UNIVERSITY OF MASSACHUSETTS
MEDICAL SCHOOL
OFFICE OF MEDICAL EDUCATION

MEDICAL STUDENT
SUMMER RESEARCH FELLOWSHIPS

CATALOGUE
2007

Directors:
Michael Godkin, PhD
Family and Community Medicine

Anthony Poteete, PhD
Molecular Genetics and Microbiology

Program Coordinator:
Christine Locke
Office of Medical Education

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March 2007

1. Cancer

TITLE: **Integrated Cytology and Fluorescent InSitu Hybridization for Bladder Cancer Detection**

Ediz Cosar MD and Lloyd Hutchinson PhD
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UMMC
Anatomical Pathology, Laboratory of Diagnostic Molecular Oncology
Three Biotech, Room 276
One Innovation Drive
Worcester Ma 01605

Project Description: Bladder cancer is the second most common urologic malignancy in the United States. At least 30% of bladder malignancies are detected after they have become invasive. This complicates treatment and is associated with a worse outcome. A reliable and accurate assay is needed to screen individuals within the high-risk category and detect bladder cancer before it becomes invasive. However, the available noninvasive methods lack the accuracy needed for routine use as a screening tool. Two main types of non-invasive assays are in clinical use. These include proteomic and cell-based assays. Cell-based assays include detection of exfoliated tumor cells through cell morphology (cytology), chromosomal abnormalities (UroVysion FISH) or aberrant protein expression. These cell-based assays have complementary properties: cytomorphology has poor sensitivity but high specificity (99%) whereas detection of chromosomal abnormalities or aberrant proteins confers high sensitivity (80-90%) with mediocre specificity. Urine cytology is used to distinguish between normal and abnormal urothelial cells and facilitates the exclusion of other cell types (e.g. inflammatory cells). Cytology suffers particularly in the detection of low-grade urothelial neoplasms that make up the majority of new diagnoses. Conversely FISH is reported to have high sensitivity but insufficient specificity to be used as stand-alone assay in new diagnosis of urothelial neoplasms. This raises the possibility that a single test combining the strengths of both assays would provide the accuracy needed for a solitary screening tool.

The Laboratory of Diagnostic Molecular Oncology has developed a novel assay integrating Cytology and FISH by employing a robotic microscope to automatically capture morphology images and FISH images of the same cell in sequential scans. Preliminary data supports the hypothesis of improved sensitivity, specificity, positive and negative predictive power for the integrated Cytology and FISH assay. A retrospective study of patient specimens with equivocal urine cytology (e.g. atypical or suspicious findings) and outcome data (e.g. a bladder biopsy) will be used to verify the accuracy and utility of this non-invasive urine assay.

Student's Role:

1. Aid in the identification of specimens suitable for the retrospective study.
2. Aid in the processing and imaging of specimens using the automated microscope imaging station.
3. Aid in classification of specimens that are positive/negative for FISH abnormalities
4. Aid in the creation/maintenance of a clinical database for statistical analysis of the data.

Required Skills: Computer literacy

Interview: Required
We would like to outline the project in more detail, and give the student a tour of the lab.

Location: Three Biotech, Room 276
One Innovation Drive
Worcester, MA 01605

2. Cancer

TITLE: Visualizing Cancer Development at Subcellular Resolution in Time Lapse

Andrew H. Fischer, MD
(508) 793-6140
Fischa01@UMMHC.ORG

Biotech 3, Room 213
One Innovation Drive
Worcester, MA 01605

Project Description: In spite of years of progress, the diagnosis of cancer still requires pathologists to examine a biopsy under the microscope. All of the criteria that pathologists use for diagnosis are based on "snap-shot" images of fixed (dead) cells. Surprisingly, almost nothing is known about how or why cancer cells are structured differently from normal cells! My lab has shown that the genes that cause cancer also directly cause the changes in cell structure that are diagnostic of cancer. We are particularly interested in learning how and why some cancer genes cause the nucleus to change from being spherical in shape to irregular. This summer research project will allow the dynamics of irregularity of nuclear shape to be studied in time lapse, in cells' native microenvironment. Students will learn about the cell biology of cancer with a high likelihood of contributing to a published study. An ideal student will bring some computer expertise to allow the confocal microscopy images to be converted to 3-d images, strung into a movie, and analyzed to relate the dynamics of the nuclear lamina to particular phases of the cell cycle, or to particular cytoskeletal elements.

Student's Role: Assistance with procuring human tissue samples and culturing human cells; adenoviral infections to introduce a green-fluorescent protein conjugated to lamin A into the human tissue sample to allow the nuclear envelope to be visualized; assisting with confocal microscopy and manipulating and analyzing the confocal images.

Interview: Required

Location: Tissue will be procured at Memorial or University campuses. Tissue culture work will be performed at Biotech 3. Confocal microscopy and computing stations are in the Medical School.

3. Cancer

TITLE: Effect of Ionizing Radiation in Prostate Cancer Cell Survival

Lucia Languino, MD
(508) 856-1606
Lucia.languino@umassmed.edu

UMMC
Department of Cancer Biology
LRB 417
Worcester, MA 01655

Project Description: Research will be foxused on the effect of ionizing radiation on integrin functions in prostate cancer. The student will become familiar with basic knowledge of prostate cancer biology and moleculare and cellular biology techniques.

Student's Role: During the training, the student will become familiar with basic knowledge of prostate cancer biology and molecular and cellular biology techniques.

Required Skills: None

Interview: Required

Location: LRB 417

4. Cancer

TITLE: The Role of PKD1-TGF-β Signaling in Prostate Cancer Cells

Paul Mak, PhD, (508) 856-8695 Paul.mak@umassmed.edu

Department of Surgery, LRB, Room 503, 364 Plantation Street, Worcester, MA

Description: The major focus of our laboratory is to understand the molecular mechanisms in the development of hormone refractory prostate cancer (androgen-independence), which is resilient to chemotherapy and androgen ablation.
The intricate balance between cell growth/proliferation factors and apoptosis-inducing factors is key to the regulation of prostate growth. Transforming growth factor beta (TGF-β), a negative growth factor is an important regulator of prostate cell growth due to its ability to inhibit epithelial cell proliferation and induce apoptosis. More interestingly, androgen receptor and TGF-β signaling are mutually inhibitory in prostate cancer, i.e. overexpression of androgen receptor (AR) could overcome the growth inhibitory effects of TGF-β in PC3 cells in the absence of hormone (5α-DHT) whereas TGF-β reduced AR transcriptional activation by 5α-DHT. Our prior differential gene expression studies (Dr. K.C. Balaji) by microarray analysis in progressive prostate cancer cell line model identified dysregulation of protein kinase D1 (PKD1) expression (down regulation) in prostate cancer. Immunohistochemical studies of prostate cancer tissue from patient progressing to androgen independent prostate cancer demonstrated a significant decrease in PKD1 expression. This observation highly suggests a functional role for PKD1 in progression to androgen refractory tumor. More importantly, we recently demonstrated that PKD1 also interacts with the androgen receptor. Thus we initiated a pilot study to examine the effects of this protein complex on TGF-β signaling in prostate cancer cells. Specifically, we will address the following questions:

(1) Can PKD1 affect the growth inhibitory effects of TGF-β in the absence or presence of AR expression in PC3 cells?
(2) How does TGF-β affect the distribution of AR within the cell compartments, i.e. cytoplasmic vs. nuclei?

Student's Role:	Learn to design experiments and interpret data Presenting data on a biweekly basis Learn to write manuscript Interact with other lab members
Required Skills:	Tissue Culture Mammalian cell transfection and luciferase assays Molecular cloning Protein expression and detection by Western blots Confocal Microscopy
Interview:	Required
Location:	LRB Room 540

5. Cardiovascular

TITLE: Regulation of Transmembrane Signaling in the Heart

James Dobson, PhD
(508) 856-3775
James.dobson@umassmed.edu

University of Massachusetts Medical School
Department of Physiology
55 Lake Avenue, North
Worcester, MA. 01655

Description: Student would carry out a project involving the determination of how left ventricular function is affected by cardioactive agents in intact and genetically modified mouse hearts.

Student's Role: Student would carry out a project involving the determination of how left ventricular function is affected by cardioactive agents in intact and genetically modified mouse hearts.

Required Skills: None in particular, but perhaps an interest in small animal surgery.

Interview: Required

Location: UMass Medical School

6. Cardiovascular

TITLE: Regulation of Intracellular Signaling in the Heart

James Dobson, PhD
(508) 856-3775
James.dobson@umassmed.edu

University of Massachusetts Medical School
Department of Physiology
55 Lake Avenue, North
Worcester, MA. 01655

Description: Student would carry out a project involving the determination of how protein kinases and phosphates are affected by cardioactive agents in normal and genetically modified mouse hearts.

Student's Role: Student would carry out a project involving the determination of how protein kinases and phosphates are affected by cardioactive agents in normal and genetically modified mouse hearts.

Required Skills: None in particular, but perhaps an interest in cellular biochemistry.

Interview: Required

Location: UMass Medical School

7. Education

TITLE: Integration of Second Year Course Websites

John Leong, MD, PhD
(508) 856-4059
john.leong@umassmed.edu

University of Massachusetts Medical School
Department of Molecular Genetics and Microbiology
Room S6-214
55 Lake Avenue, North
Worcester, MA 01655

Project Description: Lyn Riza and Andrea Barrett (IS Dept), Susan Pasquale (OME) and I (MedMicro Block 3 Coordinator) have developed a website for the Medical Microbiology course. The site contains course information, lecture notes, practice exams, summary tables and a few links to outside sites. The lecture notes often include links to slides that are shown in class, so that lectures can be reviewed in their entirety by computer. In addition, the website contains two practice exams that can be taken by students on the computer.

A former medical student has generated many links between the summary tables of the third Med Micro block to the lecture notes. I am now seeking a medical student to continue this work this coming summer, and to link Med Micro practice exam questions to the appropriate places in the lecture material. No particular background in microbiology or programming is required. The student would work closely with IS and me, and would have access to all of the hardware and software required.

The benefits to the course are immense: the links placed by the student would facilitate efficient review of course material. The website is evolving to promote the formation of intellectual connections that facilitate learning. The student should also benefit by learning state-of-the-art web programming, and by reviewing and previewing first and second year course material. I anticipate that student input into design will be significant. I believe this is a great way to solidify the vast amount of material that med students are asked to incorporate. Furthermore, it is possible that a role for the student in the evolution of the website may extend beyond the summer.

Student's Role: Student(s) will work closely with Lyn Riza to acquire expertise in web programming and generate links within and between websites. John Leong (Coordinator of Medical Microbiology) and John McCullough (Coordinator of Pharmacology) will provide support for the material covered. The student(s) will also be heavily relied upon to make the site user friendly and an efficient tool for learning course material. Ideally, if the links between the MedMicro and Pharm websites can be finished in time, the student would help identify useful links between the websites of different courses.

Required Skills: Some computing background useful.

Interview: Required

Location: IS Department

8. Education

TITLE: The application of Mindfulness to training residents in cultural competency

Deborah T. Rana, MD
(508) 943-5224
Deborah.rana@umassmed.edu

South County Pediatrics
Department of Pediatrics
336 Thompson Road
Webster, MA 01570

Project Description: The MBSR (mindfulness based stress reduction) curriculum used at the Center for Mindfulness will be adapted for use in clinical Pediatrics by tailoring it as part of a training program for Pediatric residents. This project was chosen as one of ten research proposal to the PAS Educational Scholars program of the APA.

Student's Role: The student will assist the PI in the development and submission of an IRB application to the human subjects committee of Umass medical school. In addition, the student will get to test some of the techniques of mindfulness (body scan, sitting meditation and yoga) and help the PI design shortened scripts for production of CDs of a shortened duration to fit a busy resident's schedule. Lastly, we will review video tapes, articles and models for cultural competency and design a noon lecture for residents about culture.

Required Skills: Interests in developing skills of cultural competency, experience and exposure to diverse cultures, interest and experience in meditation and mindfulness as a practice, writing skills and self-reflection skills.

Interview: Required

Location: We will meet either in Worcester at or near Umass medical school.

9. Genetics

TITLE: HPV-induced Genomic Instability

Jason J. Chen, PhD
(508) 856-1857
Jason.chen@umassmed.edu

UMass Medical School
Department of Medicine
LRB Room 323
364 Plantation Street
Worcester, MA 01605

Project Description: Infection with human papillomavirus (HPV) is necessary but not sufficient for the development of cervical cancer. An unstable genome caused by HPV may enable cells to accumulate additional genetic abnormalities necessary for carcinogenesis. Although the prophylactic HPV vaccine has recently become available, it will not be effective against all types or for those who are already infected or are immunosuppressed. Therefore, therapies for HPV-associated diseases are still worthwhile to pursue. An unstable genome in the form of polyploidy (cells containing >2 sets of chromosomes) has been implicated in a causal role in carcinogenesis. The E7 gene from HPV induces polyploidy but the mechanism is not well understood. Our preliminary data demonstrate that induction of re-replication (extra rounds of DNA replication without mitosis) is a mechanism by which E7 induces polyploidy. Interestingly, the replication initiation factor Cdt1, whose uncontrolled expression induces re-replication in cells, is increased, modified, and localized to the nucleus specifically in E7 expressing cells, and this correlates with E7-induced re-replication. This project is designed to examine the role of Cdt1 in E7-induced re-replication and explore the mechanism by which E7 modulates Cdt1. These studies will shed light on mechanisms by which HPV induces genomic instability and hold promise for the development of drugs that target this process.

Student's Role: To perform experiments to examine the role of Cdt1 in HPV E7-induced re-replication and/or some other issues related to HPV-induced genomic instability

Required Skills: No special requirements

Interview: Required

Location: LRB 370F-G

10. Genetics

TITLE: Molecular Mechanism of Gene Amplification

Anthony R. Poteete, PhD, (508) 856-3708, anthony.poteete@umassmed.edu

Department of Molecular Genetics and Microbiology
Room S6-119, 55 Lake Avenue North, Worcester, MA 01655

Project Description: Gene amplification is a well-known and biologically widespread mechanism in which a small portion of an organism's genome is selectively and repeatedly replicated, out of synchrony with the rest of the genome. The result is a cell that has many copies of one or a few genes, but only one or two copies of all the others. The amplified genes are typically expressed at elevated levels, commensurate with their elevated copy numbers. Gene amplification is known to play an important role in three key processes: (1) In the development of many animals, gene amplification is employed transiently to supply the products of particular genes at very high levels when needed. (2) Over-expression through gene amplification is one of the processes by which normal genes become cancer genes in tumorigenesis. (3) Amplification of genes conferring weak resistance to chemotherapeutic agents is a well-known mechanism by which both infectious agents and cancer cells can develop effective drug resistance.

Employing genetic engineering techniques, we have recently constructed a variant strain of the common laboratory bacterium *E.coli,* with a duplication of a weakly functional gene, called *lacIZ33*, in its chromosome. Placed under conditions which demand the function of *lacIZ33*, this strain exhibits a remarkably high frequency of amplification—higher than any chromosomal mutation event we know of in a cell with normal DNA replication and repair functions. It appears to be an ideal system for learning more about the molecular mechanisms underlying gene amplification.

The specific aims of the research are designed to answer two key questions: (1) Which of the cells many DNA recombination/repair functions are necessary for amplification? (2) How does variation in the structure of the amplified unit affect the efficiency of amplification?

The experimental approach will be based on genetics. Mutant strains lacking DNA recombination/repair functions will be constructed and tested for their ability to undergo amplification. Similarly, strains with structurally different precursor duplications will be constructed and tested. In constructing these strains, we will be making extensive use of chromosomal engineering techniques originally developed in our lab.

Student's Role: Working with the PI on all aspects of the research

Required Skills: Keeping good notes

Interview: Required

Location: UMMS, Room S6-110

11. Genetics

TITLE: Characterization of Epigenetic Switches in Yeast

Oliver J. Rando, PhD
(508) 856-8879
Oliver.rando@umassmed.edu

University of Massachusetts Medical School
Department of Biochemistry and Molecular Pharmacology
LRB, Room 903
Worcester, MA

Description: Our lab has isolated a number of genes in yeast that exhibit heritable changes in expression pattern without any changes in DNA sequence. We have strains carrying fluorescent fusions to these genes that we use to identify switching frequencies. The purpose of this project will be to explore the environmental conditions that affect these switches, and to screen for mutants that block switching.

Student's Role: Entire project – yeast growth, transformation, and microscopy.

Required Skills: Yeast culture and media preparation

Interview: Required

Location: LRB

12. Genetics

TITLE: Role of Alternative Splicing in Human Diseases

Ravindra N. Singh, PhD
(508) 856-1333
Ravindra.Singh@umassmed.edu

University of Massachusetts Medical School
Department of Medicine
LRB 326
364 Plantation Street
Worcester, MA 01605-2324

Project Description: Alternative splicing increases the coding potential of the human genome by producing multiple proteins from a single gene. It is also associated with a growing number of human diseases such as cancer, cardiovascular diseases and neuronal diseases. Thus understanding the mechanism of alternative splicing has direct therapeutic implications. Over the past several years, my laboratory has acquired unique expertise to address various aspects of alternative splicing. In particular, we have identified novel targets to correct the aberrant splicing of spinal muscular atrophy gene. Currently, we are interested in cis-elements and transacting factors that regulate alternative splicing of a number of genes.

Student's Role: There are various projects available. For example, student will have opportunity to do a project on alternative splicing of a particular gene involved in one of the human diseases. There is also opportunity to study the global profiling of genes after correction of aberrant splicing.

Required Skills: Basic molecular biology techniques are desirable

Interview: Required

Location: LRB 360A,B

13. Immunology

TITLE: **Tests of Yeast Cell particles (YCP's) as Combined Vaccine Vectors and Adjuvants.**

Donald Tipper, PhD, (508) 856-2308, Donald.tipper@umassmed.edu

Department of Molecular Genetics and Microbiology
Room S6-228
55 Lake Avenue, North
Worcester, MA 01655

Project Description: YCP's, made from yeast cells expressing recombinant protein antigens, can be rapidly manufactured, are cheap and have the potential for being orally effective vaccines that can be administered in dry pill form. This would eliminate the need for refrigeration for storage and transportation, the "cold chain" that is a major factor preventing effective immunization in the non-industrialized world.

Elicitation of an adaptive immune response requires endocytosis of an antigen by an antigen-presenting cell (APC: dendritic cell, macrophage) in physical association with a Toll-Like Receptor (TLR) or other receptor occupied by its cognate ligand. These ligands are generally conserved microbial components such as a cell wall polymer (LPS, peptidoglycan, glucan, mannan etc.). Interaction with TLR's activates the APC (adjuvant effect) enabling presentation of any associated antigens to T-cells in local lymph nodes, mimicking response to microbial infection. Yeast cell wall β-glucan is a strong adjuvant, highly conserved in fungi, and is also recognized by receptors on M cells in the Peyer's patches lining the small intestine. This interaction results in efficient translocation of an orally delivered vaccine dose to the APC's of the gut-associated lymphoid tissues. Glucan is masked in intact yeast cells. Chemical extraction both kills the yeast cells and exposes glucan, producing effective YCP's vaccines.

We are in the process of testing this vaccine delivery system in mice. Green fluorescent protein (GFP) is used as a convenient model antigen and GFP fusions are being used to test responses to important antigens such as viral capsid proteins, avian influenza hemagglutinin and the Alzheimer's Abeta peptide.

Student's Role: Help with expression vector construction**,** analysis of expression in yeast, YCP vaccine production and analysis and testing of immune responses in mice by ELISA and other assays.

Required Skills: Familiarity with recombinant DNA methods and protein gel techniques would be an advantage. Willingness to work with mice and standard laboratory skills are important.

Interview: Required

Location: Laboratory S6-223

14. Immunology

TITLE: Retrospective and prospective review of MS patients who received chemotherapy with interferon immunomodulating therapy to assess for long term complications either hematological or cardiac

William Tosches, MD, FAAN
(508) 473-4323
WATMD1945@aol.com

UMASS
Department of Neurology
54 Hopedale Street
Hopedale, MA 01747

Description: The project will be a retrospective and prospective review of MS patients who received chemotherapy with interferon immunomodulating therapy to assess for long term complications either hematological or cardiac.

Student's Role: The student will be expected to learn how to use the electronic record for data collection and analysis and be expected to write a short paper, suitable for a poster presentation at a national or international MS meeting.
Would prefer a student interested in neurology but that is not necessary. The student would work out of my office several days weekly and should be able to complete the work in the time allotted.

Interview: Required

Location: 54 Hopedale Street
Hopedale, MA

15. Immunology

TITLE: Dicer Dependent B Cell Functions?

Robert T. Woodland, PhD
(508) 856-2465
Robert.Woodland@umassmed.edu

University of Massachusetts Medical School
Dept. of Molecular Genetics and Microbiology
55 Lake Avenue, North
Worcester, MA 01655

Project Description: Small RNA molecules produced by the action of the enzyme Dicer, have been shown to regulate numerous eukaryotic genes. We would like to determine the potential role of these small RNAs in regulating basic B lymphocyte functions including the response to growth factors and mitogens. In collaborative studies with Dr Steve Jones we have produced two lines of mice in which the dicer gene is flanked by lox P sites allowing excision of the gene in the presence of CRE. The mouse lines express CRE under the control of CD19 or MX promoters. We would like to impair small RNA expression in B lymphocytes by dicer excision and determine the effect on B cell development (CD19 promoter) or on the invitro response of mature B cells to growth factors or mitogens (MX promoter).

Student's Role: Cell preparation and analysis by FACS, in vitro cultures determining mitogen and growth factor responses by DNA replication , survival and Western Blotting of critical signaling molecules and transcription factors.

Required Skills: Preparation of lymphocyte populations, making cell extracts for biochemical studies. Molecular biology techniques helpful

Interview: Required

Location: UMass Medical School
Room S5-248

16. Medication

TITLE: Chronic Pain Management

Hugh Silk, MD, (508) 334-8846, silkH@ummhc.org

Hahnemann Family Health Center
279 Lincoln St
Worcester, MA. 01605

Description: In an effort to treat our chronic pain patients with more respect and avoid having them develop an addiction problem we want to revolutionize how we treat chronic pain in our health center. We will create a system that converts our chronic pain patients from short acting prescription narcotics to one of three options: long acting prescription narcotics with adjuvant therapy, suboxone (a combination pain receptor odulator/blocker used for weaning off of narcotics), or voluntary dismissal from the practice. We would like to track our results to evaluate if this new protocol system is beneficial to patients and providers. We need to propose data to record how many patients we have on chronic narcotics, develop criteria for success of converting their pain management plan, develop a system that can be replicated by all physicians in our institution and possibly beyond, and evaluate how providers respond to this change.

Student's Role: Over the 8 weeks the student will be actively involved in helping to research and design a chronic pain management protocol for our patients that converts them to alternatives to short acting narcotics. This literature search will help form the basis for a clinical revolution in our health center. The student will also help design parameters for following the success of the conversion of pain management for our patients. These parameters will be used in this phase of the study (pre testing) as well as in the post testing phase once the new pain management protocol is implemented. The student will be responsible for assessing the charts of identified patients to record what medications they are on, if a pain medication contract is present, etc. The student will help complete an application for the IRB department. The student will help design spread sheets for recording the data and setting up a process for following the data over time. The student will be invited to return to Hahnemann in the future (next summer) or as a senior project to see the fruition of the research. They will be offered the opportunity to co-author the research in the future.

Required Skills: Motivation, interest in pain management, and lots of energy are mandatory. Writing skills are helpful, previous research is helpful but neither are necessary.

Interview: Phone interview accepted

Location: Hahnemann Family Health Center

17. Neurology

TITLE: Imaging Evaluation of an Embolic Stroke Model

Marc Fisher, MD
(508) 334-6543

UMMHC
Memorial Campus
119 Belmont Street
Worcester, MA 01
55 Lake Avenue North
Worcester, MA 01655

Project Description: The student will help in our ongoing analysis of the diffusion/perfusion mismatch in our embolic stroke model in rats. She will work closely with Berndt Bratane, a graduate assistant in our research group. The focus of the research is to determine if visual inspection of the mismatch region compares in accuracy to threshold derived identification of the mismatch. The student will be trained in region of interest analysis of the MRI scans for identification of the diffusion and perfusion lesions. She will then be asked to trace the lesions identified visually on the two scans and to derive a lesion volumes by summating the areas on each slice. She will assist in the data analysis of the lesion volumes derived by the two methods, visual inspection and thresholding by predefined abnormal values. During the animal experiments to acquire the data, she will assist by drawing blood samples for analysis of blood gases and other parameters such as glucose and hematocrit/hemoglobin. She will receive training in the use of our blood gas machine and our metabolic analyzer.

Student's Role: As described above

Location: Center for comparative neuroimaging in the Biotech Park

18. Orthopedics

TITLE: **Mechanical Regulation of Articular Cartilage Extracellular Matrix Turnover**

Paul Fanning, PhD
(508) 856-3054
Paul.fanning@umassmed.edu

UMass Medical School
Department of Orthopedics
Room S4-850
55 Lake Avenue North
Worcester, MA 01655

Project Description: "Osteoarthritis is one of the most high-impact disorders of all time. Thirty million Americans have osteoarthritis and this number is expected to almost double over the next 30 years as the population of baby boomers approaches old age. Current treatments range from over-the-counter dietary supplements to total joint replacement surgery. However, no treatment yet exists that will effectively prevent or halt the progression of osteoarthritis. The major effectors of osteoarthritis are a class of degradative enzymes termed 'matrix metalloproteinases' (MMPs). The expression of these enzymes is controlled by several specific intracellular signaling pathways. We have recently found the activation of these signaling pathways in cartilage tissue subjected to abnormal loading conditions. Since osteoarthritis is defined as a disease of abnormal wear and loading, we anticipate that this finding represents a first step towards understanding the relationship between loading and the tissue destruction of osteoarthritis. It also represents the first time in basic cartilage biology research that a mechanical signal has been found to be turned into a specific biochemical signal. We wish to extend this line of pursuit to the analysis of the genes (MMPs) expressed specifically by these stress-activated pathways and inhibit their appearance through the use of pathway-selective inhibitors. Treatments that interfere with the expression of MMPs are likely to slow the progression or even prevent osteoarthritis, thereby reducing the impact and incidence of this disorder."

Student's Role: Student would take active participation in basic science research on above project. 40+hrs/week would be required. It is my hope that the student takes a hands-on approach right from the start to make the best of his/her 4 weeks. I will be present and available for the entire 8-week period.

Required Skills: Knowledge of protein sample preparation, protein quant. assays, SDS-PAGE, immunoblot. Note: these skills can be acquired fairly rapidly in my lab.

Interview: Required

Location: Dept. of Orthopedics
University Campus, UMMS

19. Orthopedics

TITLE: **Assessing physical activity and function to improve outcomes after total knee replacement**

Patricia D. Franklin, MD, MBA, MPH
David Ayers, MD Chair – Orthopedics
Ferrin Williams, MD
Lance Warhold, MD
Jack Wixted, MD
Contact: Janel Milner (508) 856-2202
Janel.Milner@umassmed.edu

UMMC
University Campus
Orthopedic Surgery
55 Lake Avenue, North
Worcester, MA

Project Description: Orthopedic Research is growing in many of its specialty areas such as Spine, Hand & Total Joint. These summer positions offer the medical student an opportunity to actively participate and observe many "in-progress" research studies in the areas of biomedical, outcomes research and clinical trials. Students will also have the opportunity to work with physicians in the laboratory, ambulatory clinic as well as in surgical settings as part of their summer experience. Responsibilities include a variety of tasks; from patient interviews to data management and all will give a variety of exposure to the latest research in the Orthopedic Sciences.

Are you interested in rehab or how patients fair after surgical intervention? If you are interested in Outcomes Research you may also want to apply for a summer position in Orthopedics, whether or not your long term ambitions are in a specific area of an Orthopedic specialty. Here you will begin to learn the general skills applicable to research in other medical specialties.

Interview: Required

Location: University campus Dept of Orthopedic Surgery

20. Orthopedics

TITLE: Using the internet, email, and self-monitoring to engage patients in chronic arthritis care

Patricia D. Franklin, MD, MBA, MPH
David Ayers, MD Chair – Orthopedics
Ferrin Williams, MD
Lance Warhold, MD
Jack Wixted, MD
Contact: Janel Milner (508) 856-2202
Janel.Milner@umassmed.edu

UMMC
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Orthopedic Surgery
55 Lake Avenue, North
Worcester, MA

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Interview: Required

Location: University campus Dept of Orthopedic Surgery

21. Orthopedics

TITLE: Clinical and patient predictors of surgical outcome in patients with carpal tunnel syndrome

Patricia D. Franklin, MD, MBA, MPH
David Ayers, MD Chair – Orthopedics
Ferrin Williams, MD
Lance Warhold, MD
Jack Wixted, MD
Contact: Janel Milner (508) 856-2202
Janel.Milner@umassmed.edu

UMMC
University Campus
Orthopedic Surgery
55 Lake Avenue, North
Worcester, MA

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Interview: Required

Location: University campus Dept of Orthopedic Surgery

22. Orthopedics

TITLE: Modulation of Fracture Healing by Runx2

Marci Jones, MD, Julie Liu, PhD, John Wixted, MD, Jane Lian, PhD

Contact Person: Janel Milner
Janel.milner@umassmed.edu
(508) 856-2202

UMass Memorial Medical Center
Departments of Orthopedic Surgery and Cell Biology
55 Lake Avenue, North
Worcester, MA. 01655

Description: This project aims to characterize the role of Runx in fracture healing in a murine model. There are two main arms of this study based on the level of Runx2 expression. In one mouse model, the Wnt antagonist secreted frizzled related protein 1 (sFRP1) is non-functional and results in a high bone mass phenotype and of the Runx2 transcription factor that is essential for bone formation. The other mouse model has a non-functional isoform of Runx2 resulting in runted growth and delayed bone formation. Pilot studies using these mice in a tibia fracture model have shown increased callus formation in sFRP1 knockout mice and decreased callus formation in the Runx2 isoform knockout. Studies are planned to further characterize fracture healing as well as intramembranous bone formation, including radiographic and histologic evaluation.

Student's Role: The student would be expected to participate in genotyping, creation of the fracture, radiographic monitoring of the healing fracture, preparation of histologic specimens and data analysis.

Interview: Required

Location: UMass Memorial Medical Center

23. Orthopedics

TITLE: A prospective study assessing overhang and its clinical significance in the Depuy Johnson and Johnson PFC sigma total knee replacement.

James Nairus, MD
Assistant Professor
Chief of Adult Reconstructive Surgery
508-334-9760
nairusj@ummhc.org

UMMHC
Memorial Campus, Arthritis and Joint Center
Orthopaedic Surgery
119 Belmont Street
Worcester, MA

Project Description: Much advertising has been done recently about whether a gender specific total knee replacement is necessary because female distal femurs tend to be more narrow than their male counterparts. I will be measuring the amount and location of any overhang of the metal femoral component in all patients using a specific total knee replacement system that is not considered gender specific. I will be comparing those patients who had no overhang to those with overhang to determine if there is any clinical significance to overhang of a component. I will be measuring pre-operative functional scores and comparing this to post-operative functional scores.

Student's Role: **H**elp collect the pre-operative and postoperative functional scores from the patients and enter these into a data base. This would require him to interact with all of my total knee replacement patients. It would also require some data entry as well.

Required Skills: good interpersonal skills

Interview: Required

Location: Memorial Campus

24. Orthopedics

TITLE: The Effect of Montelukast Sodium on Fracture Repair

John J. Wixted, MD
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Contact Person:
Janel Milner
(508) 856-2202
Janel.milner@umassmed.edu

UMMC
University Campus
Orthopedic Surgery
55 Lake Avenue, North
Worcester, MA

Project Description: Fractures can take from 6 to twenty weeks to heal in adults. Fractures which take many months to heal can be painful, cause people to lose mobility, and have significant economic and societal impact. As our population ages, fractures from weak bones are becoming increasingly common. Treatments which cause fractures to heal faster and more reliably could be useful for millions of people. We propose to study two drugs which are FDA approved for use in asthma treatment to see if they can make fractures heal faster. Specifically, a fracture study using a knockout mouse deficient in 5-lipoxygenase showed 30% faster fracture repair. We have an IACUC approved study to determine if pharmacologic treatment with either montelukast sodium (Singulair) or zileutin (Zyflo) will have similar effect, and will be conducting a fracture study in mice to test this hypothesis.

Student's Role: Daily mouse gavage of study medications, histology sample preparation, some small animal surgery

Required Skills: Will train

Interview: Available by email, wixtedj@ummhc.org

Location: University campus Dept of Orthopedic Surgery

25. Psychiatry

TITLE: **A Study to Determine the Effectiveness Prenatal Emotional Health Screening**

Rebecca Lundquist, MD, (508) 334-7445, LundquiR@ummhc.org

Department of Psychiatry, 361 Plantation Street, Worcester, MA. 01605

Description: It is estimated that 10-15% of women will experience a depressive episode in the year following the birth if a child, and the rate is double that for women in poverty. While anxiety disorders in the peri- and postpartum are less well researched, there is some thought that these may be even more common than depressive disorders in the same periods. Additional risk factors for postpartum depression include a history of depression and a lack of social support. Untreated depressive and anxiety disorders in pregnancy are unlikely to end once the baby is born and both depressive and anxiety symptoms during pregnancy are thought to be risk factors for PPD. Depression affects both the mother and the baby. When caught early, however, PPD can be very responsive to treatment. Many new mothers do not recognize the symptoms of depression in themselves, and as such, do not seek treatment. However, with appropriate screening and intervention tools, healthcare providers can be adept at recognizing PPD and, with the support of trained clinical staff, make appropriate referrals. In the Worcester area, there is screening for depression both peril- and postpartum as part of the federally funded Healthy Start program at Great Brook Valley Health Center but this program misses a significant number of pregnant and postpartum women in Worcester and does not screen for the presence of anxiety symptoms. The present study proposes to implement a two-level Prenatal Emotional Health Screening (PEHS) in two Worcester area OB/GYN clinics serving low-income, underserved women. The PEHS will consist of a standardized screening both pre- and postpartum, and follow-up assessments with trained clinicians where indicated. Expected outcomes include increased awareness of PPD and postpartum anxiety among clinic staff, increased screening for PPD and anxiety disorders, and increases in appropriate referrals for support and treatment.

Student's Role:	To help in all aspects of the study that will be ongoing this summer -- patient recruitment and screening, data analysis, liaison with obstetrical providers at the clinics where we will be recruiting patients
Required Skills:	Basic patient interviewing skills (first year medical student course is sufficient)
Interview:	Required
Location:	Worcester -- Worcester State Hospital, UMMHC- Memorial Campus, Great Brook Valley Health Center

26. Psychiatry

TITLE: Clinical Research Opportunities in Psychiatry

Douglas M. Ziedonis, MD, MPH
Professor and Chair, Department of Psychiatry
University of Massachusetts Medical School
UMass Memorial Medical Center
55 Lake Avenue North
Worcester MA 01655
ph: 508-856-3066
fax: 508-856-2725
Email: ZiedoniD@ummhc.org

Project Description: The Department of Psychiatry has a well developed research program in clinical and health services research. The Department has strengths in addiction psychiatry (tobacco dependence, co-occurring addiction and mental illness), mood disorders (psychopharmacology), Law and Psychiatry, Criminal Justice System, Psychosocial Treatments in the Community (Schizophrenia), Child and Adolescent Psychiatry (children & families with mental illness, Developmental Disorders), and Primary Care Psychiatry (integrating mental health in primary care settings). Our approaches are varied and include psychopharmacology, behavioral therapy development, organizational change, and health services research. Several Principal Investigators are interested and willing to mentor medical students on projects.

Please contact Dr. Ziedonis if you are interested in this area of research and he will facilitate linking you with the specific faculty member.

Student's Role & Required Skills: We will tailor the position to the medical student's prior skills and experience. We desire a well organized and team oriented individual; with excellent writing skills. Our goal is for the student to have a written paper as a result of this activity.

Interview: Required

Location: Worcester UMass Campus

Additional information may be found on the Department of Psychiatry website: www.umassmed.edu/psychiatry.

27. Psychiatry

TITLE: Basic Science Research Opportunities in Psychiatry

Douglas M. Ziedonis, MD, MPH
Professor and Chair, Department of Psychiatry
University of Massachusetts Medical School
UMass Memorial Medical Center
55 Lake Avenue North
Worcester MA 01655
ph: 508-856-3066
fax: 508-856-2725
Email: ZiedoniD@ummhc.org

Project Description: The Department of Psychiatry has a well developed research program in basic sciences within the Brudnick Neuropsychiatric Research Institute (BNRI) which has a common focus on the elucidation of the principles underlying addiction. The faculty is doing research in several areas related to addiction (nicotine, cocaine, and alcohol) and psychiatric disorders (schizophrenia, depression, and Alzheimer's). The research focuses on the molecular bases of psychiatric disorders. Our approaches are varied, and will provide exposure to a wide range of cutting edge techniques, including behavioral testing, brain imaging, cellular imaging, and the molecular biology of neuroadaptation to drugs of abuse. Several Principal Investigators are interested and willing to mentor medical students on projects.

Please contact Dr. Ziedonis if you are interested in this area of research and he will facilitate linking you with Dr. Steve Treistman (Director of the BNRI) and the specific faculty member.

Student's Role & Required Skills: We will tailor the position to the medical student's prior skills and experience. We desire a well organized and team oriented individual; with excellent writing skills. Our goal is for the student to have a written paper as a result of this activity.

Interview: Required

Location: Brudnick Neuropsychiatric Research Institute (BNRI) on the campus of Worcester State Hospital (across from the University Campus).

Additional information may be found on the Department of Psychiatry website: www.umassmed.edu/psychiatry.

28. Public Health

TITLE: Adulterants, Drugs, Coingestants and Associated HIV Risk

Edward Boyer, MD, PhD
(508) 421-1400

Contact Person: Christina McAuliffe (508) 421-1462
Christina.mcauliffe@umassmed.edu

University of Massachusetts Medical School
Department: Emergency Medicine
55 Lake Avenue, North
Worcester, MA. 01655

Description: The ultimate goal of this research is to explore the relationship between the twin epidemics of substance use and behaviors that may increase the risks of HIV transmission. We intend to estimate the magnitude of drug, adulterant, and coingestant use and their impact on HIV transmission risk behaviors among men who have sex with men (MSM) attending venues in Provincetown, MA.

Student's Role: Under the supervision of the Principal Investigator, the Research Assistant is responsible for recruiting MSM to participate in this study, assist in the identification of appropriate venues for recruitment, getting proper consent, administering the questionnaire, and collection of a urine sample.

Required Skills: Absolute comfort with the gay community and men who have sex with men, and with sexually explicit and vernacular language, discussions and interview materials that address high risk sexual and drug taking behaviors.

Interview: Required

Location: Provincetown, MA

29. Public Health

TITLE: Physician and Healthcare Workforce Planning

Linda Cragin
(508) 856-4303
Linda.cragin@umassmed.edu

MassAHEC Network and MA Dept. of Public Health, Primary Care Office
222 Maple St.
Chang Bldg
Shrewsbury, MA 01545

Project Description: Opportunity to work in a innovative partnership of UMass Medical School and the Mass. Dept of Public Health to identify and assess health professions shortage areas (HPSA), a shortage designation determined by the federal government. Specific focus for a medical student during the summer is physician allocation and retention in medically underserved communities. Certain projects could result in publication or national presentation.

Projects to include:

- Survey of recipients of Conrad 30 J1-Visa recipients and analysis to determine reasons for retention or lack thereof.
- Work with Mass. Board of Registration in Medicine to assess data resources and additional data needed to inform state policy and practice. Includes review of other state practices and lessons learned. May result in similar process with other Boards of Registration or Licensure for other health care disciplines.
- Collect and analyze data for federal submission/re-submission of HPSAs, including survey implementation and follow-up.

Student's Role: Student will participate on a team currently assessing opportunities and challenges of physician recruitment and retention, particularly for underserved and vulnerable populations. Student will be expected to provide coordinate these projects. These projects could be revised depending upon student interests and background.

Required Skills: Quantitative, ability to work on a team and also independently, and communicate clearly – both verbally and in writing.

Interview: Required

Location: Boston, MA

30. Public Health

TITLE: Injury Free Coalition for Kids

Michael Hirsh, MD/ Mariann Manno MD

Contact Person: Colleen McGuire
508-793-6015
mcguirec@ummhc.org

UMass
Department of Surgery/Pediatrics
55 Lake Avenue North
Worcester, MA

Project Description: The Injury Free Coalition for Kids is a physician-led program driven by the Coalition's mission: preventing injury to children. While research determines where the injuries take place and which ones most prevalent and severe, most of the injuries addressed occur in urban environments, and Coalition members work to empower the diverse populations who live there. They do so by helping people to make their communities safer and they do it in a manner that is respectful of various cultures, beliefs, and lifestyles. Current Projects include: Teen driving safety, ski helmet safety, car seat safety, gun safety, home safety, playground safety and bicycle safety.

Student's Role: Student will oversee a project from start to finish including: Literature review, needs assessment, program design and implementation and program evaluation.

Required Skills: Must be able to work independently and exhibit strong initiative and self-starting skills. Must have an interest in preventing childhood injury.

Interview: Required

Location: University and Hahnemann Campus, Community at Large

31. Public Health

TITLE: CHC/CMHC Pilot Demonstration Project on Collaborative Care

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Debra.hurwitz@umassmed.edu

UMass Medical School
Commonwealth Medicine/Center for Health Policy and Research/ State Health Policy and Analysis Unit
222 Maple Avenue
Higgins Building
Shrewsbury, MA 01545

Project Description: The purpose of the overall demonstration project is to design, implement, and evaluate models of collaborative care that improve integration and delivery of components of mental health, substance abuse, and primary care services for specific populations. This demonstration project involves strategic partnerships between community health centers (CHCs) and community mental health centers (CMHCs) in six communities across Massachusetts.

Description of Student Project: Financial barriers to clinical integration[1] has been identified as part of the ongoing overall evaluation of the demonstration sites which will take place during April – August, 2007. The student intern would work directly with the Principal Investigator and Project Director to develop a ***Massachusetts Integrated Care Billing Guide*** based on the identified barriers. This practical guide could be used by primary care, mental health and addiction service providers, to guide their billing practices in support of the provision of clinically integrated care. The project would entail interviewing Medicaid, Medicare, third party payers and others to develop the guide and then make recommendations to address existing financial barriers and gaps. In addition, the student will have the opportunity to be a member of the project team and participate in site visits to the six demonstration sites in July and August.

What is the problem? In Massachusetts, there are upwards of 30 different payers all with different procedures and reimbursement policies and there is general consensus that the billing process is misunderstood, frustrating and costly. It is difficult for primary care, and behavioral health providers to maximize reimbursement since they have to familiarize themselves with multiple payer-specific rules. The complexity of the process and the resultant confusion, in large part, results in fragmented and uncoordinated care.

Why is this important? Billing for integrated care in primary care, mental health, substance abuse is a complex quagmire which if made plain could address financial stumbling blocks that currently exist. If proven to be a successful and useful guide for Massachusetts providers, it could be replicated in other states and then annually updated to reflect changes in billing codes, practices, etc.

What is the Research Question: Who (Clinician types - MD, PhD, PA, RN, LICSW, etc.) can be reimbursed, how much and with what co-pay, by whom, against which benefits, in which settings (primary care centers, mental health centers, addiction treatment centers, or individual providers) and for how long.

Opportunity to interface with key project collaborators: This project would give the student the opportunity to work with individuals from the UMass Center for Health Policy and Research, Department of Mental Health (DMH), Department of Public Health (DPH) Bureau of Substance Abuse services (BSAS), DPH Rural and Primary Care Office, the Mental Health and Substance Abuse Corporations of Massachusetts (MHSACM) and the Massachusetts League of Community Health Centers (MLCHC).

Student's Role: The student would become a member of the project team for the demonstration site evaluation and specifically for the development of the billing guide and recommendations to address financial barriers and gaps related to integrated care delivery. The deliverable from the project would be the guide itself and a concise report including relevant recommendations.

Required Skills: First or second year medical student with interest in clinical integration.

Interview: Required

Location: Project based in the Higgins Building in Shrewsbury but will require some in-state travel with the team.

32. Public Health

TITLE: Developing a Community Resource Site (HELP Desk) at UMass Memorial

David Keller MD, (508) 943-5224, kellerd@ummhc.org

South County Pediatrics, Department of Pediatrics
336 Thompson Road, Suite # 3, Webster, MA 01570

Project Description: Patients often present with non-medical problems that affect their health status. HELP Desks represent an additional level of care and outreach as they give assistance with economic and social conditions that impact patient health. Pioneered by Boston's Project Health, hospital-based Family HELP Desks are staffed by student volunteers who work with to help connect them with community resources. HELP Desks are a place where patients receive more information about housing, nutritional, employment, and other aid programs. The trained volunteers use a large database of community programs and resources to give patients help they need.
In addition to a store of knowledge of community programs, a HELP Desk also needs the buy-in and cooperation of the site's medical professionals. Help Desk users often first hear about its services from their doctor or nurse who then refer the patient to the Desk. Deciding the best site for a HELP Desk within the UMass system will require building staff support and finding the place where a HELP Desk fits most naturally into ongoing patient services.

Student's Role: During the summer, the student will focus on two primary tasks:

1) A needs assessment of potential Help Desk sites. To best serve patients through a Help Desk, we need to know what their unmet needs are, what obstacles they currently face in using assistance programs, and how best the Desk staff could interact with the site's physicians and nurses. The needs assessment would survey three potential host sites for a Help Desk: the outpatient Pediatric clinic, the Emergency Room, and the Family Health Center on Queen Street. The assessment would use short paper surveys and some follow-up key informant interviews to get a better sense of how a Help Desk would work and what clinical setting would be the best fit. The needs assessment would survey both patients and medical staff.

2) Background research on local assistance programs and resources. This information will be core of the Help Desk's mission as it gives Desk volunteers the knowledge they need to help Desk clients. The research would also be the basis for informational handouts that clients could take with them.

Required Skills:
Interviewing experience, organizational ability and willingness to take initiative
Some knowledge of basics of assistance programs and obstacles individuals face in using those programs
Eagerness to explore community assistance programs and collect detailed information on their outreach
Data management skill for processing results of key informant interviews and surveys.

Interview: Required

33. Public Health

TITLE: The Utilization Trends of Professional Interpretation for the In patient, and Its Effects on Post Discharge Health Care Visits

Mary Lindholm, MD, (508) 334-2403, lindhholM@ummhc.org

Department of Family Medicine and Community Health
55 Lake Avenue, North,Worcester, MA 01655

Description: The goal of this project would be to examine the trends of interpretation for inpatients at UMMHC. We know that professional interpretation makes a difference in patients' understanding of their illness and the quality of care they receive. There may be certain points during an admission when it is especially crucial to have an interpreter to help prevent errors and unnecessary testing. Trends in interpretation use may affect post hospitalization health utilization and even readmission. If this knowledge could be elucidated, it would be possible to anticipate inpatient interpretation needs even better and possibly develop guidelines for the most efficient and necessary use of an interpreter while an LEP (limited English proficient) patient is admitted to the hospital.

AIMS/Methods:**Aim 1**: Examining inpatient interpretation trends: In collaboration with the department of interpreter services at UMMHC, the data base of in patient interpretations for the adult, non psychiatric admissions will be examined from the last 3 years. **Aim 2**: Comparing requests for interpretation with actual interpreter utilization: Over the same 3 year period, the records from admission indicating patient request or need for interpretation will be compared with the department of interpreter services records of interpretation. **Aim 3:** Examine post hospitalization usage for LEP patients: Using a database of inpatients with needs for interpretation services, we will compare individual usage of health care for the 6 week period following hospitalization. To supplement this quantitative analysis, we will conduct a small number of patient interviews (20-30) among those patients who requested interpreter services and received it, compared to those patients who received no interpreter services but requested them. The purpose of the telephone interviews will be to assess the amount of routine follow up medical care utilization, including ED visits or readmission to ascertain if patient or family understanding of follow up care was an issue.

Student's Role: A student can be involved in all aspects of the study occurring over the summer. These could include analysis of data from over 8000 patients, conducting an open interview with about 15 – 20 patients on their experience with interpretation while hospitalized, and helping with the final write up of our findings with submission to a peer reviewed journal.

Required skills: Interest in low English proficient patients, good interpersonal skills. Proficiency in a second language is not a prerequisite, as we will use telephonic interpreters when conducting interviews.

Interview: Required

Location: UMass Memorial-Benedict Building

34. Public Health

TITLE: Lawrence Latino Diabetes Prevention Project

Ira S. Ockene, MD; Yunsheng Ma, PhD, Barbara Olendzki, RD MPH, LDN; and Phil Merriam, MSPH
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University of Massachusetts Medical School
Medicine; Cardiovascular Medicine and Preventive & Behavioral Medicine
Shaw Building
419 Belmont Street
Worcester, MA 01655

Project Description: The student project will be part of the Lawrence Latino Diabetes Project (LLDPP). The LLDPP is a four-year study supported by NIDDK in which Latino participants at high risk for the development of diabetes are randomized to one of two conditions. Participants in the intervention condition participate in a motivational theory-based intervention for diet and physical activity modification/maintenance that is primarily group-based, but also includes individual counseling sessions. Educational materials are literacy-tailored and culturally specific, and include an educational drama, large visuals, provision of pedometers, cooking demonstrations and other hands-on experiences.

Students' Role: Participate in the delivery of the lifestyle intervention focused on metabolic syndrome and weight loss. The intervention includes culturally appropriate materials to assist with nutritional change, and additional development of the physical activity component. The student will assist with the intervention classes & individual counseling sessions conducted in Lawrence MA.

Required Skills: Strong interpersonal skills; interest in learning about metabolic syndrome, enjoy practicing in a community setting, Latino cuisine & physical activity. *Spanish speaking required*

Interview: Required

Location: UMMS Shaw Bldg, 2nd floor and the Greater Lawrence Senior Center

35. Public Health

TITLE: Senior Care Options (SCO) Program Evaluation: Member Experience

Darlene O'Connor, PhD, (508) 856-8148,darlene.oconnor@umassmed.edu

Contact Person:, Faith C. Little, MSW, (508) 856-8529, Faith.little@umassmed.edu

Center for Health Policy and Research
222 Maple Ave
Chang Bldg
Shrewsbury, MA 01545

Project Description: The purpose of this research project is to evaluate the health care experience of nursing home certifiable older adults enrolled in the Senior Care Options (SCO) program. SCO is an integrated health program for dually-eligible (eligible for both Medicare and Medicaid) and MassHealth-only elders in Massachusetts. The purpose of SCO is to integrate, coordinate and deliver all Medicare and MassHealth services for enrollees through a comprehensive network of health and social services coordinated by one of three organizations currently under contract to implement the SCO program in MA. This research project will gather information from participants about their experiences with the program to date, through individual, in-person interviews with SCO enrollees in English and two other languages. The results of the study will be used to inform program planning and future local and national decision making for the SCO program.

Student's Role: The student would be involved in multiple aspects of the research project, including: recruiting participants for the study; conducting in-person interviews with eligible SCO members; analyzing interview data; writing summary reports of interviews; and assisting in other aspects of the research project depending on the interests of the student.

Required Skills: Excellent interviewing skills, ability to develop good rapport with older adults, use of a car to travel within the state to conduct interviews, good writing skills. Ability to speak Spanish or Portuguese fluently would be helpful but not essential.

Interview: Required

Location: The research is based at CHPR's offices in Shrewsbury. Individual interviews with SCO members will be conducted in various locations throughout the state.

36. Public Health

TITLE: Evaluation of the Community Case Management Program

Christine Stein, PhD, (617) 210-5611, Christine.Stein@umassmed.edu

Office of Clinical Affairs, Commonwealth Med., 100 Century Drive, Worcester, MA

Project Description: Community Case Management (CCM) is a unique program of Commonwealth Medicine (UMMS) that provides administrative case management to medically complex children and young adults who are in part or entirely insured by MassHealth (Massachusetts Medicaid). The goal of CCM is to provide the necessary community long term care services, such as private duty nursing and durable medical equipment, that support families in having their medically complex child live safely at home. There are over 500 children and young adults enrolled in CCM throughout Massachusetts, and the enrollees are among the most medically complex children in the state.

The Office of Clinical Affairs has been asked to evaluate CCM. The goal of the evaluation is to provide an integrated assessment of the process and outcomes of the planning, implementation, and operation of the CCM program. The resulting report will help inform internal program planning and management, and serve as a report to interested parties to describe the program's successes, lessons learned, and opportunities for the future. The objectives of the evaluation are to:

1. Describe the medical and socio-demographic characteristics of the CCM members, and the socio-demographic characteristics of their families.
2. Characterize the key components of CCM that differentiate this program from other case management programs for medically complex children.
3. Assess factors that facilitate or hinder CCM's operation.
4. Compare the experience of accessing medical services for families with children/adolescents enrolled in CCM to a group of MassHealth children/adolescents not enrolled but who have similar severe special health care needs.
5. Analyze the cost and utilization of MassHealth services by CCM members, pre- and post-enrollment in CCM as applicable, and compare this cost and utilization to a group of MassHealth children/adolescents not enrolled but who have similar severe special health care needs.

The evaluation will involve, among other methods, a) in-depth semi-structured interviews with families of CCM enrollees to inform development of a family survey, and b) development and administration of a survey of families of CCM enrollees and of a comparison group of MassHealth children/adolescents not enrolled who have similar severe special health care needs.

Student's Role: Assist the PI and her staff with evaluation tasks such as conducting and analyzing qualitative interviews with families of children enrolled in CCM, developing a family survey, and preparing a plan for fielding and analyzing the survey.

Required Skills/characteristics: Strong inter-personal skills. Willingness to work in an environment that values qualitative and quantitative research/ evaluation methods. Willingness to work as a member of an evaluation team.

Interview: Required

Location: 100 Century Drive, Worcester (PI's office is 600 Washington Street, Boston, but the majority of the work would take place in Worcester)

37, 38 & 39 Respiratory

Michael J. Sanderson. PhD
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University of Massachusetts Medical School
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Abstract:
Airway hyper-responsiveness (AHR) associated with asthma is mediated by the contraction of the airway smooth muscle cells (SMCs). Although this contraction is initiated by increasing the level of Ca^{2+} within the cell, the extent of the contraction is also determined by how sensitive the contractile process of the SMC is to Ca2+. To investigate the relative contribution of each process, we have developed a mouse lung slice preparation to simultaneously examine the contractile behavior of both the intrapulmonary airways and arterioles and have correlated this contraction with the Ca^{2+} signaling and sensitivity of the SMCs by confocal and phase-contrast microscopy. Our studies indicate that the extent of airway and arteriole SMC contraction is determined by the frequency of agonist-induced Ca^{2+} oscillations occurring within the SMCs and by an agonist-dependent increase in the SMC sensitivity to Ca2+. It is also clear that these 2 processes combine to determine the contractile behavior.
Consequently, our hypothesis is that the relative contribution of the Ca2+ oscillations and Ca2+ sensitivity determines the contractile state of the airway and arteriole SMCs in health and disease. Our understanding of how the relative magnitudes of these determine contraction is complicated by the fact that we do not know how Ca2+ oscillations are initiated or maintained, how Ca2+ related changes correlate with contraction in healthy lungs, how contraction is altered by external factors such as breathing or why contraction is altered by disease. We are approaching this problem by simultaneously studying the signal mechanisms of airways and arterioles in lung slices.
The specific projects related to this hypothesis are:

Project # 37: *To identify the important molecular mechanisms mediating airway contraction by the application of siRNA knock-down techniques to lung slices.*

Lung slices will be treated with various siRNAs to specific cellular enzymes and the responses of the lung slices to agonists examined.

Project # 38: *To determine the relevance of the temporal and spatial kinetics of Ca2+ oscillations to airway or arteriole contraction.*

Lung slices will be stimulated with agonists to contact and the effects of a range of intracellular Ca2+ buffers on their contraction will be examined.

Project # 39: *To determine the extent that Ca2+ sensitivity contributes to airway hyper-responsiveness.*

Lung slices from different strains of mice or rats will be compared for Ca2+ oscillations and Ca2+ sensitivity to understand why each strain displays different levels of airway reactivity.

Each project will involve the use of tested methods and has been established from preliminary data. Therefore, each project will be successful from a technical point of view in that all the experiments can be routinely performed. We, of course, do not know the final outcome. Each student will work directly with an experienced post-doctoral associate. Consequently, a diligent student who is organized and efficient in performing the experiments in a timely manner has a very good chance of publication.

Student's Role: Full responsibility for the project: Preparation of lung slice, performance of experiments, analysis and presentation of data. This will require handling of mouse tissue.

Student Skills: A clear desire to perform research. Some basic lab training would be an asset. An interest and knowledge of pulmonary physiology. Some molecular biology knowledge would be helpful.

Interview: Required

Location: UMass Medial School

40. Surgery

TITLE: Investigation of the Reliability of Utilizing the Ethmoidal Arteries as Landmarks in Orbital Surgery

Anne M. Gilroy, PhD and Mark Hatton, MD
Department – Surgery, Cell Biology, Anesthesia & Orthopedics
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University of Massachusetts Medical School
Department of Cell Biology
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Description: The anterior and posterior ethmoidal arteries are two of the most important landmarks for orbital surgeons. Standard measurements and identifiable landmarks are used to locate these vessels during surgery. This project will investigate the reliability of these measurements with regard to the variation among individuals and between the orbits of single individuals. Further investigations will look at the reliability of the location of these arteries as landmarks for defining a safety zone in such surgical procedures as the removal of the medial orbit wall (determining the distance between the vessels and adjacent frontal lobe of the brain) or decompression of the orbit (as in Grave's disease) in which the orbital "strut" (the junction of the medial wall and the floor) is preserved.

Student's Role: The student will be involved in all aspects of the project: literature search, cadaver dissection, review of data.

Required Skills: This will require very precise dissection skills.

Interview: Required

Location: Primarily anatomy lab in the medical school

41. Surgery

TITLE: CMCJ Dislocations in the Hand

John Shufflebarger, MD
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shufflej@ummhc.org

UMMHC
Hahnemann Hand Center
55 Lake Avenue North
Worcester, MA 01655

Project Description: Chart review and outcome study, and outcome analysis with DASH

Student's Role: Computer spreadsheet and statistics, data collections, paper writing

Interview: Required

Location: Hahnemann Hand Center or home

42. Urology

TITLE: Elucidation of the Kidney Retention Mechanism of a Novel Radiolabeled Oligomer in Mice

Guozheng Liu, PhD, Tel: 508-856-1958

Donald J. Hnatowich, PhD, Tel: 508-856-4256

Department of Nuclear Medicine, Room S6-304, 55 Lake Avenue N, Worcester, MA

Background: Our lab has established a preclinical tumor targeting procedure. In this procedure, an aliquot of tumor cells is injected into mice subcutaneously to develop a tumor. After the tumor is about 0.5 g, an antibody specific for the tumor is injected intravenously. While the antibody gradually clears from the normal tissue, those antibody molecules bound to tumor will be retained. At the time when the antibody in the normal tissue is sufficiently low, a small molecule effector carrying a probe and specific for the antibody is injected. It rapidly combines to the antibody in tumor and rapidly clears from normal tissue through kidney. Using a diagnostic nuclide as the probe, excellent tumor targeting has been achieved. If using a therapeutic nuclide, this strategy can be used as a tumor therapeutic tool.

Especially for therapy, kidney retention of radioactivity will be harmful. The structure of the radiolabeled effecto can be modulated to improve its property of kidney clearance. By structure modulation, kidney clearance has been greatly improved, however, there is still considerable kidney retention (~5 % of injected dose per gram of kidney at 3 h). Further improvement by fine structure modulation is unaffordable, but further reduction would be greatly beneficial to lower kidney toxicity and therefore better tumor therapy. To achieve this goal, understanding of the kidney accumulation mechanism of the radiolabeled effector will be very important.

The Study: This project is to investigate the kidney trapping mechanism of radiolabeled effectors. The experiments involve determinations of the blood protein binding, the blood clearance curve, the chemical state in blood, urine, and kidney, the location of the small molecule effector in the kidney as well as its co-injection into mice with a radiolabeled agent with known mechanism of kidney excretion. The student will be involved in one aspect of this study, specifically the analysis of the water extract of kidney homogenates.

Student's Role: The radiolabeled effector will be prepared and the quality assurance procedures will be performed under the guide of lab personnel. Animals will be handled by lab personnel. The student will need to attend a radiosafety training class first, to familiarize with the project background, and then to participate a specific study. The study includes preparation of a radiolabeled DNA analog used in tumor pretargeting, injection into a mouse, homogenization of its kidneys, and analysis of the chemical state of the radiolabeled effector in kidney by HPLC. The student will be involved in every step of the specific study. We expect that during the two-month period, the student will contribute to a specific experimental study and will appear as a coauthor on a future paper in a peer-reviewed journal that we plan to submit describing the completed study. Thus the student will participate in a whole process from the planning, the performance, and the submission of a report on the completed study. The student will work directly with Dr. Guozheng Liu in Dr. Donald J. Hnatowich's lab.

Required Skills: The minimum requirements for the student are to have a basic knowledge and skills in chemistry and some primary knowledge in physiology. The student should show strong ability of acquiring knowledge from a new field and be capable of searching the literature.

Interview: Required

Location: 55 Lake Avenue, North, Room S6-304, Worcester, MA, 01655

43. Urology

TITLE: Long-term subjective and objective results of the Mersilene Mesh Pubovaginal Sling for complicated forms of urinary incontinence

Stephen B. Young, MD, Division of Urogynecology & Reconstructive Pelvic Surgery (508) 334-9842, Memorial Campus, Obstetrics & Gynecology, 119 Belmont Street, Jaquith Bldg 4th Floor, Worcester, MA

Project Description: All patients of the PI who have undergone a pubovaginal Mersilene mesh sling procedure (~300) will be included in the retrospective chart review of pre, peri and postoperative clinical and urodynamic data. All patients will be invited via a letter mailed to their home, to participate in the self-administered questionnaire follow-up portion of the study. Patients who have reached >9 years since surgery and have not had a follow-up cough stress test since reaching the >9 year out point will be invited to perform a 24 hour home pad test. Patients who have either 1) had subsequent surgery for incontinence or 2) have already been documented by stress test or urodynamic evaluation to have "failed" at any time since surgery will NOT be asked to return a pad test.

Quality of life questionnaires are always administered to Urogynecology patients both new and returning for follow-up. In this instance they are being administered solely for research purposes. The 24-hour home pad test would never be standard of care for our patients.

Opt-out choices will be included in all letters. The research assistant will telephone those patients who fail to send in questionnaires AND have not "opted out." Patients who will be invited to participate in the >9 year 24 hour home pad test will be mailed these kits ONLY if they return permission to mail kit form or if verbal permission is given via telephone.

Student's Role: Research assistance: participate in team research meetings, observe pubovaginal sling surgery to round-out their knowledge-base relative to the study, chart reviews, study phone questionnaires, data entry. Although it will be after the 8-week Summer Research Program has ended, this student will be offered involvement in manuscript preparation at a later date. If the data is accepted for presentation at a national meeting and the student is interested in attending, a stipend to assist in attending will be provided.

Required Skills: Basic computer literacy, English as primary language, good phone skills, comfortable with verbal interaction regarding personal issues. A female student is preferred as the majority of phone calls will be to older women who would find it more comfortable to speak with a woman regarding these very personal issues, in my opinion.

Interview: Required

Location: UMMHC - Memorial Campus, Jaquith 4

ADDITIONAL PROJECT # 44

TITLE: Genetic Analysis of Synaptic Transmission in *C. elegans*

Michael Francis, PhD
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University of Massachusetts Medical School
Department of Neurobiology
715 LRB

Description: Excitatory signaling mediated by ligand-gated neurotransmitter receptors plays a critical role in both invertebrate and vertebrate nervous systems. We seek to take advantage of the conservation of synaptic mechanisms across species and utilize the genetically tractable model organism C. elegans to identify and analyze molecular mechanisms for the regulation of post-synaptic neurotransmitter receptors. Several C. elegans genes encode ion channel subunits with obvious homology to vertebrate neuronal nicotinic acetylcholine receptor subtypes and these subunits are expressed in the neurons and muscles of a simple circuit required for C. elegans locomotion. We are currently testing the role of these receptor subtypes in the C. elegans locomotory control circuit and are interested in identifying genes important for the assembly, localization or function of these receptors.

Student's Role: The student could be involved in all aspects of the project including molecular biology, the generation of transgenic C. elegans, genetic screens, behavioral analyses and/or electrophysiology.

Required Skills: A basic understanding of genetics and experience in molecular biology and/or electrophysiology would be helpful but not absolutely required.

Interview: Required

Location: LRB

Additional Project # 45

TITLE: MiRNA Regulation Of Alcohol Actions On Gene Expression In Mammalian Brain.

Andre Pietrzykowski MD PhD
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Department: Psychiatry
Brudnick Neuropsychiatric Research Institute
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Description: The discovery of the RNA interference (RNAi) process has been heralded as a major scientific breakthrough. The importance of that discovery was further highlighted by awarding the 2006 Nobel Prize in Medicine or Physiology to its discoverers, including Dr. Craig Mello from UMass. RNAi is a process in which short, non-coding RNAs (microRNA, miRNA) are key elements regulating diverse cellular processes. We have discovered that in mammals alcohol regulates expression of voltage- and calcium-sensitive potassium channel of high conductance (BK) - one of the most important targets of alcohol in the brain, as determined on both, molecular and behavioral levels. Recently, we have established, using organotypic cultures, that alcohol regulation of the BK channel mRNA expression utilizes RNAi mechanism through a specific miRNA species (miR-9). We observed that alcohol increases expression of miR-9, which leads to selective destruction of BK channel mRNAs encoding alcohol-sensitive isoforms of BK channel. Concomitantly, BK channel messages encoding alcohol-insensitive isoforms are resistant to alcohol actions. These results describe a very elegant mechanism of alcohol tolerance underlying neuronal adaptation to alcohol and are the very first example of the role of miRNA in alcohol addiction. The major aim of these studies is to determine the role of miR-9 in alcohol effects on gene expression in the CNS in the early stages of the development of drug addiction *in vivo*. Using cellular, molecular and biochemical approaches, experiments will test the hypothesis that *in vivo*, single alcohol exposure increases expression of miR-9 in brain regions important in drug addiction. Additional aims will focus on miR-9-controlled downregulation of specific BK channel mRNA variants and consequences of that regulation.

Student's Role: Student will have assigned to her/him a separate sub-project suitable for a 2 month-long period. Will perform experiments, analyze and interpret data under my supervision in a nice, relaxed atmosphere.

Required Skills: Familiarity with molecular biology techniques: PCR, ISH or immunostaining preferred but not required.

Interview: Required

Location: Brudnick Neuropsychiatric Research Institute is located just above UMass, on the top of the hill, by the clock tower, adjacent to the State Hospital

ADDIDTIONAL PROJECT # 46

TITLE: Mars Gravity Biosatellite

Dava J. Newman, PhD
Contact Person: Erika Wagner Erika@MITT.edu

MIT
Cambridge, MA

Description: Evidence from numerous flight and ground studies has identified skeletal degradation, muscle atrophy, and deconditioning of neurovestibular pathways as major challenges facing life in a microgravity environment. Surprisingly, nearly all flight physiology research to date has focused solely on the questions of health in low earth orbit (LEO) and the effects of microgravity. The prospect of a human presence on the Moon and Mars raises yet another set of medical uncertainties regarding how the body will respond to the partial-g environments of living and working beyond LEO. The basic questions of "how much gravity is enough gravity to prevent deconditioning?" and "how will long-duration exposure to partial gravity levels affect basic physiological processes?" remain unanswered.
The Mars Gravity Biosatellite Program, begun in 2001, aims to provide such a free-flying research platform for Earth-orbiting investigations. The initial payload manifested for the vehicle will launch 15 mice into LEO for a five-week flight. In spin-stabilized mode, the satellite will provide artificial gravity at 0.38-g, simulating the accelerations found on the surface of Mars. After 35 days of data collection, the satellite will land in southern Australia for recovery and further scientific investigations. This research will be the first of its kind, and the longest self-contained biosatellite flight in history. As the first study of mammalian physiology in partial gravity, the inaugural flight of the biosatellite will focus on broad, hypothesis-driven investigations. This peer-reviewed research will include characterization of musculoskeletal degradation, alterations of vestibular reflexes, and downregulation of the immune response.

Student's Role: The student will be working with our partial weight suspension team, characterizing the effects of reduced weightbearing on bone and muscle biomechanics. Specific tasks will include basic animal care, refinement of existing surgical techniques for quantifying in vivo skeletal strains, and extension of the model to examine selected interventions and countermeasures. Daily oversight will be provided by a PhD student or post doctoral fellow in the lab.

Required Skills: Basic animal handling, comfort with reading and synthesizing journal articles, undergraduate level analytical skills in biomechanics

Interview: Required

Location: Massachusetts Institute of Technology, Cambridge, MA

ADDIDTIONAL PROJECT # 47

TITLE: Insulin Signaling to Membrane Fusion Events

Michael P. Czech, PhD
Professor and Chair
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Program in Molecular Medicine
373 Plantation Street
University of Massachusetts Medical School
Worcester, MA 01605

Description: Total internal reflection fluorescence (TIRF) microscopy reveals highly mobile structures containing enhanced green fluorescent protein-tagged glucose transporter 4 (GLUT4) within a zone about 100 nm beneath the plasma membrane of 3T3-L1 adipocytes. We developed a computer program (Fusion Assistant) that enables direct analysis of the docking/fusion kinetics of hundreds of exocytic fusion events. Insulin stimulation increases the fusion frequency of exocytic GLUT4 vesicles by approximately 4-fold, increasing GLUT4 content in the plasma membrane. Remarkably, insulin signaling modulates the kinetics of the fusion process, decreasing the vesicle tethering/docking duration prior to membrane fusion. In contrast, the kinetics of GLUT4 molecules spreading out in the plasma membrane from exocytic fusion sites is unchanged by insulin. As GLUT4 accumulates in the plasma membrane, it is also immobilized in punctate structures on the cell surface. A previous report suggested these structures are exocytic fusion sites (Lizunov et al., J. Cell Biol. 169:481-489, 2005). However, two-color TIRF microscopy using fluorescent proteins fused to clathrin light chain or GLUT4 reveals these structures are clathrin-coated patches. Taken together, these data show that insulin signaling accelerates the transition from docking of GLUT4-containing vesicles to their fusion with the plasma membrane and promotes GLUT4 accumulation in clathrin-based endocytic structures on the plasma membrane. This summer project will use the above methodology to test the hypothesis that specific SNARE proteins such as syntaxin4 and Vamp2 are intimately regulated by insulin signaling to control the fusion process. We will also test the hypothesis that Munc18c interacts with these SNARE proteins and negatively regulates the process of fusion, and that its tyrosine phosphorylation by insulin action releases this negative regulation.

Student's Role: The student will be involved in all theoretical and practical aspects of the project, including culturing and transfecting cells with GFP fusion proteins of the SNARES, doing the TIRF microscopy under supervision, and analyzing and interpreting the data obtained. This will be done in conjuction with Michael Czech and other members of the lab.

Required Skills: General laboratory skills obtained in an undergraduate science setting.

Interview: Required

Location: 2 Biotech, Czech lab

ADDIDTIONAL PROJECT # 48

TITLE: Using fMRI for Memory Lateralization in Patients with Medial Temporal Lobe Epilepsy

Alexandra Golby, MD

Brigham and Women's Hospital
Department of Neurosurgery
Boston, MA

Description: Thousands of people worldwide may benefit from surgical treatment for medically refractory epilepsy every year. Research has shown that patients with longstanding epilepsy may display unconventional mappings of brain functions such as memory. Accurate preoperative localization of the seizure region is essential for successful surgery, but equally important is the minimization of post-operative neurological deficits. In particular, for patients with mesial temporal lobe epilepsy, determining the risk for post-operative memory deficits is critically important in patient selection. Currently, the gold standards for memory mapping include intracranial electrode monitoring and intracarotid amytal testing (Wada test), both of which are highly invasive. The use of functional magnetic resonance imaging (fMRI) for functional mapping affords a noninvasive technique with improved spatial resolution that is repeatable and without time limitations. These attributes make fMRI a clinically desirable diagnostic tool. The goal of this research project is to explore the use fMRI for memory lateralization and localization. Existing patient data provided by Brigham and Women's Hospital in Boston, MA has been obtained from approximately 10 patients with a diagnosis of medically refractory medial temporal lobe epilepsy. Data includes fMRI studies, Wada results, electrocorticography, and surgical outcome. Analysis of memory lateralization and localization using fMRI will be conducted using the software package Statistical Parametric Mapping (SPM2) run on a MATLAB platform. We will compare the functional maps and quantitative asymmetry indices using two contrasts which capture encoding: novelty versus successful encoding. This research build directly on the supervisor's past experience and published reports.

Student's Role: Quantitative neuroimaging analysis using fMRI data and statistical parametric mapping

Required Skills: Statistical Parametric Mapping software package (SPM2), Matlab, neuroanatomy

Interview: Required

Location: Brigham and Women's Hospital, Boston, MA