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Scientific Overview on CSCI-CITAC Annual General Meeting and 2016 Young Investigators' Forum

Abstract

The 2016 Annual General Meeting of the Canadian Society of Clinician Investigators (CSCI) and Clinician Investigator Trainee Association of Canada/Association des Cliniciens-Chercheurs en Formation du Canada (CITAC/ACCFC) was a national conference held in Toronto November 21-23, 2016, in conjunction with The University of Toronto Clinician Investigator Program Research Day. The theme for this year's meeting was "Mapping Your Career as a Clinician-Scientist"; emphasizing essential skills for developing a fruitful career as clinician-scientist. The meeting featured an opening presentation by Dr. Alan Underhill, Dr. Nicola Jones and Alexandra Kuzyk. The keynote speakers were Dr. Nada Jabado (McGill University), who discussed the association between cancer and histones, Dr. Norman Rosenblum (University of Toronto), who addressed the career path and the "calling" of the Clinician Scientist, Dr. Martin Schmeing (McGill University), who was the 2016 Joe Doupe Award recipient, and Dr. Linda Rabeneck (Cancer Care Ontario and University of Toronto), who received the Friends of CIHR lectureship. The workshops, focusing on career development for clinician scientists, were hosted by Drs. Alan Underhill, Nicola Jones, Lynn Raymond, Michael Schlossmacher and Norman Rosenblum, as well as University of Toronto communication specialists, Caitlin Johannesson and Suzanne Gold. In addition, the Young Investigators' Forum included presentations from clinician investigator trainees from across the country. The research topics were diverse and comprehensive: from basic sciences to clinical practice; from epidemiology to medical engineering. All scientific abstracts are summarized in this review. Over 70 abstracts were showcased at this year's meeting during two poster sessions, with six outstanding abstracts selected for oral presentations during the President's Forum.

CSCI-CITAC Annual General Meeting
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President's Forum: Oral Presentations

Each year, six outstanding abstracts are selected for oral presentation during the President's Forum session. This year, abstracts by Richard Wu (University of Toronto, UofT), Aleksandra Leligdowicz (UofT), Dmitry Rozenberg (UofT), Zaheed Damani (University of Calgary, UofC), Madhur Nayan (UofT) and Kirill Zaslavsky (UofT) were selected.

Richard Wu presented research on mechanisms by which oligosaccharides in human milk might protect preterm infants from necrotizing enterocolitis (NEC) via protective effects on the intestine. Through a combination of epithelial cell cultures and NEC murine models, his project showed that human milk oligosaccharides can protect cell barrier integrity in response to enterohemorrhagic *E. coli* treatment via chaperone proteins and mucin production.

Aleksandra Leligdowicz presented research on the study of biomarkers in a Ugandan hospital that may predict mortality risk in acutely febrile children. Her research goal is ultimately to design a triage tool combining clinical assessment with as few as one biomarker to rapidly identify children at serious risk of demise in resource-limited settings.

Dmitry Rozenberg examined if a validated pre-lung transplantation frailty index was predictive of post-transplantation outcomes with respect to quality of life and mortality. Overall, frail lung transplantation candidates demonstrated significant improvements in both functional capacity and quality of life after transplantation, though there was no difference in one-year mortality rates.

Zaheed Damani provided results of a new service delivery strategy in Winnipeg that enables patients to see the next-available health care provider for speedier total joint replacement surgery. Though successful, concerns related to increased workload and stakeholder confusion regarding expectations were addressed to improve the implementation of other new models of care delivery.

Madhur Nayan investigated the association between vasectomy and prostate cancer, following a 10.9-year follow-up of over 300,000 men who underwent vasectomies. The research showed a slightly increased risk of prostate cancer for those who underwent the surgery; however, after adjusting for a measure of health-seeking behavior, no correlation between vasectomy and prostate cancer was observed.

Kirill Zaslavsky investigated the molecular consequences of loss-of-function mutations in the *SHANK2* gene in the context of autism spectrum disorder (ASD). This research showed that *SHANK2* loss-of-function mutations in neurons lead to a hyper-connective synaptic phenotype.

Young investigators' presentations (all posters): Basic Science

Similar to the presentations in past years, basic science research was well represented at the 2016 CSCI-CITAC Annual General Meeting, and drew attention from researchers around the country.

The majority of MD/PhD and CIP trainees had basic science-focused projects: their dual training allowed them to bridge bench-top discoveries and patient care at the bedside.

Cancer

Elina Cook (Queen's University, Queen's) presented work on clonal hematopoiesis of indeterminate potential in an inflammatory landscape. She found that the underlying immune microenvironment of clonal hematopoiesis of indeterminate potential leads to a pro-inflammatory state, and may depend on clone-specific factors. Identifying microenvironmental factors of clonal hematopoiesis of indeterminate potential may facilitate preventative strategies for leukemia occurrence or relapse. Ashton Connor (UofT) hypothesized that classifying pancreatic ductal adenocarcinoma (PDAC) according to distinct mutational processes at the genomic level would reveal clinically-relevant transcriptional differences in given mutation-based subtypes. He showed that signature-based subtyping may predict the response of PDAC to personalized therapy for PDAC, particularly immune checkpoint blockade and indoleamine-pyrrole 2,3-dioxygenase-1 inhibitors. Ayesh Seneviratne (UofT) presented work on the role of the cardiolipin remodelling enzyme, tafazzin (TAZ), in established hematopoiesis and acute myeloid leukemia (AML). He determined that TAZ plays an important role in AML self-renewal and propagation, as loss of TAZ function arrests acute myeloid leukemia cells in G0/G1 of the cell cycle. Eric Zhao (University of British Columbia) presented work on the mutational signature of homologous recombination deficiency (HRd) and the use of this mutational signature to identify breast cancer patients who are candidates for platinum-based chemotherapy. He found that the HRd mutation signature predicts clinical improvement on platinum-based therapy in breast cancer and extends time to treatment failure, even in the absence of detected *BRCA1/BRCA2* mutations. Nicholas Jette (UofC) presented work on targeting DNA repair proteins with short hairpin RNA knockdown and then testing cell viability in the presence of various drugs. He found low levels of ataxia telangiectasia mutated made cells sensitive to the chemotherapeutic drug, Olaparib. Kara Ruicci (Western)

presented work on investigating mechanisms of innate and evolved resistance to PI3K-pathway inhibition in head/neck squamous cell carcinoma (HNSCC). By measuring HNSCC cell line and xenograft viability, she found that PI3K and mTOR inhibitors demonstrated broad efficacy and synergy in HNSCC, suggesting that combinatorial treatment may prevent/delay HNSCC resistance. Lori Minassian (Queen's) showed that PD-L1/PD-1 signalling, which leads to cytotoxic T lymphocytes inactivation, is bidirectional. This signalling axis leads to activation of oncogenic pathways as well as to drug resistance in tumor cells. Nardin Samuel (UofT) studied the molecular basis of germline *TP53* mutations and susceptibility to malignant transformation. She found that *TP53* mutations are significantly associated with epigenetic dysregulation of *miR-34A*, an important component of the p53 regulatory network.

Cardiology

Alison Michels (Queen's) presented work using mice to investigate the possible influence of diet on the biology of clot formation. She showed an association between a high fat diet, elevated levels of thrombogenic molecules and enhanced venous/arterial clot formation. Charles Yin (Western) presented work characterizing the gene expression changes in macrophages isolated from human atherosclerotic lesions. Preliminary data suggested that these macrophages exhibit impaired ability to clear apoptotic cells and adopt a pro-inflammatory phenotype. Microarray analysis is planned on lesion samples from patients during coronary artery bypass graft operations, better characterising the pathologic changes that lead to atherosclerotic disease. Daniyil Svystonyuk (UofC) and colleagues investigated the mechanism underlying cardiac repair by using extracellular matrix biomaterials. They found that extracellular matrix-biomaterial stimulates enhanced angiogenesis through a fibroblast growth factor-2-dependent bio-inductive vascularization. Jessica Blom (Western) presented work on how primary cilia disassembly promotes mammalian cardiac repair. By inhibiting a protein vital to ciliary function after an induced myocardial infarct (in mice), she found reduced cardiac scarring and improved epithelial-to-mesenchymal transition of epicardium-derived cells (*in vitro*), suggesting that inhibition of primary cilia may provide supportive vasculature for cardiac regeneration. Lindsay Burrowes (UofC) quantified diastolic suction (using two methods) under a variety of hemodynamic conditions. She found that the volume of diastolic suction has a strong relationship with both ejection fraction and end-systolic volume; increasing as ejection fraction increases and as

end-systolic volume decreases. Mark Chandy (UofT) presented work to identify microRNAs from extracellular vesicles as novel biomarkers for diabetic cardiomyopathy in type-2 diabetes. The Goto-Kakizaki rat and db/db mouse models will be used to identify altered microRNA contents and their correlation with diabetic cardiomyopathy.

Endocrinology

Adam Ramzy (UBC) investigated the application of an adeno-associated virus able to aid the maturation of post-natal, pre-mature pancreatic β -cells in mice. He showed transient remission from diabetes and insulin dependence in knockout β -cell mice treated with the insulin-carrying virus. Amy Norquay (University of Alberta) presented work on characterizing the mechanism of LovB, the enzyme responsible for producing lovastatin, a statin drug used for dyslipidemia treatment. She identified novel aspects of the LovB-mediated reaction, and developed a nuclear magnetic resonance spectroscopy assay to aid in product identification. Bader Alamri (Dalhousie University) presented work using a mouse model of high fat-diet induced obesity to investigate the mechanisms leading to the dysregulation of ghrelin secretion in obesity. He showed that impaired ghrelin suppression found in obesity is due to insulin resistance occurring at the level of ghrelin cells.

Hepatology

Daniela Keren (UofC) investigated the best way to characterize DNA methylation patterns in hepatocellular carcinoma. She found that the combination of MeDIP, MethylMiner™ and Ion Torrent™ was needed. The finding may help to minimize liver transplant rejection.

Nephrology

Adom Bondzi-Simpson (UofC) investigated the mechanistic role that Shiga toxins play in enterohemorrhagic *E. coli*-induced acute kidney injury and renal failure. He showed that Shiga toxins activated the IRE1 α section of the ER stress pathway, upstream of mitochondrial reactive oxygen species and triggered the NACHT, LRR and PYD domains-containing protein 3 inflammasome.

Neuroscience and psychiatry

Alexander Levit (Western) and colleagues used a rat model to study the impact of multiple neurological comorbidities on cognition. They suggested that comorbidity involving stroke

and neurodegeneration can synergistically worsen cognition. Glenn Walpole (McMaster University) presented work on the association between huntingtin protein and specific regions of the mitotic spindle. They found that endogenous huntingtin protein localizes to zones of Rab 8a and Rab 11-marked membrane, suggesting a multi-functional role for huntingtin protein during cytokinesis. Because signs of oxidative stress are observed in Parkin-related Parkinson disease, Jacqueline Tokarew (University of Ottawa, UOttawa) and colleagues investigated the role of Parkin in protecting cells from oxidative stress. They found that Parkin overexpression can inhibit oxidation of glutathione when cells are treated with 1 mM hydrogen peroxide, suggesting that Parkin may mitigate oxidative stress. Olivier Deguise (UOttawa) presented work characterizing gross, histological and molecular changes in the spleens of mouse models of spinal muscular atrophy. They found that reduced survival-of-motor-neuron protein levels correlated with smaller spleens, as well as disrupted, mislocalized and misregulated immune cells in the spleen, indicating potentially reduced immune functions in spinal muscular atrophy patients. Matthew Carr (UofT) described a subset of neural crest-derived mesenchymal cells involved in mammalian tissue repair and regeneration. Transgenic mice, including Wnt1-Cre and Dhh-Cre, were used for lineage tracing of neural crest progeny. He showed that adult peripheral nerves contain a subpopulation of neural crest precursors, which differentiate into mesenchymal lineage cells, contribute to digit tip regeneration. This finding may lead to novel therapeutic modalities for tissue repair. Patrick Steadman (UofT) developed a method to assay behaviour and tie it to brain-wide neuronal activity patterns. This method mapped cells across the brain representing a fear memory. Siddharth Nath (McMaster University) characterized the role of CAG triplet repeats in spinocerebellar ataxia. He found a ataxin-7 mutation, specific to this subtype of ataxia, that caused protein structure changes. These changes may contribute to the clinical manifestation of the disorder.

Ophthalmology

Daniel Evans (Memorial University) and colleagues found a novel deletion of *MERTK* gene in recessive retinitis pigmentosa with severe progression. Such finding may help in providing a genetic diagnosis for retinitis pigmentosa of unknown etiology. Tianwei Zhou (McGill University) presented work that seeks to understand and prevent the corneal calcification that is associated with the xylazine anesthetics used in longitudinal optical coherence tomography. She found that activation of $\alpha 2$ -adrenoceptor is responsible for

corneal calcification in mice and rat pups, therefore establishing a direct link between $\alpha 2$ -adrenoceptor and corneal calcification.

Other topics

Christopher McFaul (UofT) presented plans to develop a platform for the study of embryonic *Drosophila* wound damage and repair, allowing researchers to identify and track epidermal cells and the molecular rearrangements associated with wound closure. Ultimately, this tool may identify pathways involved in the repair of embryonic tissue, which does not result in the same scar formation as adult tissue repair. Laura-Eve Mantella (UofT) presented a work on mechanical stretch-induced changes in human aortic smooth muscle cells. Her data indicated that human long intergenic non-coding RNA-p21 (lincRNA-p21) was significantly upregulated in stretched human aortic smooth muscle cells ($P < 0.05$) and human aneurysmal samples ($P < 0.05$) and that silencing of lincRNA-p21 decreased the expression of the p53-downstream genes Bax, Puma, Noxa and Mdm2 under conditions of stretch ($P < 0.05$). Platnich (UofC) and colleagues investigated a novel region of conserved amino acids overlying the ATP-binding pocket of Nod-like receptors involved in mediation of inflammation and immune signaling. By ablating these conserved residues using site-directed mutagenesis, Platnich showed that they are critical to oligomerization of NLRP3 and NLRP6 and normal activity inflammasome activity.

Clinical research

With dedicated training in surgical skills, research methodologies and clinical statistics, clinician investigator trainees are well equipped to address questions stemming from clinical practice; including case series, epidemiological surveys, randomized controlled trials and surgical technique improvement. Grouped by medical specialties, this section summarized clinical studies carried out by Canadian clinician investigator trainees.

Population health and epidemiology

Ario Mirian (UofC) studied demographic patterns, trends and disparities of premature mortality due to stroke in the Americas (1998-2013). Despite an overall reduction in premature mortality due to stroke in the Americas, significant disparities continue to exist between countries. Jonathan Fuller (UofT) presented his exploration of the shortcomings of using randomization to balance out causal interference (by confounding causal variables) in randomized controlled trials.

He proposed a new variable, 'condition C', to better determine sound inference in a randomized controlled trial, elucidating important concepts in clinical epidemiology and evidence-based medicine.

Surgery

Amanda Khan (UofT) presented work on developing a novel device to accurately quantify potentially damaging mechanical stress (crush force) on tissues during gastrointestinal laparoscopic surgery. By measuring cell death as an outcome of applied stress, she aimed to define the safe limits of force, which will aid in surgical trainee teaching. Christopher Wallis (UofT) presented a meta-analysis of observational studies examining overall and prostate cancer-specific mortalities in patients treated with either radical prostatectomy or radiotherapy for localised prostate cancer. Compared with radical prostatectomy, radiotherapy for prostate cancer was associated with an increased risk of overall and prostate cancer-specific mortality. Daniel Pincus (UofT) and colleagues characterized the impact of concurrent surgery, defined as a single surgeon supervising multiple simultaneous operations, on complications following hip fracture surgery. He found that concurrent hip fracture surgery is at increased risk of complications. Méliissa Roy (UofT) used the Canadian Nutritional Screening Tool to determine the percentage of plastic surgery patients at nutritional risk in a tertiary care center through a cross-sectional study. She found that out of 500 plastic surgery patients recruited, 25% of the subjects were at nutritional risk according to the Canadian Nutritional Screening Tool. For those at nutritional risk, 52.8% had a wound diagnosis and 19.0% had other plastic surgery-related concerns. Dale Podolsky (UofT) presented the development of a novel robotic instrument for infant cleft palate repair using the da Vinci® Surgical System and a high-fidelity cleft palate phantom. All steps of the repair were feasible; however, the repair was challenging and required the development of a novel instrument wrist to minimise mechanism length and facilitate instrumentation within the confines of the infant oral cavity.

Mitchell Goldernberg (UofT) and colleagues systematically reviewed the literature on absolute standard-setting methodology to create benchmarks for technical performance in surgery. Searching MEDLINE, Embase, PsycINFO, and the Cochrane Database of Systematic Reviews, he identified 1809 studies with 37 using standard-setting methodology for assessment of procedural skills. This study provided evidence that absolute standard-setting methodologies can be used to establish cut-offs for procedural skills assessments. Anne-Marie Carreau

(USherbrooke) and colleagues investigated the early effect of bariatric surgery on postprandial fatty acid inter-organ partitioning. They concluded a decrease in myocardium dietary fatty acid partitioning and an increase in visceral adipose tissue partitioning following preliminary results from two sleeve gastrectomies and one biliopancreatic diversion with duodenal switch.

David Berger-Richardson (UofT) presented work on instruments and gloves as a source of wound seeding in soft tissue sarcoma surgery. He found that for procedures during which there is a high likelihood of direct contact with malignant tissue, sarcoma cells are retained on surgical instruments and gloves. In contrast, there were no cases of detectable contamination during R0 (defined as complete tumour removal with negative resection margins) wide local excisions. Naif Alotaibi (UofT) studied the relationship between a neurosurgeon's academic productivity and clinical outcomes following clipping of ruptured aneurysms. He found that patients of neurosurgeons with higher H-indices had improved neurological outcomes but no difference in mortality rates, compared with patients under the care of surgeons with lower H-indices. Natalia Ziolkowski (UofT) developed a patient-reported outcome instrument called SCAR-Q to study the impact of scars on patients who underwent surgical interventions, burns and trauma. SCAR-Q will be used to assess patient concerns about the impact of interventions on their quality of life.

Internal Medicine

Alison Michaud (UofC) presented a systematic review to identify better tools for risk assessment of patients diagnosed with acute heart failure. Such work will help develop a pathway for more accurate risk stratification, and thus improved management. Alvin Tieu (Western) examined the potential impact of hemodialysis on efficiency of common beta blocker medications. He found that differences in the dialytic clearance of these medications had important ramifications for medication effectiveness in patients.

Amanda Ricciuto (UofT) presented work on characterizing liver abnormalities in children with inflammatory bowel disease treated with anti-tumour necrosis factor (a marker of inflammation). She reported that 10% of anti-TNF-treated children had transiently significantly elevated liver enzymes, indicating liver damage. Jason Zelt (UOttawa) and coworkers investigated whether N-terminal pro b-type brain natriuretic peptide and high sensitivity cardiac troponin levels could be related to the amount of hibernating myocardium in patients with ischemic heart

failure. They found that elevated levels of these two markers were significantly associated with patients with >10% of hibernating myocardium. Keerat Grewal (UofT) examined the risk of fractures in discharged emergency department patients with peripheral vertigo who were being prescribed opioids. She found that patients who were being prescribed opioids had a higher hazard of fracture compared with those who were not (OR: 3.59 (95%CI:1.97-6.13)), and the effect was greater than in urinary tract infection patients. Natasha Lane (UofT) analyzed various factors that contribute to a long-term care resident's subsequent rate of disablement. She found that residents with lower disability scores upon admission experienced a faster rate of disablement over two years, compared with residents who are more disabled at admission. Rachel Ward (UofC) developed a framework to improve recruitment and retention of Indigenous Peoples in medicine by targeting medical schools. Semi-structured interviews provided thematic information that will construct a framework for targeted recruitment. Tim Rappon (UofT) and colleagues examined post-implementation phenomena within the context of the national expansion of a complex Evidence-Based Practice and Quality Improvement intervention. This study aimed to understand the extent to which organizational context affects the sustainability and/or sustainment of the Acute Care for Elders Strategy and its component practices.

Neurology and Psychiatry

Stephanie Mason (UofT) and colleagues studied how burn injury alters the risk of self-harm. Among 1,530 patients with major burn injury, self-harm emergencies increased from 6.3 per 1,000 patient years pre-injury to 13.3 per 1,000 patient years, yielding a rate ratio of 1.96. Self-harm risk increased significantly following major burn injury, underscoring the need for screening during follow-up. Christopher Newell (UofC) presented a pilot study examining the effects of whole body vibration in patients with mitochondrial myopathies who experience muscle weakness. He found that whole body vibration was well tolerated and improved peak jump power compared with a natural history cohort, suggesting that whole body vibration may improve muscle function in these patients. Irene Harmsen (UofT) used magnetoencephalography, a technique for mapping brain activity by recording magnetic fields produced by electrical currents in the brain, to understand changes in brain activity during deep brain stimulation. She recorded magnetoencephalography activity from 70 patients with a wide spectrum of neurological and psychiatric disorders. This preliminary dataset illustrates that

magnetoencephalography is a safe approach that is able to show specific activation of varied brain circuits. She aims to characterize and compare brain activation pattern across different pathological states and deep brain stimulation protocols. Suze Berkhout (UofT) and colleagues investigated whether earlier interventions translated into shorter durations of untreated psychosis, improved utilization of services and led to better prognoses for recovery. She found these goals are steeped in assumptions about biomedical progress and idealizations of clinical populations. A robust approach to recovery in first episode psychosis entails a critical engagement with such assumptions. Kramay Patel (UofT) presented work on the development of a wheelchair-based neuroprosthesis capable of perturbing subjects with realistic, support-surface translation perturbations while simultaneously contracting different trunk muscles in a feed-forward manner. Results indicated that feed-forward control of the trunk muscles, using both functional electrical stimulation protocols, was effective in significantly reducing maximum angular displacement and velocity of the trunk during perturbations up to 40% of body weight in the forward and backward directions. Jonathan Lee (UofT) presented work on sex differences in the plasticity of inhibitory interneurons in healthy adolescents. He found that pair associative stimulation lengthened the cortical silent period in males but not in females, demonstrating the utility of pair associative stimulation in investigating adolescent neuroplasticity. Paul Kudlow (UofT) explored how an academic article can be better disseminated post-publication in an online network. Recommended articles were viewed more than non-recommended articles, showing the power of an online network in knowledge dissemination. Simina Toma (UofT) and colleagues compared brain structure in adolescents with Bipolar Not Otherwise Specified, Bipolar-I/II and healthy controls. Volumetric abnormalities in anterior cingulate cortex were shared between Bipolar Not Otherwise Specified and Bipolar-I/II early in the illness. The findings support Bipolar Not Otherwise Specified as a full bipolar subtype.

Medical education

Advocating for high-quality medical training is an important mandate for both CITAC and CSCI. Along this line, there is an increase in the number of trainees who strived to better Canadian medical education.

Vivek Bodani (UofT) and colleagues successfully developed a low-cost, reusable and patient-specific simulator for training residents in endoscopic colloid cyst resection. Future work will focus on improvements in simulator realism,

incorporating additional instrumentation and conducting additional validation studies. Andrea Jones (UBC) presented findings of a CITAC-directed national study surveying Canadian MD/PhD programs regarding program structure, funding, tuition and mentorship structures. She reported on a noteworthy inter-institution variation in the aforementioned factors and proposed improved collaboration and mentorship of students on a combined clinician-scientist career path. Nabeela Nathoo (UofC) examined the factors that contributed to successful physician-scientist training at the UofC Leaders in Medicine Program. She showed that training both MD/PhD and MD/MSc students contributed to greater retention and more diversity among physician-scientists.

Translational Study, Applied Science and Biomedical Engineering

Clinician investigator trainees often have the opportunity to work in a multidiscipline team and to develop skills (i.e., computer programming and database mining) that were not taught during conventional medical training. Encouragingly, there has been an increase in the number of trainees who worked on projects related to translational study, applied science and engineering.

Damien Pike (Memorial University) and colleagues aimed to develop an automated texture-analysis algorithm for retinal optical coherence tomography. This algorithm could improve the diagnosis of retinal disease, which is often delayed when using current thickness measurement. Jeremiah Hadwen (UOttawa) and colleagues, in collaboration with Pfizer, created a database of drug-gene interaction as a result of a large transcriptomic screen in primary mouse neurons aimed at discovering clinically-approved drugs that upregulate expression of genes known to cause rare disease. He found 30 promising drug-gene interactions and several novel transcriptional effects of the antineoplastic drug, hydroxyurea. Katarina Ondrusova (U of A) and colleagues presented work on engineering adipocytes for light-controlled secretion of bioactive insulin. Rat subcutaneous adipocytes could be engineered to secrete human insulin in basal amounts in response to pulses of blue light; the work may lead to needle-free management of diabetes. Raphael Schneider (UofT) and colleagues examined microRNAs to determine biomarkers for familial frontotemporal dementia. Sequencing revealed decreased expression of seven microRNAs in patients, providing potential biomarkers to be tested and validated in future studies.

Concluding Remarks

The landscape of medical research in Canada continues to evolve. The 2016 Annual General Meeting highlighted outstanding research performed by clinician investigator trainees from around the country. The work presented at the CSCI-CITAC Annual General Meeting exemplified the strength of clinician investigators – tackling questions at the interface between patient care and science. As such, we are grateful that the Young Investigators' Forum continues to provide the opportunity for the exchange of ideas and the mentorship and career development of these promising young scientists.

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