oncogenes or cause genetic instability of the host genome under low-frequency genomic integration. Several studies within the past decade support these hypotheses, but comprehensive methods to detect these rare events are time consuming and resource constraining.

Our research group is interested in determining the mechanism underlying rAAV vector integration. More specifically, we are exploring whether certain attributes of viral vector design are prone to either targeted or random integration in treated tissues. With this knowledge, we hope to develop next-generation vectors that do not elicit a genotoxic response when delivered to patients. Because current detection methods for vector integration are labor intensive and cannot detect single integration events, new approaches need to be explored.

Recently, a platform for visualizing sequence-specific genomic regions in live cells was developed. The approach utilizes guide-RNAs to recruit the catalytically inactive Cas9 enzyme (dCas9) that is fused to a protein scaffold known as a SunTag. The SunTag scaffold in turn promotes the multimerized recruitment of GFP molecules to single genomic sites in live cells. Thus, we aim to develop a CRISPR/dCas9-SunTag platform for the quick assessment of rAAV integration in live cells. This methodology therefore represents a novel and efficient method for screening integration potential for current and future rAAV vector designs.

Student's role:
The student will be closely mentored in the development of the CRISPR/dCas9-SunTag platform to detect low-level rAAV integration events in mammalian cell-culture. The student will learn basic cell biology, molecular biology, concepts in global gene regulation, and virology. Standard DNA cloning strategies, fluorescence microscopy, and cell culture techniques will be employed on a daily basis. The student is also strongly encouraged to attend and present at weekly lab meetings.

Required Skills:
Previous laboratory experience is preferred. A background in molecular and cell biology is strongly recommended.

Location of research:
University Campus

22. Interconception Care (ICC) at Family Health Center of Worcester (FHCW)

PI: Virginia Van Duyne, MD

Interview required – CV and 3-4 line statement of interest with current contact information for a phone interview (virginia.vanduynefhcw@umassmed.edu)

Description:
The interconception period is the time between a woman's delivery and her subsequent conception. It is a crucial time for making changes in a woman's health whereas traditional interventions during a woman's pregnancy have not been successful. Certain populations such as the patients at FHCW are especially at risk for poor birth outcomes, including low birth weight and preterm birth. Interconception Care (ICC) aims to identify modifiable risk factors (depression, smoking, lack of folic acid supplementation and lack of contraception) prior to a subsequent pregnancy. Our working hypothesis is that detecting and modifying these risk factors during the interconception period will decrease rates of low birth weight and preterm birth.

The ICC initiative has been in development at FHCW for the past three years. Currently, mothers are being screened for the risk factors at well child visits from ages 0-2 on all 4 family medicine teams. Maintenance of screening rates requires an ongoing effort of communication and data interpretation. We strive to improve these rates even further.

Student's role:
The student, in collaboration with the ICC team (resident, faculty and staff) will help increase ICC screening rates, documentation rates and implementation of interventions through quality improvement techniques. Methods will include chart auditing, data interpretation, communication with teams about rates, and the use of PDSA (Plan-Do-Study-Act) cycles to improve processes. In addition, the student will analyze the screening data to determine which risk factors are most prevalent and help to discover ways to improve the interventions done by providers.

Required Skills:
Microsoft excel use (ability to analyze simple data and generate graphs), communication skills (with provider teams, supervisor)

Location of research:
Family Health Center of Worcester
26 Queen Street

23. A Novel Subunit Dengue Vaccine

PI: Daniel Libraty, Professor of Medicine

Interview required – 3-4 line statement of interest with current contact information (daniel.libraty@umassmed.edu)

Description:
Dengue is the most prevalent arthropod-borne viral illness in humans with half of the world's population at risk. There are four serotypes of dengue viruses (DENVs 1-4). Developing a DENV vaccine is the primary preventive goal for disease control. In order to prevent serial infections with more than one DENV serotype, vaccination strategies have been examining products directed against all 4 DENV serotypes simultaneously. We propose a novel subunit dengue vaccine approach in order to induce broadly neutralizing antibodies against DENVs 1-4. A synthetic peptide that recapitulates two conserved conformational epitopes on the DENV envelope protein will be linked to yeast-cell derived recombinant hepatitis B surface antigen (the hepatitis B vaccine) as a carrier. The project will involve chemically conjugating the peptide to the hepatitis B vaccine and performing Western blots to check the subunit dengue vaccine product.

Student's role:
Laboratory work – see description

Required Skills:
Prior lab experience preferred, not required

Location of research:
University Campus
Medical School Building

24. Gene Therapy for Fatty Acid Oxidation Defects

PI: Mai Elmallah, MD; Assistant Professor, Pediatrics and Gene Therapy, Division of Pulmonary Medicine

Interview required – CV with current contact information for an interview in person interview (mai.elmallah@umassmed.edu)

Description:
Very long-chain acetyl-coenzyme A dehydrogenase (VLCAD) deficiency is an autosomal recessive mitochondrial disorder which can induce cardiac and multi-organ failure. It is the most common disorder of long-chain fatty acid metabolism. VLCAD is necessary for the metabolism of fat into glucose. Therefore, in VLCAD deficiency (VLCADD), the body cannot break down fat, and depends on glucose for energy. Half of VLCADD cases occur in infants, and can result in sudden infant death syndrome (SIDS) when the time between feeds is prolonged, and VLCADD is usually discovered too late. Fortunately, in the US, all states offer newborn screening for VLCADD, but there is no cure for infants when they are diagnosed. If there is a period of prolonged fasting, acute metabolic decompensation can occur. This project has the potential to provide a therapeutic option for this primary mitochondrial disease for which there is currently no cure. The UMDF is the best funding source for this project because this is a primary mitochondrial disease and there is a strong potential that this project will lead to a treatment or cure for VLCADD.

Student's role:
The student will be involved in experimental design, data collection, data interpretation and presentation.

Required Skills:
A basic knowledge of pulmonary physiology

Location of research:
Albert Sherman Building