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May 20th, 8:00 AM

Mini Symposia Program: 2014 UMass Center for Clinical and Translational Science Research Retreat

UMass Center for Clinical and Translational Science

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UNIVERSITY OF MASSACHUSETTS CENTER FOR CLINICAL & TRANSLATIONAL SCIENCE

5TH ANNUAL RESEARCH RETREAT

May 20, 2014

Albert Sherman Center, UMMS Worcester campus

MINI SYMPOSIA PROGRAM	
11:00 AM – 12:30 PM	<p>1. Polyphenols: Eat, Drink and Be Healthy Moderators: Mahdi Garelnabi, Catherine Neto, and Thomas A. Wilson Room: Multi-Purpose Room EAST, Albert Sherman Center</p>
	<p>2. Creating Devices for Personalized Health Monitoring Moderator: Joseph Jerry Room: Multi-Purpose Room WEST, Albert Sherman Center</p>
	<p>3. Finding Signals Amidst the Noise Moderator: Anthony Carruthers Room: Auditorium, Albert Sherman Center</p>
	<p>4. Can Simply Paying Attention Change Behavior? Emotion and Behavior Regulation Through Meditation Moderator: Judy Ockene Room: Hiatt Auditorium, UMass Medical School (1st floor)</p>
2:30 PM – 4:00 PM	<p>5. Utilizing Community Voices to Translate Research into Communities: Results from Three Pilot Studies Conducted by Academic and Community Partnerships Moderator: Ira Ockene Room: Multi-Purpose Room EAST, Albert Sherman Center</p>
	<p>6. Data Acquisition, Data Management, and Subject Tracking in Clinical and Translational Research: Seeking Solutions to Persistent Challenges Moderators: Mary Costanza and Bruce Barton Room: Auditorium, Albert Sherman Center</p>
	<p>7. Divergent Impacts of Physical Activity and Sedentary Behavior on Glucose Intolerance and Vascular Function: From Laboratory to Clinic Moderators: Barry Braun and Sheila Chauhan Room: Hiatt Auditorium, UMass Medical School (1st floor)</p>
	<p>8. Physical Activity, Sedentary Behavior and Function in Individuals with Knee and Hip Osteoarthritis: Clinical Observations and Opportunities for Future Moderator: David Ayers Room: Multi-Purpose Room WEST, Albert Sherman Center</p>
4:00 PM – 5:30 PM	<p>9. Manipulating the Gut Microbiome for Human Health Moderators: Beth McCormick and Jeffrey Blanchard Room: Auditorium, Albert Sherman Center</p>
	<p>10. Systems Science and Health: Using Analytical Approaches to Evaluate Healthcare Policy Decisions Moderators: Isa Bar-On and Allison Rosen Room: Multi-Purpose Room EAST, Albert Sherman Center</p>
	<p>11. Advanced Computational and Technological Approaches to Mitigating Mobility Dysfunction in People with Multiple Sclerosis Moderator: Richard van Emmerik Room: Multi-Purpose Room WEST, Albert Sherman Center</p>

1. Polyphenols: Eat, Drink and Be Healthy

Moderators: **Mahdi Garelnabi, MSc. MLT, PhD**, Assistant Professor, Department of Clinical Laboratory and Nutritional Sciences, University of Massachusetts Lowell

Catherine C. Neto, PhD, Professor, Department of Chemistry and Biochemistry, University of Massachusetts Dartmouth

Thomas A. Wilson, PhD, MPH, LDN, Associate Professor, Department of Clinical Laboratory and Nutritional Sciences, University of Massachusetts Lowell

Presenters: **Barabara Shukitt-Hale, PhD**, Research Physiologist, Neuroscience and Aging Laboratory, Tufts USDA-ARS-HNRCA

Julia J. Peterson, PhD, Adjunct Assistant Professor, Friedman School of Nutrition Science and Policy, Tufts University School of Medicine

Background and Purpose:

Polyphenols include a diverse group of naturally-occurring flavonoids, tannins, and stilbenes. These molecules are found in many vegetables and fruits such as onions, cranberry and grape; as well as their processed byproducts such as red wine and chocolates, spices, "nutraceutical" supplements, herbals and botanical preparations. Several polyphenols are known to have beneficial health effects because of their antioxidant properties and their anti-inflammatory inhibitory role. Recent data from human studies and animal models experiments have shown that phytochemical compounds have anti-cancer, and cardiovascular and neurological protective roles. The goal of this mini symposium is to highlight the beneficial health effect of flavonoids by presenting the current scientific understanding from the basic laboratory research and evidences from clinical studies. The four presenters are expected to share data from their research in areas covering areas such as infection, cancer, cardiovascular and neurological diseases.

This mini-symposium will provide an interdisciplinary and translational aspect of polyphenol antioxidants and is expected to be attended by a wide audience of researchers interested in diseases mentioned above and on the role of antioxidants in health and disease.

Format:

We propose an invited key speaker from the Antioxidants Research Laboratory at Tufts University speaking for 30 minutes including discussion and 3 additional presentations 15 minutes each followed by 5 minutes discussion for a total of 20 minutes slot.

2. CREATING DEVICES FOR PERSONALIZED HEALTH MONITORING

Moderator: **Joseph Jerry, PhD**, Professor Department of Veterinary and Animal Science, University of Massachusetts Amherst; Science Director, Pioneer Valley Life Sciences Institute; Co-Director, Rays of Hope Center for Breast Cancer Research

Presenters: **David D. McManus, MD, ScM, FACC, FHRS**, Assistant Professor of Medicine, Section of Cardiac Electrophysiology, University of Massachusetts Medical School and Worcester Polytechnic Institute

Patty Freedson, PhD, Professor and Chair, Department of Kinesiology, University of Massachusetts Amherst

Christopher Salthouse, PhD, Dev and Linda Gupta Assistant Professor, Department of Electrical and Computer Engineering, University of Massachusetts Amherst

Jeffrey Morse, PhD, Managing Director, National Nanomanufacturing Network, Center for Hierarchical Manufacturing, University of Massachusetts Amherst

Background, Purpose, and Scientific Issues to be addressed:

Background: This past summer Governor Patrick announced a \$100 million grant from the Massachusetts Life Science Center for life sciences capital projects and includes \$95 million for UMass Amherst. The grant will foster increased engagement with industry partners and institutions such as the University of MA Medical School. Three centers were funded including the Center for Personalized Health Monitoring (CPHM). The CPHM is an interdisciplinary research, training, and technology development center in wearable sensor systems for personalized health and biometric monitoring. CPHM's mission is to conduct basic and translational research with world-leading impact across the entire technical roadmap for advanced personalized health monitoring for acute care and tele-medicine settings.

Purpose: This mini-symposium will present examples of applications of personalized health monitors and technical capabilities available through CPHM. Dr. McManus will present recent work related to cardiac monitoring using smartphone and bioimpedance sensors, including arrhythmia, blood volume, and heart failure monitoring. Dr. Freedson will highlight her group's research on the calibration and validation of wearable physical activity sensors and how these sensors are used to examine the relationship between physical activity dose and health-related responses. She will also discuss research pertaining to sleep monitoring sensors conducted by Dr. Rebecca Spencer in the Department of Psychology. Dr. Salthouse will discuss the expertise and tools available in CPHM to develop instruments to digitize biology giving examples from his current projects to build a point-of-care flow cytometer and a non-intrusive head and eye tracking system. Dr. Morse will discuss advances in transitioning nanofabrication processes for realizing sensors for personalized health monitoring, including the development of wearable microfluidic sensors for detection of biomarkers indicative of stress and fatigue. Examples from current projects include nanoparticle field effect transistor (FET) sensors, printed microfluidics, and replication of antimicrobial/anti-fouling surfaces via high throughput, roll-to-roll processes.

Scientific Opportunities: We will provide a framework for how the CPHM research laboratories, industry partners, and UMass Medical School collaborators can be integrated to produce novel wearable sensors to assess behaviors and biomarkers related to human health. Giles Whalen, MD, Department of Surgery or James Liebmann, MD, Department of Medicine, University of MA Medical School, will participate in the Panel Discussion providing insights into needs and applications of monitors in oncology.

Format:

Introduction (5 min): Joseph Jerry

Four speakers (60 min total): 15 minute presentations by Drs. McManus, Freedson, Salthouse, and Morse

Panel Discussion (25 min): Pose issues for discussion and feedback of collaborations between CPHM and clinical partners at UMMS

3. FINDING SIGNALS AMIDST THE NOISE

Moderator: **Anthony Carruthers, PhD**, Professor and Dean, Graduate School of Biomedical Science, University of Massachusetts Medical School

Presenters: **Wes Salomon**, PhD Candidate, Zamore Laboratory, University of Massachusetts Medical School

Victor Serebrov, PhD, Research Instructor, Moore Laboratory, University of Massachusetts Medical School

Kate Lapane, PhD, Associate Dean, Graduate School of Biomedical Science; Director, Doctoral Program in Clinical & Population Health Research; Professor, Division of Epidemiology of Chronic Diseases and Vulnerable Populations, University of Massachusetts Medical School

David Grunwald, PhD, Assistant Professor, Biochemistry and Molecular Pharmacology, University of Massachusetts Medical School

Arlene Ash, PhD, Professor and Division Chief, Division of Biostatistics and Health Sciences Research, Department of Quantitative Health Sciences, University of Massachusetts Medical School

Manuel Garber, PhD, Associate Professor and Director, Bioinformatics Core Facility, Department of Quantitative Health Sciences, University of Massachusetts Medical School

Presentations:

<i>RISCy business</i>	Salomon and Serebrov
<i>The promise and perils of pharmacoepidemiology</i>	Lapane
<i>In motley pictures with a little clarity, much error and a spark of verity</i>	Grunwald
<i>Predicting key healthcare outcomes</i>	Ash
<i>The ups and downs of genomic analysis</i>	Garber
<i>Moderated Panel Discussion</i>	All presenters

Format:

Five, short presentations (10 minutes) followed by a moderated panel discussion.

4. CAN SIMPLY PAYING ATTENTION CHANGE BEHAVIOR? EMOTION AND BEHAVIOR REGULATION THROUGH MEDITATION

Moderator: **Judy Ockene, PhD, MEd, MA**, Professor, Department of Medicine, University of Massachusetts Medical School

Presenters: **Wenjun Li, PhD**, Associate Professor, Department of Medicine, University of Massachusetts Medical School

Carl Fulwiler, MD, PhD, Associate Professor, Department of Psychiatry, University of Massachusetts Medical School

Judson Brewer, MD, PhD, Associate Professor, Departments of Medicine and Psychiatry, University of Massachusetts Medical School

Background and Purpose:

Why do we eat cookies when we are anxious? Why do we smoke when we are stressed? And what can we do about this? Much progress has been made over the past several decades in elucidating the psychological and neurobiological mechanisms underlying emotional and cognitive regulation. Cognitive Behavioral Therapy has shown that we can retrain our minds to reduce depressive symptoms and stop using drugs. And more recently, this type of cognitive control has been shown to involve the prefrontal cortex exerting “top-down” control of evolutionarily older brain structures such as the limbic system.

However, the prefrontal cortex is also the first structure to become less functional during anxious or stressful situation; and it has also been suggested that will power can be depleted, which may suggest at least in part why cognitive therapy success rates are far below 50%. Recently, mindfulness training, which helps individuals pay attention to their present moment experience, and in doing so, “let go” when they are perpetuating unhealthy habit patterns, has been shown to effectively treat depression, anxiety and intractable pain, and even double the quit rates for smokers compared to “gold-standard” cognitive therapy. From a neurobiological perspective, mindfulness seems to enlist brain structures involved in self-referential processing, suggesting an entirely different, potentially powerful and lasting mechanism of behavioral change.

In this mini symposium, we will briefly present clinical and translational data showing how mindfulness training affects clinically relevant problems such as emotional eating and smoking, and how it changes network connectivity and activation of relevant brain structures. Specifically, Dr. Fulwiler will present preliminary data on changes in emotional eating following mindfulness training and neuroimaging studies on changes in emotion regulation pathways that may explain how mindfulness may be helpful for maintaining healthy behaviors. Next, Dr. Brewer will briefly present studies that used conventional and real-time fMRI to investigate the neurobiological mechanisms of mindfulness comparing novice and experienced meditators. He will also present ongoing work aimed to test the utility of neuro-feedback as an augmentation strategy for mindfulness training. Finally, Dr. Li will present the overarching design and progress on the development of International Network of Data Registries for Advancing Mindfulness Practice, Education and Research (INDRA-M). INDRA-M is designed for the mindfulness profession, and to support comparative effectiveness research through systematic prospective data collection across multiple practices in 56 countries. It will support research on weight loss/obesity prevention, smoking cessation, pain management, stress reduction and work productivity, and long-term return-on-investment analysis.

Format:

Each presentation will be a maximum of 15 minutes, which expressly is intended to foster discussion around the issues related the similarities and differences between cognitive and mindfulness techniques, as well as the promises and challenges in translating mechanistic findings into clinical practice. The discussion will be led off by Dr. Ockene, who will give a brief description of key elements of the mechanisms underlying cognitive therapies.

5. UTILIZING COMMUNITY VOICES TO TRANSLATE RESEARCH INTO COMMUNITIES: RESULTS FROM THREE PILOT STUDIES CONDUCTED BY ACADEMIC AND COMMUNITY PARTNERSHIPS

Moderator: **Ira S. Ockene, MD**, David and Barbara Milliken Professor of Preventive Cardiology; Cardiovascular Medicine; Director of the UMass CCTS Community Engagement and Research Section, University of Massachusetts Medical School

Presenters: A) **Elmer R. Freeman, MSW**, Center for Community Health Education Research and Service

B) **Heather-Lyn Haley, PhD**, Assistant Professor, Family Medicine and Community Health, University of Massachusetts Medical School and **Valerie Zolezzi-Wyndham, Esq.**, Community Legal Aid

C) **Jeroan Allison, MD, MS**, Professor, Department of Quantitative Health Sciences, University of Massachusetts Medical School and **Marie Boone, MHS**, Vice President, Mosaic Cultural Complex (Mosaic)

Background and Purpose:

The mission of the Community Engagement and Research Section of the UMass Center for Clinical and Translational Science is to improve health in Massachusetts by fostering community engaged research among UMass researchers and community partners. One mechanism to foster this research approach is through pilot funding for community translational research. Our pilot awards focus on community engaged research defined as “the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting well-being of those people” (CDC, 1997). Our three 2013 awardees will present their collaborative research projects, outcomes and future plans. The session will provide an opportunity for the cross-fertilization of ideas and experiences, and will bring together people with diverse interests from different community organizations. The three presentations will be:

- A) ***Resilient, Active and Vibrant Elders (RAVE)***; **Elmer R. Freeman, MSW**, Center for Community Health Education Research and Service. RAVE is an exploratory study of barriers to chronic disease management among Black and Latino Roxbury residents over age 50 in order to create a pilot health promotion program. This study is spearheaded by the Center for Community Health Education Research and Service, Inc., which is nationally recognized as a model community-academic research partnership.
- B) ***Understanding and Addressing the Legal Needs of Refugees***; **Heather-Lyn Haley, PhD**, Family Medicine and Community Health and **Valerie Zolezzi-Wyndham, Esq.**, Community Legal Aid. This study focuses on understanding the barriers refugees face when obtaining critical support services, benefits and housing. The aim is to improve individual and systemic level advocacy and training strategies designed to reduce the barriers impeding access to public benefits and housing for Worcester’s growing and diverse refugee population.
- C) ***Simulation-based Community-engaged Research Intervention for Informed Consent Protocol Testing and Training (SCRIPPT) Project***; **Jeroan Allison, MD, MS**, Department of Quantitative Health Sciences and **Marie Boone, MHS**, VP of Mosaic Cultural Complex (Mosaic). This project incorporates culturally and linguistically competent methods into the informed consent process using the expertise of community members. Results of this work will be an increase engagement by communities of color in biomedical research. This project is led by a team whose experiences include community health and community-engaged research, and builds upon the work of Mosaic, the UMass Center for Health Equity Intervention Research (CHEIR), the CCTS Bioethics, Core, and the UMMS Office of Educational Affairs’ Inter-professional Center for Experiential Learning and Simulation (iCELS).

Format:

Three, 20-minute presentations, with time after each presentation and at the end for questions, comments, and interaction.

6. DATA ACQUISITION, DATA MANAGEMENT, AND SUBJECT TRACKING IN CLINICAL AND TRANSLATIONAL RESEARCH: SEEKING SOLUTIONS TO PERSISTENT CHALLENGES

Moderators: **Mary Costanza, MD**, Professor Emeritus, Department of Medicine, University of Massachusetts Medical School

Bruce Barton, PhD, Research Professor, Department of Quantitative Health Sciences, University of Massachusetts Medical School

Presenters: **Roger Luckmann, MD, MPH**, Associate Professor, Department of Family Medicine and Community Health, University of Massachusetts Medical School

Dane Netherton, Database Administrator, Department of Quantitative Health Sciences, University of Massachusetts Medical School

Rebecca Gore, PhD, Biostatistician/Programmer, University of Massachusetts Lowell

Paul Ranauro, Research Software Engineer, UMMS Information Services, University of Massachusetts Medical School

Background and Purpose:

The implementation of clinical studies that involve recruiting and observing human subjects over time requires that data of many types be collected from subjects directly, and from electronic data sources (e.g. electronic health records, claims databases). These data usually must be integrated into a single data system through the use of a variety of data collection interfaces (e.g. data entry and scanning applications, computer assisted telephone interviewing tools, data extraction programs, etc.) and then used to track subjects throughout the study period, to generate reports relevant to study management and ultimately to develop analytic datasets.

As clinical studies become increasingly complex, the development of the supporting data systems presents many challenges including: 1) designing effective and complete field naming conventions, 2) handling potentially conflicting data from disparate sources, 3) designing routines for updating data fields in real time from external clinical data sources, 4) developing applications to support building customized data collection tools and report generators, and other challenges. While some software applications (e.g., REDCap) are available that provide some of the functionality required to meet complex clinical research needs, much of the time custom software development and database design are the only viable approaches to creating a system that meets all study needs. These applications and interfaces are usually built by teams that may include researchers, software developers, database designers, data managers and/or data analysts who may have only limited experience in systematic approaches to confronting the complex challenges of data system design for clinical studies.

We propose a symposium aimed at starting a dialogue among a diverse set of UMass faculty and staff who are involved in addressing the clinical data challenges described above. The specific objectives of the symposium are: 1) to identify and characterize important and recurring challenges to data acquisition and management and subject tracking, 2) to identify *local* resources (e.g. consultants, specialized information system teams, software developers) that could facilitate clinical data system design and implementation for UMass research studies, and 3) to explore potential solutions to common data problems and additional resources needed to address identified challenges.

Format:

The symposium will open with a 10 minute case presentation by Dr. Luckmann focusing on common challenges arising from his clinical research experience in the development and implementation of complex data systems. A summary of this case study presentation will be provided to other panel members one week before the symposium to allow them to prepare comments on the issues he raises.

Each subsequent presenter will have 10 minutes to address one or more of the issues arising from Dr. Luckmann's presentation and to share challenges and solutions to design problems they have identified in their own work.

This format will allow for 40-45 minutes for the moderators to engage the panel and the audience in a discussion aimed at defining the most important issues to be addressed, the most promising approaches to address them and the resources required to respond to the data system development needs identified.

7. DIVERGENT IMPACTS OF PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR ON GLUCOSE INTOLERANCE AND VASCULAR FUNCTION: FROM LABORATORY TO CLINIC

Moderator: **Barry Braun, PhD**, Professor, Department of Kinesiology, University of Massachusetts Amherst

Shaila V. Chauhan, MD, Assistant Professor of Obstetrics and Gynecology, University of Massachusetts Medical School

Presenters: **Sarah Witkowski, PhD**, Assistant Professor, Department of Kinesiology, University of Massachusetts Amherst

Barry Braun, PhD, Professor, Department of Kinesiology, University of Massachusetts Amherst

Lisa Chasan-Taber, ScD, Professor, Epidemiology and Biostatistics, Department of Public Health, University of Massachusetts Amherst

Background, Purpose and Scientific Issues to Be Addressed:

Lack of sufficient physical activity is strongly associated with increased risk for Type-2 diabetes, gestational diabetes and cardiovascular disease. The pathophysiology of all three disorders is characterized by insulin resistance, glucose intolerance and endothelial dysfunction. Habitual exercise opposes all of those conditions and reduces risk for making the transition from insulin resistance compensated by hyperinsulinemia to overt clinical diagnosis. Although the influence of increasing physical activity is reasonably well understood, the impact of increased sedentary behavior (e.g. time spent sitting) is less clearly understood. The separate roles of physical activity and sedentary behavior in the underlying mechanisms and clinical manifestations of insulin resistance/glucose intolerance/vascular dysfunction are just now being elucidated. Despite the lack of compelling data, the media have unleashed a blizzard of attention about the benefits of less time spent sitting, with headlines touting the use of treadmill desks, walking meetings, etc., to enhance health and lower health-care costs, e.g., "Stand-up desks can add years to your life", Miami Herald, 5/21/12. "The health benefits of working on your feet", Denver Post, 9/5/11. "Companies take a stand against sitting", San Francisco Chronicle, 8/8/12.

Despite the media frenzy, there are almost no experimental data that compare the efficacy of reduced sitting with the better established efficacy of daily physical activity. In this mini-symposium, the three speakers will show data on the role of increased physical AND sedentary behavior in mediating Type-2 diabetes, gestational diabetes and cardiovascular disease. In addition, they make connection to the impact on clinical practice and discuss future directions.

Format:

Introduction: Shaila Chauhan (5 min)

Three speakers: 20 minute presentations (60 min total)

Discussion (25 min)

Questions from audience (10 minutes)

Discussion of how the results potentially affect/change clinical practice (15 min)

8. PHYSICAL ACTIVITY, SEDENTARY BEHAVIOR AND FUNCTION IN INDIVIDUALS WITH KNEE AND HIP OSTEOARTHRITIS: CLINICAL OBSERVATIONS AND OPPORTUNITIES FOR FUTURE RESEARCH

Moderator: David Ayers, MD, Professor and Chair, Department of Orthopedics and Rehabilitation, University of Massachusetts Medical School

Presenters: Patty Freedson, PhD, Professor and Chair, Department of Kinesiology, University of Massachusetts, Amherst

Amanda Hickey, MS, Doctoral Candidate, Department of Kinesiology, University of Massachusetts, Amherst

Patricia Franklin, MD, MPH, MBA, Professor, Department of Orthopedics and Rehabilitation, University of Massachusetts Medical School

Background, Purpose and Scientific Issues to Be Addressed:

Background - Osteoarthritis (OA) has negative effects on quality of life due to pain which impacts the ability to carry out activities of daily living. Osteoarthritis affects 27 million people in the US¹ and annual medical costs are estimated to be \$89.1 billion². Thus, it is desirable to examine possible strategies and interventions that may be effective in improving quality of life and reducing costs in individuals with OA. Physical activity has positive effects on functional capacity in knee and hip OA patients but evidence has also shown that as OA progresses, physical activity declines. Most of the evidence examining OA and physical activity use self-report tools to quantify physical activity behavior. These subjective assessment measures are prone to recall bias and differential errors in reporting. **Purpose** - This symposium will highlight research results from a Life Science Moment Fund project that used wearable monitors to objectively quantify changes in physical activity and sedentary behavior in individuals with moderate to severe knee and/or hip OA. These patients were undergoing conservative treatments (e.g. physical therapy, medications) and we monitored them with wearable sensors every 3 mos for 9 mos. **Scientific/Translational Issues** - We will present the physical activity and sedentary behavior results and examine these measures in relation to commonly used self-report measures of pain and function. Use of objective tools to quantify physical activity and sedentary behavior in large clinical trials examining OA, obesity, or various interventions to reduce pain and improve function will also be discussed.

¹Lawrence et al. *Arthritis Rheum.*, 2008

²Leigh et al., *Rheumatol.*, 2001

Format:

- 1) Introduction: David Ayers (5 min)
- 2) Three speakers: 20 minute presentations (60 min total)
- 3) Discussion (25 min)
 - a. Answer questions from audience (10 minutes)
 - b. Pose issues for discussion to audience for feedback (e.g. how can this work be expanded to integrate basic science research?) (15 min)

9. MANIPULATING THE GUT MICROBIOME FOR HUMAN HEALTH

Moderators: **Beth A. McCormick, PhD**, Professor, Department of Microbiology & Physiological Systems, University of Massachusetts Medical School

Jeffrey Blanchard, PhD, Associate Professor, Department of Biology, University of Massachusetts Amherst

Presenters: **Randall Pellish, MD**, Assistant Professor, Division of Gastroenterology, Department of Medicine, University of Massachusetts Medical School

Vanni Bucci, PhD, Assistant Professor, Department of Biology, University of Massachusetts Dartmouth

Barbara Olendzki, MPH, RD, LDN, Assistant Professor, Center of Applied Nutrition, University of Massachusetts Medical School

David Sela, PhD, Assistant Professor, Department of Food Science, University of Massachusetts Amherst

Background and Purpose:

Mounting evidence suggests that particular aspects of human health and disease may be attributable to the trillions of microbes that inhabit our gastrointestinal tract, collectively referred to as the gut microbiota. The gut microbial communities contribute to human health and survival in a variety of critical ways, including facilitating nutrient acquisition and immune development and providing protection against introduced pathogens. The recent realization of the power of the gut microbiome in regulating human health and disease is a major advancement and provides a new potential target for the maintenance of health and prevention and therapy for some human diseases. Evidence suggests that pathologic changes to the microbiota (termed “dysbiosis”) are associated with a wide variety of medical outcomes, and therefore therapeutic manipulation of the microbiota is a major area of research interest. However, the complex and interconnected nature of this population poses a major challenge for the development of interventions. We propose a mini symposium with the goal of fostering an interdisciplinary discussion among practitioners, dieticians, nutritionists, as well as basic/clinical scientists interested in the gut microbiome and its role in health and disease. We will facilitate this goal by focusing on two important clinical diseases known to be associated with dysbiosis, Inflammatory Bowel Disease and *Clostridium difficile* colitis, and inviting clinical and basic researchers to present their diverse perspectives on potential therapeutic interventions. Approaches for manipulating the gut microbiome through diet, targeted antibiotic therapy, provision of specific cocktails of select bacteria, and fecal microbiota transplantation for health and disease are under investigation or use. Keeping abreast of this rapidly moving field and realizing how these findings could possibly be extrapolated to the clinical setting is difficult, yet an understanding of the mechanisms and potential clinical applications is imperative. The gut microbiome offers myriad possibilities to basic and translational researchers, clinicians and patients. Thus, UMass thought leaders in the field of microbiome research will present session lectures and participate in a follow-up interactive, discussion-based workshop on topics related to attempts to manipulate the gut microbiota to improve health.

Format:

Introduction by Moderators:

Drs. McCormick and Blanchard (10 min)

C. difficile infection:

Clinical gut manipulation: Dr. Randy Pellish - Fecal Transplantation (15 min)

Basic research approach: Dr. Vanni Bucci - Antibiotic Treatment (15 min)

Intestinal Disease:

Clinical gut manipulation: Barbara Olendzki - Dietary Interventions (15 min)

Basic research approach: David Sela - Probiotic Delivery (15 min)

Interactive Discussion/Workshop on Relevant Topics: (20 min)

10. SYSTEMS SCIENCE AND HEALTH: USING ANALYTICAL APPROACHES TO EVALUATE HEALTHCARE POLICY DECISIONS

Moderators: **Isa Bar-On, PhD**, Department of Mechanical Engineering, Worcester Polytechnic Institute

Allison Rosen, MD, MPH, ScD, Quantitative Health Sciences, University of Massachusetts Medical School

Presenters: **Tze Chao Chiam, PhD**, Quantitative Health Sciences, University of Massachusetts Medical School

Renata Konrad, PhD, School of Business, Worcester Polytechnic Institute

Oleg Pavlov, PhD, Social Science & Policy Studies, Worcester Polytechnic Institute

Khalid Saeed, PhD, Social Science & Policy Studies, Worcester Polytechnic Institute

Shamsnaz Virani, PhD, Systems Engineering and Leadership Institute, Worcester Polytechnic Institute

Background and Purpose:

The focus of this symposium is on systems science applications to health research. Systems science is a collection of analytical computer simulation techniques which are used to evaluate optimize and improve healthcare delivery processes. These techniques account for the complexity of the healthcare system and healthcare processes by modeling nonlinear relationships between variables, the feedback effects, delays and soft variables. The analysis stresses heterogeneity of agents, resistance to change, potential unintended consequences, and behavioral emergence in complex systems. Such models use historical data to simulate the operations of healthcare systems providing an approximation of future outcomes. The presenters will discuss several different types of simulations methods, highlight recent advances, and describe funding opportunities from the National Institutes of Health. Examples from chronic disease patient chains, physician incentive redesign, clinic staffing and Emergency Department redesign will be discussed.

Emergency Department: Consider an Emergency Department that is contemplating a decision to add beds in an effort to reduce wait times. It is not certain the degree to which additional beds would reduce congestion or the financial viability of such an option. It is not, however, practical to add beds and later have to remove them if the anticipated results are not obtained. Simulation is used when the proposed change cannot be implemented without a significant change in practice that may be too disruptive or too expensive. A computer simulation provides the ability to assess trade-offs among resource utilization, service quality and costs.

A Chronic Disease Patient Chain: Chronic diseases are not like infectious diseases. Chronic diseases often progress slowly and are not communicated to others by patients. At some point, a radical surgical procedure such as an organ transplant might be required when expected benefits of the surgery outweigh its risks. We will discuss a computer model that simulates the diagnosis and treatment of patients with acute kidney failure. The core of the model is a patient chain, in which new cases flow into a stock of diagnosed cases of acute renal failure. Every time period, a fraction of these patients are referred to become candidates for kidney transplants, yet a fraction of them die before they are scheduled for a surgery. These candidates for transplant then undergo the transplant procedure, die while on the waitlist, or are removed from the waitlist if their condition deteriorates and it becomes unsuitable for surgery.

Format:

The format will be a mix of presentations and demonstrations with an interactive discussion.

11. ADVANCED COMPUTATIONAL AND TECHNOLOGICAL APPROACHES TO MITIGATING MOBILITY DYSFUNCTION IN PEOPLE WITH MULTIPLE SCLEROSIS

Moderator: **Richard van Emmerik, PhD**, Professor and Director, Sensory-Motor Control Laboratory, Department of Kinesiology, UMass Amherst

Presenters:

Carolina Ionete, MD, PhD, Associate Professor of Clinical Neurology, Associate Director, Multiple Sclerosis Center, UMass Memorial Health Care

Introduction to Clinical Issues and Mobility in MS - Along with Dr. Peter Riskind, Director of the UMass Memorial Health Care MS Center, and Profs. Richard van Emmerik and Jane Kent-Braun from UMass Amherst, Dr. Ionete has been part of the inter-campus UMass MS collaborative research effort since its inception. Dr. Ionete will present an introduction to the topic, focusing on the key clinical issues related to mobility challenges in people with MS.

Stephanie Jones, PhD, Research Assistant Professor, Sensory-Motor Control Laboratory, Department of Kinesiology, UMass Amherst

Somatosensory Impairment and Balance Dysfunction in MS – Impaired balance and gait function are highly prevalent and associated with reduced quality of life in those with MS. Recent evidence implicates the somatosensory system as a major contributor to balance dysfunction in this population. This presentation will discuss evidence supporting the role of reduced somatosensation in balance for those with MS and introduce a new paradigm to assess sensation during functional postures in the clinical and laboratory settings.

Richard van Emmerik, PhD, Professor and Director, Sensory-Motor Control Laboratory, Department of Kinesiology, UMass Amherst

Improving Balance and Mobility in People with Multiple Sclerosis - This presentation will review current intervention and rehabilitation methods aimed at improving balance and mobility in people with MS. Particular focus will be on the effects of Tai Chi training, which integrates coordination, strength and flexibility in enhancing adaptive postural control and physical function.

Frank Sup, PhD, Assistant Professor and Director of the Mechatronics and Robotics Research Laboratory, Department of Mechanical and Industrial Engineering, UMass Amherst

Using Robotics to Enhance a Person's Mobility and Balance - Wearable robotic exoskeletons are becoming a reality for restoring mobility for individuals with spinal cord injury. However, these devices are not designed to be used by individuals with MS or other conditions that result in functional, yet diminished, motor control. This talk will cover the development of ambulatory aids and exoskeletons for individuals with mobility impairments, with special application to the MS population.

Background and Purpose:

Background: Multiple sclerosis (MS) is the most common neurological disorder striking adults aged 20-50 years. Its heterogeneous presentation and clinical course, along with as-yet-unclear etiology, make it particularly difficult to treat and manage. Fatigue and poor mobility function are two of the most common symptoms in this population, and these problems have significant negative impacts on both quality of life and risk for the development of other chronic health issues related to inactivity. In this mini-symposium, we will provide an overview of mobility dysfunction in MS, and present our recent, current and future research related to mobility. An emphasis will be placed on how we might use emerging opportunities and approaches to reverse key limitations to mobility currently experienced by this population.

Purpose: To introduce the audience to the clinical and mechanistic underpinnings of mobility impairments common in people with multiple sclerosis, and provide insight as to emerging, interdisciplinary approaches to solving this problem.

Format:

Four, 15-minute talks, each followed by a 3-minute Q&A period.

Panel Discussion (*18 min*)

Open discussion with the audience and speakers, with a focus on making connections with other researchers, and identifying other approaches and opportunities to investigate as part of the UMass MS research program.