# *UNIVERSITY OF MASSACHUSETTS*
# *MEDICAL SCHOOL*
# *OFFICE OF UNDERGRADUATE MEDICAL EDUCATION*


# *MEDICAL STUDENT SUMMER RESEARCH FELLOWSHIPS*

# *CATALOGUE*
# *2011*

**Directors:**
***Michael Godkin, PhD***
Family Medicine and Community Health

***Anthony Poteete, PhD***
Molecular Genetics and Microbiology

Administrative Assistant
***Christine Locke***
Office of Undergraduate Medical Education

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*March, 2011*

## 1. Clinical

**Title: The Patient's Story: A Qualitative Study of the Patient's Experience in a Primary Care Medical Home**

**Katharine Barnard MD and Ken Peterson NP, PhD**
**(508) 334-1102**

**Department: Family Medicine and Community Health**
**Plumley Village Health Services**
**116 Belmont St # 11**
**Worcester MA, 01605**

**Description:** Plumley Village Health Services (PVHS) is a small family medicine practice serving the urban Worcester neighborhood of Bell Hill and Plumley Village housing. The mission of the clinic is to provide primary care and public health services for this underserved, primarily Hispanic patient population. We are currently engaged in a process of practice transformation to become a "Patient Centered Medical Home". It is our patients' experiences and needs that will inform our decisions as we develop new innovative methods of care delivery and communication. At this time, we wish to collect narratives from our patients through individual or family interviews. Themes that emerge in the patients' stories will be utilized in establishing measurable objectives and goals to guide practice transformation. Follow-up interviews can be conducted two years later for comparison. We would also like to interview staff. Analysis of staff narratives can be used similarly in developing objectives and goals for practice innovation and transformation and for comparison with patient's perspectives.

**Student's Role:** The student research intern will conduct face-to-face interviews with patients and/or families to obtain their personal story as a primary care patient at Plumley Village Health Services. This student will also conduct face-to face interviews with key PVHS staff. The student will with work with PI's to review recent literature on patient engagement, patient centered medical homes and healthcare quality including quality improvement approaches. PI's will assist the student with developing a series of questions to guide structured interviews in either individual or group format. The student will transcribe interviews for analysis, and work with PI's to identify themes among patient and staff experiences. Common themes will be used to design measurable objectives for practice innovation and transformation.

**Required Skills:** The candidate should be comfortable with word processing and use of simple recording devices. Previous qualitative research experience not required. Spanish language fluency would be helpful, as approximately 40% of our patients are primarily Spanish-speaking, but our clinic outreach worker could be used as interpreter by a non-Spanish-speaking student.

**Interview:** Telephone interview accepted

**Location:** Interviews may be conducted on site at the clinic or at a mutually agreeable location for the patient such as at the patient's home. Interview data will be transcribed either on site at the clinic or remotely as preferred by the student. Analysis of the data will occur on site with the study PIs. Student will attend weekly Patient Centered Medical Home planning meetings at the clinic, which are attended by the full staff of the clinic. Additionally, weekly review of the project with PI's will occur as needed at the clinic.

## 2. Clinical

**Title: What is the Impact of Obstetric Hospitalization on Depression, Anxiety and Quality of Life in High Risk OB Patients?**

**Nancy Byatt, DO, MBA**
**(508) 334-7839**

**UMass Medical School**
**Departments of Psychiatry and OB-GYN**
**55 Lake Ave North**
**Worcester, MA 01655**

**Description**: Perinatal mental illness can cause tremendous suffering for mother, fetus/child and family; thus its influence both individually and on a societal level cannot be under-estimated. Untreated mental illness can lead to maternal engagement in poor health behaviors, substance abuse and suicide. Tragic long-term consequence can occur in children, including cognitive delays, behavioral problems and infanticide. While medical hospitalization has been established as a risk factor for depression and anxiety, this has not been explored in the obstetric population. Women hospitalized for conditions associated with high obstetrical risk constitute a unique group of obstetrical patients who may be at high risk for depression and anxiety.

Despite knowledge that perinatal mental illness carries significant morbidity and mortality for mother, fetus/child and family, there is a dearth of information about the prevalence of depression among hospitalized obstetrics patients. UMass Memorial Hospital serves as the sole tertiary care facility for high-risk obstetrical cases in Central Massachusetts. Pregnant women at risk for a wide range of poor pregnancy outcomes, most commonly risk of preterm birth, are routinely transferred to UMass's antenatal service for inpatient observation and obstetrical management. Many of these women remain hospitalized under the care of the high-risk obstetrical team for prolonged periods of time, frequently from weeks to months depending on the nature of their condition.

We are conducting a two-phase study. Phase 1 aims to assess the impact of obstetric hospitalization on depression, anxiety and quality of life in high obstetrics women. The first phase of our study will be conducted over the spring and summer of 2011. In this first phase, we will assess the prevalence of depression and anxiety among patients hospitalized on the high risk obstetrical service. To this end, we will be using standardized questionnaires which have been validated in pregnancy (EPDS, GAD-7 and SF-36). Along with these questionnaires, we will administer a survey to obtain demographic information, and a needs assessment. Participants will be invited to complete these surveys on a weekly basis. We will then evaluate how symptoms of depression evolve over the course of a hospitalization by comparing severity of depression and anxiety and quality of life measure at the beginning and end of the hospital course.

The second phase of the study will be initiated upon analysis of the data obtained in phase I. Phase 2 will be an interventional study in which we will offer a formalized antenatal support group facilitated by a trained professional, focused on the specific needs of this population. We will then assess depression severity by the same measures as those described in Phase 1 in order to assess whether an antenatal support group decreases rates of depression and anxiety in our target population.

**Student's Role:** Research assistant.
Responsibilities include:

1. Screening study participants for depression and anxiety.
2. Administering needs assessment surveys to study participants.
3. Maintain database.
4. Participate in writing of manuscript for publication

We are seeking a student research assistant to participate in the administration and data maintenance of these surveys. This position would provide the opportunity for the student to be actively involved in all steps of the research project, including interviewing patient participants, developing a research database, and working with the statistician to analyze and interpret the data. The student will meet with the PI, Dr. Byatt and the co-I's on a weekly basis for supervision and teaching. The student will have the opportunity to play an active role in writing the manuscript to be submitted for publication.

**Required Skills**:
1. Interest in women's health
2. Interview skills
3. Familiarity with Excel
4. Aptitude for research

**Interview:** Required

**Location:** UMass Memorial Hospital, Memorial Campus, Worcester, MA

**3. Clinical**

**Title: The Effect of Depression on Patient Satisfaction and Perception of Functional Outcome Following Arthroscopic Rotator Cuff Repair. Outcomes Following Distal Bicep Tendon Repairs with a PEEK Interference Screw and a Cortical Button.**

**Nicola A. DeAngelis, MD**
**(508) 334-1145**

**Department of Orthopedics**
**Division of Sports Medicine**
**Hahnemann Campus, 3rd Floor**
**281 Lincoln Street**
**Worcester, MA 01605**

**Description:** It is our hypothesis that psychological factors, especially depression, adversely affect patient-perceived outcomes after arthroscopic rotator cuff repair. We will test the null hypothesis that depression and depressive symptoms do not correlate with patient satisfaction after arthroscopic rotator cuff repair.

Despite numerous reports showing positive clinical outcomes after arthroscopic cuff repair, there is a subset of patients who fail to improve. There are many biologic documented explanations for poor outcome including retearing or incomplete healing as occurs in 20-65%. However a fully healed tendon does not guarantee a positive outcome in functional improvement and patient satisfaction. Strictly biologic outcomes may not sufficiently explain differences in patient outcomes and perception of post-operative progress.

Several recent studies have suggested that patients' psychological well-being is important in successful post-operative outcomes. To date, there appear to be no peer-reviewed articles analyzing the affect of depression and psychological factors in patients who have undergone arthroscopic rotator cuff repair. At our institution, Dr. Ethan Healy and Dr. DeAngelis began a retrospective review of the impact of depression and other pyschological factors on patient satisfaction after rotator cuff repair or subacromial decompression. Data collected through CES-D and DASH scores revealed that following the acute recovery phase of arthroscopic rotator cuff surgery, pateints with greater depressive symptoms had greater disability and less satisfaction. The current study would continue this research with a prospective analysis of the impact of depression on disability and outcome perception after arthroscopic rotator cuff repair.

Over the last decade, there has been considerable research concerning the management of distal biceps tendon ruptures. Currently, there is no consensus in the literature on the optimal operative treatment for these injuries despite the variety of methods available for securing the tendon to bone. These options include, single incision, two-incision, and arthroscopic techniques using fixation methods such as sutures through bone tunnels, suture anchors, cortical buttons, and interference screws.

Recent research has favored a single incision technique over the originally described two incision technique in and attempt to decrease the risk of heterotopic ossification and nerve injury. Current biomechanical data shows cortical buttons to have the highest load to failure, but interference screws to be superior with cyclic loading. Our recent work using a PLLA biotenodesis screw (Arthrex, Naples, FL) has shown this technique to be a safe and effective method for the operative management of distal biceps tendon ruptures. This screw provides more anatomic positioning of the biceps tendon

along the ulnar border of the bicipital tuberosity and biomechanical advantages allowing for earlier mobilization. Given that cortical buttons have superior load to failure characteristics without increased risk of PIN injury, we have modified our technique to use both a cortical button (Biceps Button, Arthrex, Naples, FL) and a PEEK interference screw (Arthrex, Naples, FL) through a single incision. It is our hypothesis that this technique is a safe and effective method for operative management of distal biceps ruptures with success and complication rates similar to the biotenodesis screw alone and previous reports in the literature. The addition of the cortical button theoretically provides superior load to failure while maintaining the advantages of an interference screw as outlined above. The purpose of this study would be to collect outcome scores (DASH, SF-12, and Mayo Elbow Performance Index) as well as radiographic evaluation and strength testing on Dr. DeAngelis' patients with this type of fixation since March 2008, with a minimum of two year follow-up.

**Student's Role:** With study 1), the student would be involved with data collection and data analysis. This study has IRB Contingent Approval and should be in the data collection phase by June.

With study 2), the student would be involved with study design, literature review, and the IRB application process. This study is not submitted for IRB approval yet.

**Required Skills:** Would be patient interaction and physical exam under attending supervision along with basic computer skills.

**Interview:** Required

**Location:** The research would take place in the Sports Medicine Center,
3rd Floor Hahnemann Campus

## 4. Clinical

**Title: Perinatal Depression and the Impact of Stress During Pregnancy**

**Kristina M. Deligiannidis, MD**
**(508) 334-7262**

**UMass Medical School**
**Center for Psychopharmacologic Research and Treatment**
**Department of Psychiatry and Obstetrics & Gynecology**
**361 Plantation St**
**Worcester, MA 01605**

**Description:** This single-site observational cohort study will prospectively examine the antenatal and postpartum plasma levels of cortisol, sex hormones and γ–aminobutyric (GABA) in women at High-Risk of developing postpartum depression (PPDHR) as contrasted with Healthy Control Low-Risk (HCLR) women and to evaluate depression, anxiety, functional disability, social support and quality of infant bonding. We will examine basal (unstressed) hypothalamic-pituitary-adrenal (HPA) neuroendocrine functioning as measured by repeated plasma cortisol, sex hormone and GABA measurements in late pregnancy and in the postpartum in two cohorts of community women: PPDHR women with depressive symptoms and HCLR women without symptoms. Standardized mood and psychosocial assessments will be completed throughout late pregnancy and in the early postpartum. We will also examine dynamic (stressed) HPA neuroendocrine functioning with a psychosocial stress test (Trier Social Stress Test) in third trimester women and evaluate its association with the development of postpartum depression (PPD). This stress test will involve repeated salivary cortisol measurements and serial blood draws. Exploratory aims of the study include collecting maternal DNA from both cohorts for genetics studies, and umbilical artery cord blood at delivery for future neuroendocrine functioning studies in neonates born to both cohorts of women.

Approximately 350 pregnant women will be screened with a one page questionnaire that assesses risk of PPD during their routine 28 week gestational age prenatal visit at our UMMMC West 4 Ob-Gyn clinic. High risk and low risk women who meet criteria will undergo a stress test and be evaluated prospectively through the $10^{th}$ week postpartum for depressive symptoms.

**Student's Role:** The medical student's role, once CITI trained, can be extensive and hands on with research subjects, if desired. The medical student could be involved in consenting subjects, performing depression screening in prenatal subjects at the Memorial OB clinic (West 4) and conducting visits on labor/delivery; can learn how research psychiatric interviews are conducted which assess not only psychiatric symptoms but obstetrical data; follow subjects longitudinally from late pregnancy to the postpartum; learn about neuroendocrine biomarkers and their significance towards understanding the pathophysiology of major depression during pregnancy; obtain collaborative skills with PI and research coordinator involved in the study, perform minimal research database entry to be shared with PI and research coordinator, etc. He/she will help administer the psychological stress test (i.e. subject gives an unprepared speech and performs math calculations) with repeated endocrine measures. He/she will be able to learn about clinical trial design, recruitment strategies, research ethics, IRB procedures, etc as they pertain to the study. There are numerous facets in which to be involved, and the medical student would have a desk adjacent to the research coordinators in our research suite where the PI's office is within the CPRT research group. The medical student would attend all research group meetings so that he/she would have exposure to the other studies ongoing in the CPRT research group. Direct supervision would be by the PI for the entire research fellowship program.

**Required Skills:** Empathic; pays close attention to detail; capacity for both independent work and teamwork; dependable; computer adeptness

**Interview:** Required

**Location:** Center for Psychopharmacologic Research and Treatment (CPRT) ; West 4 Obstetrics/Gynecology Clinic at Memorial; Labor and Delivery Unit at Memorial

## 5. Clinical

**Title: Measures of Nicotine Addiction**

**Joseph DiFranza, MD**
**(774) 442-5658**

**UMass Medical School**
**Department of Family Medicine and Community Health**
**Benedict Building, A3-235**
**55 Lake Avenue, North**
**Worcester, MA 01655**

**Description:** The Fagerstrom Test for Nicotine Dependence has been used by researchers for over 3 decades to measure nicotine dependence, but amazingly enough, there is no consensus regarding what aspects of dependence it measures. Although this scale has only 6 questions, none of them ask directly about dependence so there is debate about what is actually being measured. With the recent advances in knowledge about nicotine dependence that we have made at UMASS we believe we are in the best position to finally determine what this instrument measures. We want to interview smokers to find out why they answer the questions the way they do so we can determine which aspects of addiction their responses reflect. The student will learn the state-of-the-art regarding the nature of nicotine dependence and the development and assessment of measures of nicotine dependence. We already have survey data to analyze and plan to supplement this with data obtained from interviewing smokers and then possibly design a second survey based on what the student learns from the interviews.

**Student's Role:** The student will be interviewing smokers about their symptoms of nicotine dependence. The student will perform a literature search on the topic of nicotine addiction and help to identify relevant articles. The student will be involved in the development of a questionnaire, the analysis of data and writing a manuscript for publication.

**Required Skills:** Interviewing skills.

**Interview:** Required

**Location:** Worcester

## 6. Clinical

**Title: The Impact of Perimenopause on the Clinical Course of Bipolar Disorder**

**Wendy Marsh MD MS**
**(508) 859 5071**

**UMass Medical School**
**Department of Psychiatry**
**361 Plantation St**
**Office B12**
**Worcester, MA 01605**

**Description:** The menopausal transition is a time of increased risk of depression in women with or without a history of depression. In women with bipolar disorder, times of rapid hormonal decline like the postpartum period are associated with severe, often depressed, mood episodes. Yet, despite the late perimenopause being a time of rapid decline in reproductive hormones, the risk of depression during the menopausal transition has not been studied in women with bipolar disorder. The objective of this K12 funded study is to prospectively assess the impact of perimenopause on mood episodes in women with bipolar disorder. Sixty women with treated bipolar disorder, twenty in each early perimenopause, late perimenopause and postmenopause, will prospectively record mood and menopausal symptoms daily for 4 months. Monthly they will complete standardized mood assessments, and estradiol and follicular stimulating hormone (FSH) plasma levels will be assayed. Mood severity will be compared between early, late, and post menopausal stage and hormonal status. High rates of depression, especially in the late menopausal transition and during times of greatest increase in FSH are hypothesized. Findings will inform future studies and will contribute concretely to the preparation of future independent investigator funding proposals. Lessons learned from affective dysregulation and reproductive neuroscience will help better address women's mental health during menopause, including the relationships between perimenopausal phase, hormonal status, and depressive symptoms on the course of bipolar disorder.

**Student's Role:**
Become CITI trained on ethical considerations in engaging in research with human subjects.
1. Subject Contacts
    - Screen potential subjects on phone
    - Present study by phone
    - Learn to administer Consents
    - Learn initial visit procedures with subjects
    - Learn follow up questionnaires
    - Engage and administer questionnaires as student is able

2. Continue contact with subjects
    - Phone calls to schedule appointments
    - Phone calls to confirm appointments the day before
    - Assess subject's interest in continued involvement
    - Recruit and enroll study participants
    - Track subject participation

3. Study Involvement –

Prepare print documents, and other graphics
Assist staff in logistical management of the study, including acquisition of supplies, inventory management, bookkeeping and strategic planning.
Handle and protect confidential and sensitive data with integrity
Help advertise and place advertisements
Produce written, tabular and visual materials for research reports and presentations.
Assist in the design, execution and evaluation of research projects, including literature reviews, surveys, data integration and analysis.
Diagnose and problem solve as it relates to the research project

Manage and respond to project related email
Be trained in administering questionnaires
Prepare research manuscripts and research presentations
Conduct literature reviews

4. Regular contact with Principle Investigator (PI)

For PI to answer broader questions about theory of study, psych practice or psych research
PI available for didactic discussions related to student's areas of interest.

**Required Skills:** Excellent interpersonal skills including professionalism, empathy, and respect for those with mental illness. Organized, takes initiative, works independently.

**Interview:** Required

**Location:** 361 Plantation St
Worcester, MA 01605

## 7. Clinical

**Title: Studies in Acute Depression, Treatment-resistant Depression, and Psychotic Depression.**

**Anthony J Rothschild, M.D**
**(508) 856-1027**

**UMass Medical School**
**Psychiatry Outpatient Clinic**
**361 Plantation St**
**Worcester, MA 01605**

**Description:** Studies of investigational antidepressant for recurrent Major Depression, a treatment-resistant depression registry (collects information) studying patients who have the Vagal Nerve Stimulator implanted and those who do not, study on the treatment (with medications) of psychotic depression, a severe form of depression.

**Student's Role:** Student will have their own sub-project with goal of submitting for publication and observe and participate in ongoing projects

**Required Skills:** Completion of rotation in Psychiatry ideal, but not required

**Interview:** Required

**Location:** Psychiatry outpatient clinic on University Campus

**8. Clinical**

**Title: Use of Cholecystostomy Tubes in the Management of Patients with Acute Cholecystitis**

**Shimul A. Shah, MD**
**(508) 334-2023**

**UMASS Medical School**
**Department of Surgery, Room S6-432**
**55 Lake Avenue, North**
**Worcester, MA**

**Description: T**he management of patients admitted to the hospital with acute cholecystitis is evolving. This study will analyze the Umass Memorial experience by retrospectively examining the use of cholecystostomy tubes compared to standard surgery (cholecystectomy). We will attempt to understand trends and analyze the differences in outcomes and create a risk adjusted review to determine the best option for patients with this common disease.

| | |
|---|---|
| **Student's Role:** | Research assistant, data analysis |
| **Required Skills:** | MS Word, Excel and data analysis entry and calculations |
| **Interview:** | Required |
| **Location:** | SOAR lab and S6-432 |

**9. Clinical**

**Title: IUD Quality Evaluation**

**Sara G. Shields MD, MS, FAAFP Clinical Associate Professor**
**Rebecca Williams, FNP**
**(508) 860-7800**

**Family Health Center of Worcester**
**Department of Family Medical and Community Health**
**26 Queen Street**
**Worcester, MA**

**Description**: 1) To assess and ensure that the effectiveness of IUDs placed by providers at FHC have the same effectiveness rate that are reported in the literature. If they do not, to identify any potential contributing factors.

2) To ascertain IUD discontinuation rates per year, compare those to those reported in the literature, and if a discrepancy exists, identify the major reasons for discontinuation, with the eventual goal of designing an intervention that could decrease discontinuation rates.

**Student's Role**: 1) To write a relatively brief literature review summarizing Mirena and Paragard IUD effectiveness and tolerability in populations similar to FHC (poor, underserved, immigrant, minority)
2) To collect specified data on IUD insertions, removals and failures by conducting a chart review of women who have had IUDs placed.
3) If sufficient data are collected, then to summarize and do basic data analysis

**Required Skills**: Basic data collection skills
Basic statistics
Ability to write literature review

**Interview:** Required

**Location:** Family Health Center of Worcester

## 10. Laboratory

**Title: Mechanisms of Sperm Interaction with the Oviduct and with Eggs**

**Harvey Florman**
**(508) 856-1675**
**harvey.florman@umassmed.edu**

**University of Massachusetts Medical School**
**Department of Cell Biology**
**Room S7-304**
**55 Lake Avenue North**
**Worcester, MA 01655**

**Description:** My laboratory studies the mechanisms of fertilization. At present, there are three ongoing projects. We study the functional maturation of sperm (capacitation) that is required for fertilization, the mechanism of sperm transport through the oviduct, and sperm-egg interaction at fertilization. All three projects entail similar methods, including basic biochemical, molecular and cellular (eg, in vitro fertilization and sperm motility assays), as well as biophysical approaches (electrophysiology, fluorescent probe studies, and image processing microscopy). The particular project would depend on the interests of the student and the needs of the laboratory.

**Student's Role:** The student will be given an aspect of one of those ongoing projects to work on for the summer. Their experiments will be designed so as to reach a logical conclusion by the end of the summer. In addition to experimental work, they will be expected to participate in weekly lab meetings and journal clubs.

**Required Skills:** Basic laboratory skills, similar to those in undergraduate chemistry and biochemistry labs, are expected. Beyond that, we can teach the student what would be required.

**Interview:** Required

**Location:** Medical School Building (S7-304)

## 11. Laboratory

**Title: Preclinical Gene Therapy Study of Canavan Disease in an ASPA KO Model**

**Guangping Gao, PhD**
**(508) 856-3563**

**University of Massachusetts Medical School**
**Gene Therapy Center**
**Biotech V, Suite 250**
**381 Plantation Street**
**Worcester, MA 01605**

**Description:** Recently, our lab has made a major advance in treating Canavan disease, a fatal inherited childhood neurodegenerative leukodystrophy by gene therapy approach. With a single iv injection at birth, we basically corrected disease phenotypes, alleviated neuropathology and prolonged the survival of mice with Canavan disease. To date there is no any effective clinical intervention for this disease, the disease mice uniformly die a few days after weaning. After the gene therapy, the disease mice live like normal mice. We need to expand our animal study significantly. We hope this project will be of interest to some MD or MD/Ph.D. students. Below is an abstract we recently submitted to American Society of Gene and Cell Therapy.

**RAAV-MEDIATED, SYSTEMICALLY DELIVERED AND MIRNA-REGULATED CNS GENE TRANSFER EFFECTIVELY CORRECT METABOLIC AND PYSCHOMOTOR DEFECT, ALLIVIATE NEUROPATHOLOGY, AND PROLONG SURVIVAL OF *ASPA*$^{-/-}$ MICE WITH CANVAN DISEASE**

**[1,2]Seemin Seher Ahmed, [3]Sylvia Szucs, [1,2,4]Hongwei Zhang, [1]Qin Su, [1]Ran He, [1, 5]Miguel Sena-Esteves, [1,2,6]Terence R. Flotte, [3,7]Reuben Matalon and [1,2]Guangping Gao.**

[1]Gene Therapy Center, [2]Dept. of Microbiology & Physiology Systems, [5]Dept. of Neurology, [6]Dept. of Pediatrics, UMass Medical School, Worcester, MA 01655, USA; [3]Dept. of Pediatrics, Biochemical and Molecular Genetics, [7]Children's Hospital, University of Texas Medical Branch, Galveston, TX 77555, USA; [4]Department of Pharmaceutical Sciences, South Dakota State University, Brookings, SD 57006, USA.

Canavan disease (CD) is a rare, inherited, and fatal childhood leukodystrophy. Caused by autosomal recessive mutations in the aspartoacylase gene (*ASPA*), the ASPA deficiency in CD patients leads to elevated N-Acetyl-Aspartic Acid (NAA) and spongy degeneration of white matter (WM) throughout the entire CNS, producing severe psychomotor retardation and early death. The *ASPA*$^{-/-}$ KO mouse model authentically mimic the neuropathology and clinical manifestation of CD patients. Currently, there is no effective treatment available for CD. rAAV gene therapy is an attractive strategy for treating CD. An earlier attempt in the CD gene therapy by direct injections of rAAV2 into brain parenchyma generated limited success, possibly due to the compartmentalization of NAA biosynthesis and catabolism, inadequate transduction efficiency of rAAV2 and limitations of localized intraparenchymal vector delivery. However, recent reports and our study revealed that i.v. delivery of some novel rAAVs are highly efficient in transducing the CNS by crossing the blood-brain-barrier. Additionally, we exploited endogenous miRNAs to regulate expression of i.v. delivered rAAV, resulting in 100-fold reduction of transgene expression in the peripheral tissues (e.g. liver, muscle, heart, etc) but not in the CNS. In a proof-of-concept gene therapy study, we harnessed those i.v. deliverable novel rAAVs to target the CNS globally to treat diffused WM degeneration in CD mice. Single i.v. injections of *ASPA* vector to the neonatal CD mice corrected metabolic defect, psychomotor malfunction and other disease phenotypes, and prolonged survival. While untreated CD mice started showing growth retardation, psychomotor malfunction in the 2$^{nd}$ wk after birth and

uniformly died soon after weaning, the treated mice began to gain weight 2 wks after vector injection and nearly caught up with their heterozygous littermates within 7 -8 weeks. Unlike CD mice, the mobility of the treated animals was similar to Wt littermates. Preliminary data from rotarod test on the treated mice showed no significant differences in the latency time among the treated CD mice and their age-matched Wt littermates, suggesting that gene therapy might have cured the ataxia, a typical neuromuscular symptom of CD. Biochemical characterization indicated reduction of NAA levels in the urine samples and restoration of ASPA activity in their brain and kidney tissues. More importantly, mitigation of the biochemical and clinical phenotypes was well correlated with globally ameliorated histopathology in not only the brain, spinal cord but also in the peripheral tissues such as kidney, suggesting that CD is not just a CNS disorder. Our findings hold great promise for future clinical development of effective and safe gene therapeutics for CD.

**Student's Role:** Gene therapy treatment, pyscomotor function evaluation, growth monitoring, MRI/MRS image analysis, tissue harvesting/processing, molecular, immunohistochemical, histopathological, biochemical and metabolic analyses of tissues.

**Required Skills:** Animal handling, intravenous injections to postnatal days 1, 4, 7, 10 and 14 neonatal mice, tissue harvesting, processing, molecular biology, immunohistochemical staining, standard and confocal microscopic analysis, Biochemical/enzymatic assays.

**Interview:** Required

**Location:** Biotech V, Gene Therapy Center Lab

## 12. Laboratory

**Title: Formation of Digital Anthropomorphic Phantoms from Volunteer MRI Acquisitions**

**Michael King, PhD, DABR, Vice-Chair for Biomedical Imaging and Bioengineering**
**(774) 442-4255**

**University of Massachusetts Medical School**
**Department of Radiology**
**55 Lake Avenue North**
**Worcester, MA 01655**

**Description:** Patient motion during medical imaging can cause artifacts, which can lead to difficulty in interpretation. This is especially true during single-photon emission-computed tomographic (SPECT) and positron emission tomographic (PET) imaging which require the patient to lay still and breathe quietly during a 15-30 minute period for imaging. The purpose of this study is to create 3D digital anthropomorphic phantoms which model the location of the structures of the chest and upper abdomen of human volunteers undergoing a series of clinically relevant motions, including respiration. The 3D anatomy is modeled using the XCAT digital anthropomorphic phantom and based on MRI studies. The NURBS surfaces of the anatomical structures of the standard XCAT are interactively adapted to fit the MRI studies. A detailed XCAT phantom is first developed from an EKG triggered Navigator acquisition composed of sagittal slices with a 3 x 3 x 3 mm voxel dimension. Rigid-body motion states are then acquired at breath-hold as sagittal slices partially covering the thorax, centered on the heart, with 9 mm gaps between them. For non-rigid body motion requiring greater sampling, modified Navigator sequences covering the entire thorax with 3 mm gaps between slices are obtained. The structures of the initial XCAT are then adapted to fit the altered locations of the structures in these different motion states. Volunteers also undergo dynamic imaging of a series of sagittal slices during slow breathing to form 4D data sets of the respiratory motion of human anatomy which includes the potential for hysteresis of motion between inspiration and expiration. Simultaneous to MRI imaging the positions of multiple reflective markers on stretchy bands about the volunteer's chest and abdomen are optically tracked in 3D via stereo imaging. These phantoms with combined position tracking will be used to investigate both imaging-data-driven and motion-tracking strategies to estimate and correct for patient motion. Our initial application will be to cardiac-perfusion SPECT imaging where the XCAT phantoms will be used to create patient activity and attenuation distributions for each volunteer with corresponding motion tracking data from the markers on the body-surface. Monte Carlo methods will then be used to simulate SPECT acquisitions, which will be used to evaluate various motion estimation and correction strategies.

**Student's Role:** The student would employ their knowledge of 3D anatomy as visualized in MRI slices with a computer interface to create 3D digital anthropomorphic phantoms based on human volunteer MRI acquisitions. Additionally they would be involved in all aspects of the research project from the acquisition of the MRI images to the application of these phantoms in investigating patient motion during medical imaging.

**Required Skills:** The student should have a strong background in computer science, engineering, and / or physics. Candidates who are considering Radiology as their medical specialty are preferred.

**Interview:** Required

**Location:** 7th floor research labs of Dr. King and A-level research MRI imaging center of Radiology.

## 13. Laboratory

**Title: Healing of Radiation Induced Wounds in Mice**

**Janice F. Lalikos, MD and**
**Ronald A. Ignotz, PhD**
**508-334-5945 (JFL) or 508-334-7692 (RAI)**

**University of Massachusetts Medical School**
**Department of Surgery**
**Division of Plastic Surgery**
**Room S4-745**
**55 Lake Avenue, North**
**Worcester, MA. 01655**

**Description:** Radiation treatment is a common treatment modality for individuals with various types of cancer. Radiation is frequently used in conjunction with surgery, or in some unresectable cases, as treatment alone. External beam radiation, and intraoperative brachytherapy, can cause significant cutaneous reactions. Acute skin reactions can range from mild skin erythema to dry or moist desquamation. The number of radiation injuries is poorly documented and little is known about the extent to which skin reactions impact daily life. In addition to being painful, moist desquamation results in unwanted interruption in a radiotherapy course or limitation to the total dose of therapy. This study is aimed at evaluating wound healing in mice that have been exposed to a small, localized dose of radiation. Following radiation exposure, the exposed area will develop a wound as the result of radiation exposure. Wounds will be treated with therapeutics and the speed and quality with which the wounds heal will be determined.

The goal of this study is to evaluate wound healing in response to treatment with sNAG (short-fiber poly-N-acetyl glucosamine) following radiation exposure of mice. Mice (C57Bl) will be exposed to a localized radiation source (Strontium-90) placed briefly on the back to give a desired dose. One to several days later, desquamatization wounds will develop at the site. The wounds will be treated with sNAGs and wound healing monitored over a 21 day period. Every 2 days, the wounds will be measured, photographed and new doses of treatment applied. At specified times listed below, mice will be euthanized and the wound site excised and processed for histologic analysis.

The importance of radiation effects on wound healing has many relevant applications in medicine today. Radiation is well known to cause complications and poor healing in wounds. However, little is known about effective treatments of wounds in the irradiated field. Investigation into these applications will benefit a diverse patient population, ranging from patients of radiation therapy to victims of nuclear disasters.

**Student's Role**: The student will participate in all aspects of the project. This included creating the radiation wounds, monitoring wound development, treatment of wounds, photographing and measuring wound healing progress, preparing histologic samples of the healing wounds at prescribed times. The student will also perform literature searches and maintain an up-to-date reference file.

**Required Skills:** The student will be required to complete the training for use of animals in research as well as radiation use training. The student will be expected to become familiar with searching research literature and maintain an accurate laboratory notebook.

**Interview:** Required

**Location:** The research will take place in the Plastic Surgery Research Lab, S4-752 and the Animal Medicine facilities.

## 14. Laboratory

**Title: Investigating the Role of DNA Sequence Content in Chromosomal Silencing by the Non-coding XIST RNA**

**Jeanne B. Lawrence, PhD**
**(508) 856-6015**
**University of Massachusetts Medical School**
**Department of Cell Biology**
**55 Lake Avenue North**
**Worcester, MA 01655**

**Description:** This project will introduce the student to cutting-edge questions and experimental approaches in the area of developmental epigenetic regulation of the human genome as related to the role of large non-coding RNAs in heterochromatin formation. Specifically, the project will investigate the role of XIST RNA in X-chromosome inactivation, primarily in human cells somatic and iPS (induced pluripotent stem) cells. The process of X-inactivation in mammals occurs by the formation of facultative heterochromatin, a phenomenon central to normal development and abrogated in some cancers. In this process, an accumulation of stable XIST RNA structurally associates with one X chromosome in females and initiates a cascade of chromosome remodeling that silences the inactive X (Xi), forming a heterochromatic Barr Body. We now need to know how XIST RNA localizes to and "paints" its parent chromosome, and how this leads to the structural transformation and condensation of a whole chromosome. Our approach to these questions utilizes molecular, biochemical and structural analyses, coupled with bioinformatics of genomic sequence organization. Our goals deal with inter-related aspects of the functional and structural transformation of the chromosome, focusing on the interaction of XIST RNA with the chromosome and the potential role of genomic repeat sequences. Repeat sequences comprise about half of the human genome, but their potential biological functions have been largely unexplored.

This specific project will investigate a novel model for silencing of an entire chromosome, whereby XIST RNA does not act at a local or individual gene level (for example to silence individual gene promoters), but has a more architectural relationship with the whole interphase chromosome territory. Specifically, we hypothesize that the inactive X chromosome (the Barr Body) is structured with an inner core enriched in non-coding DNA and repeat elements, with canonical protein-coding genes positioned at the periphery around this inner core. In this model, XIST first interacts with the repeat-rich regions of the X chromosome, nucleating a heterochromatic core that then propagates to the more peripheral protein coding genes. The student will use both molecular cytology and bioinformatic approaches to help characterize the role of repeat sequences, both repeat DNAs and repeat RNAs, in the process of X chromosome inactivation. The student will also learn about and utilize an experimental system to study the initiation of X-inactivation based on a new approach for the targeted insertion of transgenes into specific chromosomal sites. This approach is also being developed in the lab for therapeutic application to chromosomal imbalances, and therefore has significant clinical relevance as well as a tool to study fundamental biological questions.

**Student's Role:** The student will read and understand a number of relevant scientific papers, become familiar with bioinformatic tools for genomic sequence analysis and the various classes of repeat element within the human genome. The student will learn how to prepare cells for molecular cytology and will conduct fluorescence in situ hybridization experiments to both DNA and RNA. In conjunction with the PI and other lab members, the student will help to define the priorities for analysis of particular types of repeat elements. The student will test the potential roles of particular classes of repeat elements by examining their distribution relative to the inactive X chromosome territory and XIST RNA in interphase nuclei. As a secondary project, the student may be assigned to examine the cellular distribution of a novel large non-coding RNA, the function of which has not yet been determined. Please note: the details of a specific plan are dependent upon findings in the lab or the literature over the next several months, before this project begins.

**Required Skills:** Some familiarity with cell culture, molecular biology techniques, digital imaging microscopy, and bioinformatics would be helpful. A good foundation in human genetics and interest in genome biology required.

**Interview:** Required

**Location:** Department of Cell Biology, 7th Floor (Main Research Building)

## 15. Laboratory

**Title: Endogenous Feedback Regulation of Neuropeptide Release**

**José R. Lemos, PhD**
**(508) 856-8567**

**University of Massachusetts Medical School**
**Department: MaPS**
**Room S4-137**
**55 Lake Avenue North**
**Worcester, MA 01655**

**Description:** Determine different synaptic neurotransmitter (ATP) and opioid receptor subtypes ( μ vs. k) and their localization on oxytocin vs. vasopressin releasing nerve terminals using immunohistochemistry and deconvolution techniques.

**Student's Role:** Independent research using immunological and microscopic techniques.

**Required Skills:** Making solutions and computer skills. We will teach them dissections, microscopy and analysis.

**Location:** SA-109

## 16. Laboratory

**Title: Development of a Novel Adjuvant Chemotherapy Targeted to Multidrug Resistant Tumors**

**Beth A. McCormick, PhD**
**(508) 856-6048**

**University of Massachusetts Medical School**
**Department of Microbiology and Physiological Systems**
**Room S6-113**
**55 Lake Avenue North**
**Worcester, MA 01655**

**Description:** Bacteria have been investigated as therapeutic agents for tumors for over 150 years, when it was first observed by William B. Coley that a fraction of cancer patients who developed post-operative bacterial infections went into remission and were cured of their tumors. Although the mechanisms underlying this observation were unclear, it was known even then that bacteria exhibit immunostimulatory properties. Since this original observation, therapeutic studies with bacteria have led to the discovery of hemorrhagic necrosis of tumors, with bacterial lipopolysaccharide being identified as the active component, in addition to the eventual discovery of the potent cytokine TNF-alpha. Moreover, it has been known for nearly 60 years that anaerobic bacteria can selectively grow in tumors, underscoring the fact that such microbes have the potential to overcome many of the delivery barriers that hinder conventional chemotherapeutics. In particular, the conditions that permit anaerobic bacterial growth, such as impaired circulation, and extensive necrosis, are found in many tumors so that bacterial therapeutic conduits may serve as a unique portal to a wide variety of malignancies. Studies over the last decade have shown that *Salmonella enterica* serovar Typhimurium (*S.* Typhimurium) is able to preferentially locate to sites of tumor growth (achieving tumor/normal tissue ratios of approximately 1,000:1) and modulate (shrink) the growth of many cancers. We found that *S.* Typhimurium profoundly downregulates the multidrug resistance transporter P-glycoprotein (Pgp). Pgp over-expression is one form of the multidrug resistance (MDR) phenotype, which can be acquired by cancer patients initially responsive to chemotherapy, therefore, much effort has been expended to find clinically effective inhibitors of Pgp; however, all the inhibitors in development that have reached the stage of clinical trials have shown high toxicity and moderate efficacy. Our work is focused on the development of a new and robust class of multidrug resistance inhibitors, which will have a major impact on the improvement of chemotherapy of some cancers that are known to express high levels of Pgp, such as colorectal cancers. It is our hypothesis that a Salmonella factor will be defined as a new MDR-reversing agent and that this factor will be particularly suitable as an oral adjuvant to chemotherapy of cancers that express high levels of Pgp. *Thus, the primary objective of this project is to evaluate the multidrug resistance (MDR) factor isolated from Salmonella for its efficacy in improving the cytotoxicity of clinically relevant drugs in* in vitro *and* in vivo *models of colon cancer.*

**Student's Role:** The student will actively take part in purifying the Salmonella MDR factor. The student will also perform a series of studies using this factor in established models of colon cancer with the objective of improving the chemotherapeutic efficacy of standard treatment.

**Required Skills:** It would be helpful (but not required) if the student has knowledge of biochemistry protocols, animal husbandry, and has some background in microbiology.

**Interview:** Required

**Location:** The McCormick Laboratory
The Medical School Building S6-110

## 17. Laboratory

**Title: Macrophage-targeted Delivery of Antimicrobials**

**Gary Ostroff, PhD**
**(508) 856-1930**

**University of Massachusetts Medical School**
**Program in Molecular Medicine**
**373 Plantation St**
**Biotech 2, Suite 113**
**Worcester, MA 01605**

**Description:** Glucan particles (GPs) are biodegradable, porous and hollow 2-4 μm microspherical particles prepared from Baker's yeast and composed of the polysaccharide beta 1,3-D-glucan. Upon administration, GPs are internalized through a receptor-mediated process by phagocytic cells, such as monocytes, macrophages, neutrophils and dendritic cells. GPs have been used for the delivery of macromolecules encapsulated within the particles via a polyplex or Layer-by-Layer (LbL) synthesis approach. For example, DNA encapsulated polyplexes have been developed using a model system with a plasmid expressing green fluorescent protein (GFP). The preparation of glucan particles for siRNA delivery followed a similar approach to that developed for DNA formulations. GPs have also been used for the delivery of small drug molecules. Previous studies have demonstrated the use of GPs for the delivery of the antibiotic, Rifampicin, using hydrogels to physically entrap the drug inside the particles and provide macrophage targeted delivery and enhanced killing of TB in vitro.

More recently we have developed a lipid enrobing process involving the synthesis of a drug core surrounded by a lipid coat within glucan particles. The Medical Student Summer Research Fellow will work as a member of a laboratory team to prepare glucan particle encapsulated antibiotics using this new process, characterize antibiotic loading levels, antibiotic release characteristics, and in vitro antimicrobial activities. Active formulations will be characterized in our collaborator's laboratories in proof of concept animal models against TB, Listeria and Salmonella.

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| **Student's Role:** | Carry out bench research synthesizing glucan particle encapsulated antibiotics, formulation characterization and assessing in vitro antimicrobial activities. |
| **Required Skills:** | Basic undergraduate chemistry and microbiology experience |
| **Interview:** | Required |
| **Location:** | 373 Plantation St., Biotech 2, Suite 113 |

## 18. Laboratory

**Title: Homologous Recombination as an Adaptive Mutation Mechanism**

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

**University of Massachusetts Medical School**
**Department of Molecular Genetics and Microbiology**
**Room S6-119**
**55 Lake Avenue North**
**Worcester, MA 01655**

**Description:** Homologous genetic recombination is a universal life process. It is nature's most accurate way to repair double strand breaks in DNA. It also catalyzes evolution, by providing a mechanism for assembling new combinations of alleles on individual chromosomes.

There is some evidence that homologous recombination may have an additional role in evolution. Cells under certain forms of environmental stress respond by elevating their rates of spontaneous mutation. This adaptive mutation response requires the activity of the cell's homologous recombination proteins. The nature of the involvement of homologous recombination in adaptive mutation is a still-open question. One hypothesis is that recombination events trigger a form of mutation-prone DNA replication in their vicinity.

The Red system of the bacteriophage λ is one of the simplest and most intensively studied homologous recombination systems, and serves as a model for the vastly more complex Rad52 system of humans. We have developed an experimental system in which it should be possible to test the Red system for its hypothesized ability to generate mutations in the vicinity of recombination events it catalyzes. The project for this summer is to carry out these tests.

**Student's Role:** Working with the principal investigator on all aspects of the research.

**Required Skills:** Keeping good notes

**Interview:** Required

**Location:** UMMS Room S6-120.

## 19. Laboratory

**Title: Regulation of Antibody Class Switching**

**Janet Stavnezer, PhD**
**(508) 856-4100**

**University of Massachusetts Medical School**
**Department of Microbiology and Physiological Systems**
**Room S5-109**
**55 Lake Avenue North**
**Worcester, MA 01655**

**Description:** A. The enzyme that initiates antibody class switching (AID) instigates DNA breaks in antibody genes but also throughout the genome, resulting in collateral damage and B lymphomagenesis. We are investigating two aspects of this problem and depending on how the experiments have progessed by summer, the student might join either of these projects.

(1) The C terminus of AID is important for proper repair and joining of the DNA breaks involved in class switching, which occurs by a recombination event. The project is to investigate whether the C terminus recruits repair proteins to the DNA. The student will perform cell culture, chromatin immunoprecipitation, and PCR experiments.

(2) We are also investigating what regulates where AID initiates DNA breaks at genes other than antibody genes. The student will perform cell culture, chromatin immunoprecipitation, PCR, and prepare DNA samples for deep sequencing.

B. After AID initiates DNA break formation, another enzyme, AP endonuclease, actually makes the DNA break. We are investigating the phenotype of mice lacking one of the two AP endonucleases involved in making the break. The student will immunize mice, and assay the antibody and immune cell responses in the knock-out mice.

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| **Student's Role:** | The student will be guided in the laboratory by a postdoctoral fellow, a technician, or an Assistant Professor. |
| **Required Skills:** | We can teach everything required but it would be best if the student knew how to pipette. |
| **Interview:** | Required |
| **Location:** | UMMS Room : S5-315 |

## 20. Medical Education

**Title: Integrating Medical Humanities into the Curriculum**

**PI: David Hatem MD**
**Co-PI: Hugh Silk MD MPH**
**(774) 442-5972**

**University of Massachusetts Medical School**
**Department of General Medicine and Primary Care**
**Benedict Building, A3-140**
**Worcester, MA 01655**

**Description:** Motivated, humanistic students enter medical school, yet on graduation evidence suggests that they are more cynical, less patient-centered, and suffer significant rates of depression, anxiety and burnout. While there is research that seeks to describe or explain this, there is less designed to reverse this trend. Efforts in the medical humanities have often focused on electives for select groups of students that exist in parallel with the curriculum, but not necessarily integrated into the curriculum.

As UMass unveils its new Learner-centered Integrated Curriculum (LInC), there is an opportunity to more clearly integrate Medical Humanities in a way that reinforces and compliments the scientific focus of medical school so that UMass will produce well-rounded and more humanistic students, capable of learning the intricacies of medicine, while also keeping focused on the central reality that the practice of medicine is an applied science involving patients with significant needs beyond knowledge about their disease.

For this summer research project, our aim is to develop an integrated medical humanities curriculum. The aim would be to do this for 4 years of the curriculum, with the initial focus on the first 2 years, and the secondary focus on the clinical years. Efforts in developing this curriculum will focus on the principles that if medical humanities are to be successfully integrated, material must be

1. Short
2. Immediately relevant including the depiction of both values aspired to and challenges faced in situations encountered
3. Have applications for those with varied experience with medical humanities

Project

1. Review curriculum and courses specifically with attention to opportunities to integrate medical humanities material
    a. Consider applications in various Courses
    b. Meet with course directors to enhance buy-in
2. Collaboratively plan with project PI and Co-PI a 4 year curriculum
    a. Meet with local experts in Medical Humanities to solicit ideas
    b. Review UMass and other resources (NYU data base, various medical humanities course sites) for medical humanities readings used throughout medical education
3. Implement curriculum in fall of 2011 and spring of 2012.
4. Develop an Evaluation plan for curriculum implemented
    a. Incorporate into course evaluation
    b. Develop plan to check effect of integration into curriculum

**Student's Role and Pre-requisites:**

1. Primary “data” collection of medical humanities resources, both internal and outside UMass
2. Will work collaboratively with PI and Co-PI to develop the range of resources
3. Will work collaboratively with PI and CO-PI to meet with course directors
4. Will develop a summary document detailing resources and make this available to course directors.

**Required Skills:**

1. Knowledge of medical humanities and resources
2. Interest in medical humanities
3. Ability to work with diverse group of people to implement project
4. Ability to work independently
5. Weekly meetings with PI/Co-PI

**Interview:** Required

**Location:** Benedict Building/Library

## 21. Public Health

**Title: Health Effects of the 2004 Federal Bureau of Prisons Tobacco Ban: Pilot Retrospective and Prospective Studies**

**Stephen A. Martin, MD, Ed.M.**
**(978) 355-9206**
**stephen.martin@umassmemorial.org**

**UMMC**
**Barre Family Health Center**
**Department of Family Medicine and Community Health**
**Department of Quantitative Health Scienses**
**151 Worcester Road**
**Barre, MA 01005**

**Description:** Despite seismic shifts in popular culture and regulation, the United States still faces a daunting amount of tobacco-related morbidity and mortality. Tobacco is still the leading cause of preventable death. Chronic Obstructive Pulmonary Disease (COPD), caused by smoking in the vast majority of cases, is the fourth leading cause of death and the only cause increasing in prevalence. Yet we know relatively little about the natural history of lung disease – especially after smoking cessation. Answering certain questions, ones as basic as whether COPD may be reversible, would be of tremendous value to policy makers and clinicians alike. Unfortunately, the costs, constraints, and challenges in conducting long-term cohort studies, let alone an interventional trial, are an impediment to understanding the progression of diseases like COPD.

However, there is a natural intervention currently underway. In 2004, the Federal Bureau of Prisons (BOP) banned the general use of tobacco for all of its inmates. Because prisoners have a higher baseline prevalence of smoking than the general population (generally 60-80%), an effective intervention results in a highly powered study. In our study design, prospective and retrospective cohorts will be employed to evaluate the health effects of the 2004 smoking ban. Data will be collected by inmate surveys, medical chart reviews, lung function tests (via spirometry), six-minute walk tests, and blood tests.

According to reviews of the proposal by those with expertise in the field, there is no similar study to the one we are proposing. Our pulmonary consultant and international authority on COPD, Dr. Bartolome Celli, believes it to be an especially important research project. The proposed study has an unusually broad potential impact, involving health services research, health policy, clinical care, and a fuller understanding of the pathophysiology of tobacco-related disease with the potential for molecular targets. It would allow contributions to the medical and policy literature in each of these areas. The collaboration for this study is in a special constellation: a BOP with a reinvigorated research mission, an existing relationship between the BOP and U Mass, and personnel who are familiar with both the prison and academic settings. Our hope from this relatively small pilot study is to generate data that would help in obtaining significant external funding, such as from the NIH/NHLBI, for a larger project that would be possible given the scale and infrastructure of the BOP.

**Student's Role:**

- Work closely with the PI and other research team members in all steps of the research
- On-site research at the Federal Medical Center, Devens potentially including informed consent, questionnaires, spirometry, 6-minute walk tests, chart reviews, and other aspects of the study; work at Devens requires a background check
- Assist with the effective gathering and entering of research data
- Review and understand medical literature as applies to this study
- Skill acquisition and exploration of the research efforts of the sponsoring departments, the Department of Family Medicine and Community Health and the Department of Quantitative Health Sciences

**Required Skills:**

- Willingness to learn and apply research techniques
- Openness and motivation to work in a corrections environment (there will always be a Federal staff escort)
- Appreciation for working with all members of the research efforts: inmate subjects, Bureau of Prison staff, epidemiologists, clinicians
- Flexibility and energy to help implement the study protocol, adapt it as necessary
- Interest in potentially learning skills such as spirometry (breathing tests) for the study

**Interview:** Required

**Location:** Federal Medical Center, Devens
University of Massachusetts Medical School

## 22. Public Health

**Title: Preterm Delivery: Assessment of Differential Risk Factors, Etiologies and Community Risk/Geography by Race/Ethnicity**

**Tiffany A. Moore Simas, MD, MPH, MEd**
**(508) 334-6678**
**TiffanyA.MooreSimas@umassmemorial.org**

**UMMHC**
**Memorial Campus**
**OB/GYN Department**
**Jaquith Building Room 4053**
**119 Belmont Street**
**Worcester, MA 01605**

**Description**: In comparison to the overall state of Massachusetts and the United States, Worcester's infant mortality rate is high, even in comparison to equivalent cities like Boston and Springfield. Local investigations into underlying causes have revealed that certain populations within the city of Worcester are disproportionately affected – for example, non-native black mothers and Hispanic mothers. The aforementioned discovery has been integral to the work and focus on Worcester's Infant Mortality Reduction Task Force (WIMRTF) – a multi-disciplinary volunteer collaborative group that seeks to address this issue and has been working towards its betterment for approximately 15 years. Many of the infants who die are born extremely prematurely. This retrospective chart review will compare the etiologies of pre-term deliveries in black, Hispanic, and white women. The study will also look for differences in potential risk factors for pre-term birth between these three races and amongst their same race counterparts that delivered full-term. Data collected from this project will be used to inform future research and clinical care efforts.

**Student's Role:**
Chart review
Data entry & cleaning

**Required Skills**:
Punctuality/reliability
Attention to detail
Strong interpersonal skills for interaction with administrative/nursing/physician staff and patients
Comfort with Xcel database
Organization skills
Completion of CITI exam
Strong independent student, comfortable asking questions
Inquisitive

**Interview:** Required

**Location:** Memorial Campus

## 23. Public Health

**Title: Gestational Weight Gain Prior to the Glucose Tolerance Test and the Risk of Gestational Diabetes Mellitus**

**Tiffany A. Moore Simas, MD, MPH, MEd**
**(508) 334-6678**
**TiffanyA.MooreSimas@umassmemorial.org**

**UMMHC**
**Memorial Campus**
**OB/GYN Department**
**Jaquith Building Room 4053**
**119 Belmont Street**
**Worcester, MA 01605**

**Description**: Gestational diabetes mellitus (GDM) complicates 4–7% of pregnancies in the US. Defined as glucose intolerance with onset or first recognition during pregnancy, GDM is associated with increased risks of perinatal complications.

Excessive weight gain in early to mid pregnancy has also been thought to be associated with increased prevalence of GDM. However, in 2009 when the Institute of Medicine (IOM) released new recommendations for gestational weight gain (GWG) they excluded GDM as an outcome citing a lack of evidence regarding the role of GWG in relation to GDM. It is not clearly known whether weight gain in excess of recommendations increases the risk of developing GDM. A modestly sized nested case-control study out of Kaiser Permanente showed that greater GWG in the first trimester was associated with an increased risk of developing GDM; several earlier studies showed that excessive GWG is associated with an increased risk of impaired glucose tolerance during pregnancy that did not meet the strict criteria for GDM. Another recent study found no association between GWG before the GDM screening and risk of GDM, but they did find a borderline association between a high rate of weight gain in the first trimester and risk of GDM. Given this conflicting data, further investigation is warranted.

Another risk of developing GDM is being a member of an ethnic group with a higher risk of developing Type II diabetes. Rates of diabetes and obesity are consistently higher among Hispanic as compared to non-Hispanic whites. It is estimated that by 2050 Hispanic women will comprise 24% of the female population in the United States. The public health impact of this is significant as Hispanics are the largest minority group in the US, with the highest birth and immigration rates of any minority group. With this in mind, and considering the significant Latina population among our patients, we propose studying GWG prior to routine Gestational Diabetes Screening in this population. Our partners at the School of Public Health & Health Sciences at the University of Massachusetts-Amherst have similar data, and by combining our populations we aim to publish a well-powered study investigating early pregnancy weight gain and risk of GDM in the Latina population.

The overall objective of this application is to perform a record review and combine data with the University of Massachusetts at Amherst to investigate the effect of GWG on the risk of developing GDM in Latina Women.

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| **Student's Role:** | Chart review<br>Data entry & cleaning |
| **Required Skills**: | Punctuality/reliability<br>Attention to detail<br>Strong interpersonal skills for interaction with administrative and research staff<br>Comfort with Xcel database<br>Organization skills<br>Completion of CITI exam<br>Strong independent student, comfortable asking questions<br>Inquisitive |
| **Interview:** | Required |
| **Location:** | Memorial Campus |

## 24. Public Health

**Title: Cognitive Impairment in Patients Hospitalized with Heart Failure**

**Jane Saczynski PhD**
**(508) 856-6944**

**University of Massachusetts Medical School**
**Department of Medicine, Division of Geriatric Medicine**
**Biotech 4, Suite 315**
**377 Plantation Street**
**Worcester, MA 01605**

**Description:** Cognitive impairment (CI) is an increasingly recognized clinical condition in the geriatric population. CI often occurs in the context of chronic medical conditions that are common in older adults and has been shown to adversely influence the clinical and quality of life outcomes of patients. Heart failure is also a common clinical condition in older adults, occurring in 3-10% of persons 65 years and older, and is associated with considerable morbidity and mortality. Rehospitalization rates in patients with HF are high with as many as 60% of older patients rehospitalized within 3-months of an acute HF exacerbation. Importantly, nearly one half of these readmissions are potentially preventable with optimal medical management and improved self-care practices. Self-care of HF is complex and requires patients to monitor symptoms and clinical signs, adhere to a number of dietary and lifestyle behaviors, and effectively communicate with their healthcare providers when changes occur; all of these tasks may be more difficult when a patient is cognitively impaired. Cognitive impairment represents an important, yet underappreciated, condition in elderly patients with HF, the understanding of which will inform the development of interventions to improve self-care practices that are tailored to patient's cognitive status.

The project that will examine the prevalence of CI among more than 800 elderly patients hospitalized with HF who are participating in a prospective cohort study at 4 medical centers in Central, MA and Providence, RI (the National Institute on Aging funded 'Cognitive Status and Management of Chronic Disease in the Elderly 'K01 AG33643-01A2). The study population has a mean age of 76 years, with women comprising approximately 50% of the sample. Cognitive function was assessed during hospitalization via several cognitive tests including the Mini-Mental State Exam. The results of this work will contribute to the understanding of the role CI plays in HF and to the development of interventions tailored to cognitively impaired elderly patients with HF that will enhance the health and clinical outcomes of these high risk patients.

**Student's Role:** Assistance with literature search, data analysis and manuscript preparation

**Required Skills:** Previous research experience preferred

**Location:** Biotech 4 - Suite 315

## 25. Public Health

**Title: Cape Cod Resident Survey to Assess the Prevalence of Household-level Challenges such as Food Security, Housing, Substance Abuse, and Mental Health and Associated Needs for and Barriers to Services**

**Christine Clements Stein, PhD**
**508-375-6629 or 508-737-2896**

**Family Medicine and Community Health**
**Barnstable County Department of Human Services**
**PO Box 427**
**Barnstable, MA**

**Description**: Barnstable County is the regional government for Cape Cod's 15 communities, which comprise 221,151 non-seasonal residents. The County focuses on issues that impact the regions public health, public safety and the environment and offers services that best reflect the needs of the region. The goals of the Department of Human Services are to 1) plan, develop, and implement programs which enhance the overall delivery of human services in Barnstable County and, 2) promote the health and social well being of County residents through regional efforts that improve coordination of services.

The Department organizes regional approaches that promote health and wellness for underserved populations by mobilizing a community response to needs identified through community-based research and evaluation. In keeping with this, the Department plans to conduct a County-wide resident survey in the fall of 2011 to assess the prevalence of household-level challenges such as food security, housing, substance abuse, and mental health and associated needs for and barriers to services. This survey is a new direction from a survey the Department administered from 2004 to 2008 called The Human Condition.

**Student's Role**: During the fellowship period June 5 – August 6, the medical student will work directly with the UMMS faculty listed above. The student will assist in 1) a literature review of recent community-based health and human service needs assessments, 2) developing and piloting a survey instrument with closed and open-response questions, which will include conducting focus groups and interviews with local consumers and other key informants; and 3) developing a sampling plan, field methods, and an analysis plan.

**Required Skills:**

Knowledge of survey methods
Prior experience conducting and analyzing focus groups and key informant interviews preferred but not required
Ability to communicate effectively with a broad variety of stakeholders, including County staff, health and human service providers and their clients, and community residents in general Interest in social determinants of health and community health in non-urban settings

**Interview:** Required

**Location:** Barnstable County Complex, Route 6A, Barnstable Village, Cape Cod, MA (Some work may be conducted remotely)