CTSC Newsletter

Clinical & Translational Science Discovery at SUNY Downstate

Clinical & Translational Science Center

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WHAT'S HAPPENING AT THE CTSC?

CTSC Investigator: ***Dr. John G. Kral – Energetics Research***

Standard life-style interventions such as diet and exercise have generally failed to curb epidemic prevalences of most chronic diseases. Two centuries of research focused on caloric restriction reveal that while diets may help, they generally fail to yield clinically meaningful outcomes. Similarly exercise which, in aggregate, is more healthful than dieting, is successful only as long as it is sustained. Dr. John G. Kral, Professor of Surgery, Medicine and Cell Biology and colleagues are using a lower-body positive pressure (LBPP) treadmill developed by NASA to simulate weight off-loading in space. The device is commercially available from AlterG®, a company in Freemont, CA. It combines the fields of Energetics and Baro-physiology to enable low-intensity, low-amount aerobic physical activity performed during lower-body positive pressure in subjects otherwise unable or unwilling to exercise. Recognizing that the treadmill might be valuable for numerous categories of ambulation-challenged people, the investigators are currently using the treadmill in several studies involving subjects with diabesity and heart failure. Collaborating investigators include Drs. MA Banerji, EM Godwin, JM Lazar, and L Salciccioli. Two studies have been completed; one measured before-after changes in blood molecules with functions ranging from gluco-regulation (glucose tolerance) and inflammation to neuroendocrine (appetite, mood, neurogenesis), the other studied hemodynamic metrics during LBPP alone. The results show improved glucose tolerance, lower cardiometabolic risk and changes in inflammatory markers and neuropeptides altogether unrelated to weight change or exertion. Novel associations between favorable changes in gluco- and neuro-regulatory peptides mediated by ambulation and lower-body pressure may reflect restored autonomic balance with the potential for preventing and treating diverse chronic diseases. These studies imply that the combination of painless ambulation, using our largest skeletal muscle mass for mild-moderate natural energy expenditure and lower-body positive pressure might be valuable for preventing or treating major chronic diseases as well as for cardiac and stroke rehab, cognitive decline, inflammatory musculo-skeletal diseases and peri-operative pre-conditioning and rehabilitation.

CTSC Investigators: ***Drs. Saranna Belgrave and Michele Pato*** **- The GPC- Genomic Psychiatry Cohort**

Dr. Michele Pato, Director of the Institute for Genomic Health (IGH) and the Vice Chair of Research for the Department of Psychiatry, and Dr. Carlos Pato, Dean of the College of Medicine at Downstate have been spearheading the GPC together for 25 years at numerous academic institutions in the USA and abroad. The Genomic Psychiatry Cohort (GPC) has been seeking to better understand, the role of genes and environment in the disorders of Schizophrenia, Bipolar Disorder, and Obsessive Compulsive Disorder (OCD). In establishing the IGH, when they arrived in 2015, the Pato's hoped to extend their work in genes and environments to a broader array of medical illnesses, and to support ongoing clinical and treatment research. The opening of the CTSC, Clinical and Translational Science Center, in January 2017, is the next step in this broader mission. Dr.'s Pato and their colleagues have two ongoing studies here at Downstate, the African Ancestry GPC (AA-GPC) Study on Schizophrenia and Bipolar Disorders and the Obsessive Compulsive Disorder (GPC-OCD). The GPC-OCD Study is not specific to one particular demographic, but seeks to better understand the genetics behind OCD and Related Disorders in the general population. The AA-GPC study aims to contribute to better understanding the role of genes and environment in these illnesses in people of African Ancestry, since the current literature has revealed different genes and environmental influences on onset and treatment. The study combines both the collection of a blood specimen for genotypic data) and a clinical interview (for the collection of phenotypic data) for each participant, with the goal of building a complementary and comprehensive picture of the disorders through whole genome analysis and continuous expansion of the phenotypic data collected. The importance of this work lies not only in the contribution of information to an accessible platform of data through the NIMH Cell and DNA Repository at Rutgers University, but through sharing this data we hope to develop better diagnostics, treatments, and prognosis for patients of all ethnicities.

DID YOU KNOW…?

Disease: Schizophrenia
Epidemiology: According to the CDC, worldwide prevalence estimates range between 0.5% and 1%.

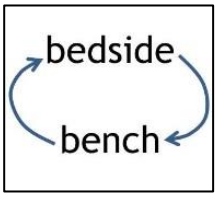
Cognitive deficits in schizophrenia are one of the more debilitating symptoms that patients struggle to manage throughout the course of their illness. Work is being done to better understand, characterize and ameliorate those deficits including but not limited to disorganized speech and thoughts, poverty of speech and language as well as deficits in working and long term memory. Molecular studies of gene expression in regions of the brain associated with memory (hippocampus) have shown that altered expression of Brain Derived Neurotrophic Factor (BDNF) may help explain with the molecular biology of mood disorders including bipolar disorder and schizophrenia. In unaffected individuals, BDNF is abundantly expressed in the hippocampus, prefrontal cortex, and amygdala and is critical for cell survival, neural plasticity, stress regulation, antidepressant efficacy, learning and memory. There is growing evidence there are decreased levels of both cerebral and peripheral BDNF in patients with schizophrenia. It remains unclear whether these systemic changes are causally related to the development of schizophrenia or if they are merely a pathologic epiphenomenon. Further exploration of these findings may lead to new ways to help patients manage their illness, improve treatments, prognosis and the course of the disease.

RELATED FUNDING OPPORTUNITIES:

https://grants.nih.gov/grants/guide/rfa-files/RFA-MH-17-606.html

TRANSLATIONAL RESEARCH AT DOWNSTATE

Investigator: *Dr.* Randall Barbour – *Noninvasive Neurosensing*



Dr. Randall Barbour, Professor of Pathology, is developing technology to address the broader problem of communication with minimally conscious subjects. Building on the recent demonstration that answers to 'Yes – No' questions by subjects afflicted with Amyotrophic Lateral Sclerosis (ALS) is feasible, he and his colleagues are exploring the use of a noninvasive neurosensing technology called Diffuse Optical Tomography (DOT), to enable ALS patients and others suffering in a persistent state of minimal consciousness, to have "unspoken communication" with others. DOT, developed in Dr. Barbour's lab, is exquisitely sensitive to the principal element in blood, namely, hemoglobin, which transports oxygen from the lungs to all tissues. Dr. Barbour's team is currently focused on two significant challenges. One concerns the development of headgear that can be worn for extended periods of time to allow affected subjects to 'learn' their new form of communication. Already available are wearable units that support measures of brain function in a wide range of unconstrained environments such as while riding a bicycle, playing sports, musical instruments, or appreciating the brain's response to coordinated actions involving a group of individuals. The second challenge is to examine the physiology of tissue-vascular coupling. Accompanying the activation of brain neurons, this coupled hemodynamic response serves to increase local blood flow thereby replenishing the oxygen needed to support brain function. This serves to maintain a steady supply of essential nutrients to the brain in response to metabolic demand.

Information accessible from measures of tissue-vascular coupling holds the translational potential to improve communication with minimally conscious subjects. Another application of DOT technology concerns early detection of breast cancer which is currently under investigation. Given that the sensing technology can measure hemodynamic responses in virtually all tissues, future applications include evaluation of tissue stressors in response to exercise, diet, chronic disease, noxious agents, extreme environments and others, all of which impact the hemodynamic response in tissue.

CTSC MEMBERS

MaryAnn Banerji | Ivan Bodis-Wollner | Carl Cohen | Jack DeHovitz | Olga Dvorkina | Ellen Ginzler
Arthur Grant | Deborah Gustafson | John Kral | Jason Lazar | Steve Levine | William Litman | Scott Miller | Howard Minkoff
Michele Pato | Carlos Pato | Michael Reinhardt | Yalini Senathirajah | Iuliana Shapira | Tonya Taylor | Shahriar Zehtabchi

HOW TO BECOME A CTSC MEMBER

The CTSC is a Center within the Institute for Genomic Health (IGH), Dr. Michele Pato, Director (michele.pato@downstate.edu). Downstate faculty conducting IRB-approved studies are welcome to apply for CTSC membership. There are no fees associated with membership. For more information, visit http://www.downstate.edu/ctsc

CTSC Newsletter comments and suggestions? Email Dr. Richard Coico, CTSC Director: richard.coico@downstate.edu