CLINICAL AND INVESTIGATIVE MEDICINE | MEDECINE CLINIQUE ET EXPERIMENTALE

TRAINEE SECTION

OVERVIEW OF THE CANADIAN CLINICIAN INVESTIGATOR TRAINEES' RESEARCH PRESENTED AT THE 2020 CSCI-CITAC JOINT MEETING

VOL 44 NO 3 SEPTEMBER 2021

Valera Castanov, PhD[1], Melissa S. Phuong, PhD[2], Bryce J. M. Bogie, MSc[2], Danny Jomaa, MSc[1], Emmanuelle V. LeBlanc, MSc[1], Jillian Macklin, MSc[3], Zacharie Saint-Georges, BSc[2], Yujin Suk, BSc[4], Wenxuan Wang, BSc[5], Matthaeus A. Ware, BSc[3], Heather T. Whittaker, MSc[6], Adam Pietrobon, BSc[2]

1 *School of Medicine, Queen's University, Kingston, ON, Canada*
2 *Faculty of Medicine, University of Ottawa, Ottawa, ON, Canada*
3 *Faculty of Medicine, University of Toronto, Toronto, ON, Canada*
4 *DeGroote School of Medicine, McMaster University, Hamilton, ON, Canada*
5 *Schulich School of Medicine and Dentistry, Western University, London, ON, Canada*
6 *Faculty of Medicine and Health Sciences, McGill University, Montreal, QC, Canada*

Submitted 17th August 2021, Accepted 18th August 2021
Clin Invest Med 2021;44(3):E4-10; DOI: 10.25011/cim.v44i3.37245

The 2020 Annual General Meeting (AGM) and Young Investigators' Forum of the Canadian Society for Clinical Investigation / Société Canadienne de Recherches Clinique (CSCI/SCRC) and Clinician Investigator Trainee Association of Canada/Association des Cliniciens-Chercheurs en Formation du Canada (CITAC/ACCFC) was the first meeting to be hosted virtually. The theme was "Navigating Uncertainty, Embracing Change and Empowering the Next Generation of Clinician-Scientists", and the meeting featured lectures and workshops that were designed to provide knowledge and skills for professional development of clinician investigator trainees. The opening remarks were given by Jason Berman (President of CSCI/SCRC), Tina Marvasti (President of CITAC/ACCFC) and Nicola Jones (University of Toronto Clinician Investigator Program Symposium Chair). Dr. Michael Strong, President of the Canadian Institutes of Health Research, delivered the keynote presentation titled "CIHR's COVID-19 Response and Strategic Planning". Dr. John Bell (University of Ottawa) received the CSCI Distinguished Scientist Award, Dr. Stanley Nattel (Université de Montréal) received the CSCI-RCPSC Henry Friesen Award (RCPSC; Royal College of Physicians and Surgeons of Canada) and Dr. Meghan Azad (University of Manitoba) received the CSCI Joe Doupe Young Investigator Award. Each scientist delivered talks on their award-winning research. The interactive workshops were "Developing Strategies to Maintain Wellness", "Understanding the Hidden Curriculum: Power and Privilege in Science and Medicine", "Hiring a Clinician Scientist Trainee: What Leaders Are Looking For" and "COVID-19: A Case Study for Pivoting Your Research". The AGM included presentations from clinician investigator trainees nationwide. Over 70 abstracts were showcased, most are summarized in this review, and six were selected for oral presentations.

Correspondence to: *Valera Castanov* ***Email***: *vcastanov@qmed.ca*

INTRODUCTION TO CITAC-CSCI AGM AND PATTERNS OF ATTENDANCE

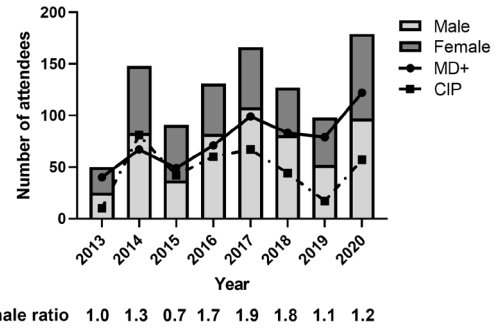
In 2020, the Canadian Society for Clinical Investigation (CSCI) and Clinician Investigator Trainee Association of Canada (CITAC) jointly held the Annual General Meeting (AGM) and Young Investigators Forum November 12–13, 2020. Due to the coronavirus disease 2019 (COVID-19) pandemic and associated restrictions, this was the first such meeting to be held virtually. It had a record-setting attendance of close to 180 trainees, including 122 MD+(MD/PhD, MD and PhD, MD/Masters) and 57 Clinician Investigator Program (CIP) and Surgeon-Scientist attendees. The meeting was the most attended to date, with the second and third most attended meetings in 2017 (166 attendees) and 2014 (148 attendees), respectively [1-4]. The theme of the AGM was "Navigating Uncertainty, Embracing Change and Empowering the Next Generation of Clinician-Scientists" and featured lectures and interactive workshops that covered the topics of wellness, the hidden curriculum, applying for clinician-scientist

faculty positions and the importance of health research during the COVID-19 crisis. Dr. Michael Strong, the President of the Canadian Institutes of Health Research (CIHR), delivered the keynote presentation titled "CIHR's COVID-19 Response and Strategic Planning".

The 2020 AGM had a distinct pattern of attendance (Figure 1). University of Toronto (UofT) had the greatest number of clinician investigator trainees in attendance (n=67) followed by University of Calgary (UofC) (n=25). Western University (Western) (n=13), Université de Montréal (UdeM) (n=13), McGill University (McGill) (n=12) and University of Ottawa (UofO) (n=12) had a similar number of attendees. The ratio of MD+ and CIP trainees decreased this year, with a 68%/32% (MD+/CIP) split, and the male:female attendance ratio remained at an almost equal split of 54:46.

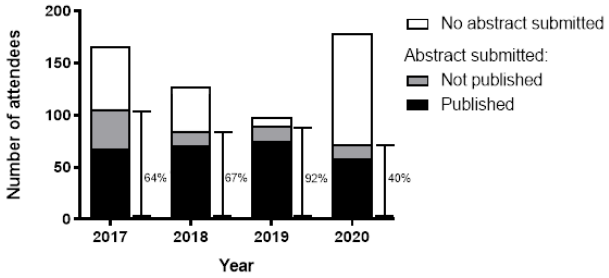
Approximately half of the attendees (40%) submitted abstracts for a presentation, which is down from 92% seen in the previous year (Figure 2). Most of the abstracts (n=58) are published in summary form in this review. Approximately 38% of the published abstracts were based in basic science research, 15% in clinical epidemiology, 22% in clinical research, 15% in translational research and the rest in medical education and sociology, philosophy or ethics. The top four research fields represented were as follows: 1) cancer biology (17 abstracts, 24%); 2) cardiovascular sciences (13 abstracts, 18%); 3) neurosciences (12 abstracts, 17%); and 4) cell and developmental biology (11 abstracts, 15%).

FIGURE 1.
NUMBER OF CLINICIAN INVESTIGATOR TRAINEES PRESENT AT CSCI-CITAC 2013–2020 AGMS.



Abbreviations: AGM, annual general meeting; CIP, clinician investigator program and surgeon scientist attendees; CSCI-CITAC, Canadian Society for Clinical Investigation - Clinician Investigator Trainee Association of Canada; female, female attendees; male, male attendees; MD+, MD/PhD, MD and PhD, MD/Master's, MD and Master's attendees

FIGURE 2.
TOTAL NUMBER OF ABSTRACTS SUBMITTED FOR PRESENTATION AT THE CSCI-CITAC 2017-2020 AGMS.



Abstracts were summarized and included in this article and in the Scientific Overview on CSCI-CITAC Annual General Meeting and Young Investigators' Forum from 2018 to 2020 [1-4]. Abbreviations: AGM, annual general meeting; CSCI-CITAC, Canadian Society for Clinical Investigation - Clinician Investigator Trainee Association of Canada

PRESIDENT'S FORUM ORAL PRESENTATIONS

In 2020, six outstanding abstracts were selected for oral presentation during the President's Forum session. Abstracts by Kara Ruicci (Western), Andrew Woodman (University of Alberta; UofA), Mark Trinder (University of British Columbia (UBC)), Michael Luo (McGill), Guillaume Beaudoin-Bussières (UdeM) and Claudia Cote (Dalhousie University; Dalhousie) were selected.

POSTER AND ORAL PRESENTATIONS

BASIC SCIENCE

Cancer biology

Matthaeus Ware et al. (UofT) aimed to determine the role of dopamine signalling in the development of glioblastoma stem cells and in glioblastoma tumor growth. With this understanding, it may be possible to repurpose existing dopaminergic drugs to treat glioblastoma.

Robin Oh et al. (UofT) used CRISPR technology to introduce mutations in frequently mutated regulatory elements (FMRE) in mammary and skin epithelium of tumor-prone mice, leading to tumorigenesis. This provided evidence that non-coding gene regulatory regions contributed to tumor formation and may be novel therapeutic targets to investigate further.

Tarek Taifour et al. (McGill) used Stat3 wild type and knockout mice to demonstrate that the cytokine Chitinase-3-like-protein 1 (Chi3l1) mediated the Stat3-induquiced immunosuppression observed in breast cancer. Their results suggested that inhibition of Chi3l1 may be a novel therapeutic intervention to investigate for patients with breast cancer.

Ethan Malkin et al. (UofT) isolated extracellular DNA from cancer cells and demonstrated that it did not associate with extracellular vesicles, as previously thought, and instead associated with nuclear and mitochondrial non-vesicular extracellular particles. This furthers our understanding of extracellular DNA structure and may have implications for anti-tumor immunity.

Melica Nourmoussavi Brodeur et al. (UdeM) compared the sensitivity of epithelial ovarian cancer cells to carboplatin in 2D monolayers and 3D spheroids. They found that the fold-change between 2D and 3D chemosensitivity varied by 7-2,000. Thus, the therapeutic response to carboplatin varied significantly according to the model system and cell type used.

Allison Balasko et al. (University of Manitoba (UofM)) presented their work on a novel method of analyzing invariant natural killer T (iNKT) cell functionality. Using HIV-negative donors, they have optimized multi-hour cytokine and multi-day proliferation assays assessing iNKT functionality and found successful activation of these cells. Future goals are now to apply these iNKT stimulation techniques to assess cellular functionality and exhaustion in HIV infection.

Keegan Guidolin et al. (UofT) presented their work on porphysome nanoparticles for photodynamic therapy in cancer. Mice with subcutaneous tumors were treated with Porphysomes combined with photodynamic therapy showed dose-dependent reductions in tumor growth. These studies established PS as a photosensitizing agent for photodynamic therapy.

Joan Miguel Romero et al. (McGill) presented their work on a pancreatic cancer T cell-inflamed signature that delineates a T cell-inflamed phenotype in ovarian cancer. Authors obtained RNA-seq data from The Cancer Genome Atlas on a variety of ovarian tumors and found a four chemokine signature accurately predicted T cell inflammation and provided evidence to suggest similar mechanisms driving T cell inflammation remain consistent across different tumor types.

In a mouse model of soft tissue sarcoma, Kayla Marritt et al. (UofC) found that activation of the stimulator of interferon genes (STING) pathway induced potent anti-tumour effects. After injecting a STRING agonist directly into the tumours, the authors observed immune-mediated tumour regression and evidence of anti-sarcoma immunologic memory.

Stacy de Lima et al. (UofC) investigated the effects of proteinase-activated receptor (PAR) signalling in different cellular models of urothelial carcinoma. They found that PAR activation increased invasion and migration of urothelial carcinoma cell lines *in vitro* monolayer cultures, but not in organotypic 3D cultures.

Kara Ruicci et al. (Western) investigated mechanisms of acquired resistance to the PI3Kα inhibitor alpelisib in head and neck squamous cell carcinoma. The authors identified TAM family receptor tyrosine kinases as key mediators of resistance to alpelisib and highlighted the therapeutic potential of a combinatorial approach with TAM inhibition.

Cardiovascular sciences

Vishnu Vasanthan et al. (UofC) evaluated an augmented bioactive patch that is used for epicardial post-infarct cardiac repair. Compared to current patches applied over ischemic areas, the augmented patch continued to improve cardiac function outcomes when tested in rats, while causing less outcome variability, and induced a less inflammatory fibroblast exosome.

Sneha Raju et al. (UofT) showed that endothelial cells selectively release microRNAs in a polarized manner and may participate in directional cell-cell communication. Using next generation sequencing, they determined that extracellular vesicles had differential expression of microRNA in apical and basolateral compartments.

Sivakami Mylvaganam et al. (UofT) used single molecule tracking and super-resolution microscopy to characterize the mechanosensory and mechanoresponsive machinery in endothelial cells under shear stress. The authors identified a spectrin network essential for stabilizing a transmembrane glycoprotein which ultimately enables shear-sensing and for orchestrating the cellular alignment along the shear axis.

Zacharie Saint-Georges et al. (UofO) compared MR attenuation correction for Cardiac PET imaging with CT attenuation correction (gold standard) in cardiac patients and healthy controls. Preliminary data showed that PET-MR image contrast appeared to be similar but not equivalent to that obtained using PET-CT. Further research with greater sample size is needed to determine the most reliable attenuation correction method for cardiac PET-MR.

Cell and developmental biology

Sarthak Sinha et al. (UofC) revealed molecular targets using single cell multiomics to exploit latent regenerative capacity of dermal fibroblasts. This work has implications for improving wound healing outcomes and interrogating disease genomics on timescales compatible with clinical decision making.

Ori Scott et al. (UofT) presented their work developing novel cell models of STAT1 gain-of-function to reveal a broad spectrum of interferon stimulated gene (ISG) expression profiles. They found that while some mutants showed elevated ISG signatures both at baseline and after stimulation, others displayed suppressed ISG

expression in the resting state, and/or diminished transcriptional responses to stimulation. This suggests that among patients harbouring different STAT1 mutations, both overlapping and distinct mechanisms may contribute to differential clinical presentations.

Catherine Mitran et al. (UofA) presented their work on exploiting immunological cross-reactivity between *Plasmodium vivax* and *Plasmodium falciparum* to develop a vaccine to prevent malaria in pregnancy. They explored ways to express the immunogenic epitope as a vaccine, screening against a cross-reactive monoclonal antibody using a library of peptides. Subsequent experimentation demonstrated that by using a cyclic peptide that constrains the conformation of this epitope to its structure in the parent protein, they produced a first-generation vaccine candidate.

Austin Yan et al. (UofO) developed a protocol to extract genetic information from viruses at the mucosal-luminal interface of the human gut. The authors used virome and metagenome sequencing to explore the virome-bacteriome interactions in pediatric patients with Crohn disease.

Stephanie Carlin et al. (UofA) presented work on the mechanisms by which intestinal phosphotidylcholine (PC) availability regulates dietary lipid handling. By isolating intestines of mice with genetic disruption of *de novo* PC synthesis, the authors demonstrated that the resulting lipid malabsorption was independent of *in vivo* influences.

Clinical and basic pharmacology

Dhiraj Mannar et al. (UBC) set out to identify regions of the SARS-CoV-2 spike protein that can bind with neutralizing antibodies. By mapping epitopes on the protein domain that mediates viral entry into host cells, the authors aim to inform the development of immunogens that elicit neutralizing antibody production and act as effective therapeutic agents for COVID-19.

Neurosciences

Amira Kalifa et al. (UofC) presented their work on the role of Semaphorin3fa in the maintenance of progenitor cells in a post embryonic retina. Their work found that without Sema3fa, the zebrafish larval eye is significantly smaller than the wildtype, concomitant with a disruption of the spatial patterning of proliferation and differentiation genes. Their data indicates that Sema3fa acted as a spatially relevant extrinsic factor that balanced proliferation and differentiation during retinal neurogenesis.

Salonee Patel et al. (Western) developed a rodent model to study the effects of hearing loss on age-related cognitive decline. This model, in which excessive noise exposure causes both high-frequency hearing loss and cognitive-behavioural impairments, will allow the authors to investigate the cellular mechanisms by which hearing loss contributes to cognitive decline.

CLINICAL RESEARCH

Cancer biology

Abi Vijenthira et al. (UofT) identified frailty as an independent variable impacting patients diagnosed with diffuse large-B-cell lymphoma even after adjusting for age, comorbidities and health care utilization. The retrospective cohort study of over 5,000 patients, found higher mortality rates and higher healthcare utilization during chemotherapy in frail patients.

Cardiovascular sciences

A retrospective chart review of cardiac surgery patients conducted by Claudia Cote et al. (Dalhousie) determined a 2.2% incidence of laryngotracheal complications in high-risk cardiac surgery patients, and identified predictors including young age, ICU readmission and having a tracheostomy performed.

Cell and developmental biology

Anne-Marie Cauchon et al. (UdeM) applied a linear regression model that combined radiological and bony morphological parameters to long-term asymptomatic participants and patients with a rotator cuff tear. They showed the model correlated weakly but significantly with the long-term Constant Score of enrollees and concluded other morphological and muscular parameters could improve the correlation.

Neurosciences

Allen Champagne et al. (Queen's University; Queen's) used MRI to compare indices for Susceptibility Weighted (SWI) and Quantitative Susceptibility Mapping (QSM) to track tissue composition of acute cerebral bleeds (aCBs) over time in traumatic brain injury patients. Significant decreases in mean and heterogeneity QSM were observed as the aCBs aged, providing important avenues for QSM to be used as a clinical tool for aCB management over time.

In their systematic review and meta-analysis, Mimosa Luigi et al. (McGill) reviewed the psychological effects and mortality rates of inmates exposed to solitary confinement in correctional settings. The analysis showed solitary confinement was associated with the psychological deterioration of inmates and suggested an effect beyond that of general incarceration or prior mental illness. They also discussed possible add-on treatments and alternatives.

Moaath Saggaf et al. (UofT) presented a prospective observational study that identified a positive correlation between carpal tunnel syndrome and cold sensitivity. Their findings indicated, on average, an improvement in the Cold Intolerance Severity Scale by 10.1 points following surgical or splinting treatments.

Nicholas Sader et al. (UofC) investigated the impact of allocated treatment on non-syndromic craniosynostosis pediatric patients on their quality of life. The multicenter cross-sectional study identified that there was no independent association between quality of life and treatment allocation.

Valera Castanov et al. (Queen's) presented a case report of a 23-year-old male with a spinal cord injury following a motor vehicle collision who was initially booked for a peripheral nerve transfer before showing spontaneous recovery five months post injury. The report indicated the need for time consideration, especially for isolated upper motor neuron lesions, prior to surgical procedures.

Reproductive biology and endocrinology

Shayda Swann et al. (UBC) investigated the biomedical, psychosocial and cellular impacts in women living with HIV compared with sociodemographically-matched HIV-negative women. This intersectional study aimed to understand the intersectional ageing process in women living with HIV through a community-collaborative approach.

Nicole Mancini et al. (UofC) explored the barriers faced by those offering comprehensive care to patients with diabetes who were experiencing homelessness. Through qualitative thematic analysis of semi-structured interviews with providers, the common barriers and potential strategies for improvement were presented.

CLINICAL EPIDEMIOLOGY

Cancer biology

Sara Mirali et al. (UofT) presented a systematic review on the malignant and non-malignant etiology of eruptive seborrheic keratoses (ESK). Their study demonstrated that although ESK is a benign lesion, it was associated with malignancy—most commonly gastrointestinal adenocarcinoma and cutaneous T-cell lymphoma—and may act as a paraneoplastic marker.

Cardiovascular sciences

Tyrone Harrison et al. (UofC) conducted a retrospective cohort study to investigate the risks of perioperative outcomes (i.e., acute myocardial infarction, AMI, and death within 30 days of surgery) in patients with kidney failure undergoing a major surgery. These researchers found that 5.8% of patients experienced an AMI or died within 30 days of major surgery. Moreover, compared with kidney transplantation, vascular, skin and soft tissue, intraabdominal, musculoskeletal, anorectal and neurosurgical procedures all had a significantly higher association with AMI and death within 30 days of surgery.

Clinical and basic pharmacology

Siraj Zahr et al. (UofT) performed a retrospective chart review to identify the risks and predictors of morbidity and mortality among patients with trisomy 21 undergoing adenotonsillectomy. These researchers found that patients with sleep disordered breathing, severe obstructive sleep apnea, an ASA score > 2, aerodigestive comorbidities and pre-operative medical instability are at a significantly higher risk of post-operative complications. No instances of mortality were identified. These findings may improve the informed consent discussions with caregivers of patients with trisomy 21 undergoing adenotonsillectomy.

Hala Muaddi et al. (UofT) conducted a systematic review and meta-analysis to investigate whether the use of cryotherapy applied to closed incisions effects post-operative pain. Seventy-one randomized controlled trials were included in the final analyses. These researchers found that, compared to patients who received no cryotherapy, patients who received cryotherapy experienced reduced post-operative pain; however, the application of cryotherapy had no effect on the duration of hospitalization nor surgical site infections.

Through repeated analyses, Guillaume Beaudoin-Bussières et al. (UdeM) revealed a decline in the humoral responses to SARS-CoV-2, including neutralization, in convalescent individuals and concluded that rapid recovery of plasma from convalescent donors after symptom resolution may be an important determinant of the clinical efficacy of convalescent plasma transfer.

Sangmin Lee et al. (UofC) aimed to understand patterns of asthma medication adherence using linked population-based administrative data. Findings suggest that a large proportion of women had no or low exposure to asthma medication during pregnancy and fluctuations in pattern of use may be linked to disease severity. Further research is warranted to understand the role of disease severity in women's decision making and knowledge regarding asthma medication use during pregnancy.

Neurosciences

Matthew Eagles (UofC) and Macdonald (University of California San Francisco Fresno) performed a *post hoc* analysis on data from the CONSCIOUS-1 trial to determine the relationship between hyperglycemia and outcomes following an aneurysmal subarachnoid hemorrhage

(aSAH) in non-diabetic patients. The researchers found that hyperglycemia following aSAH was a significant independent predictor of increased length of stay in the intensive care unit; however, hyperglycemia following aSAH was not a significant independent predictor of death.

Tea Rosic et al. (McMaster University; McMaster) analyzed data from a 12-month longitudinal study to identify and characterize specific opioid use trajectories in patients receiving pharmacological treatment for opioid use disorder (OUD). They identified the following distinct trajectories: High Use (7.4%), Increasing Use (7.5%), Decreasing Use (5.1%), Low Use (30.2%), and Very Low Use (49.8%). The identification of these trajectories, along with the characteristics that are predictive of each trajectory, may be important in guiding patient-centered care for patients with OUD.

Bastien Rioux et al. (UdeM) found that the risk of new cancer diagnosis in the first year after an ischemic stroke was approximately 2.4 times higher compared with age-matched healthy controls. Their retrospective cohort study evidenced the need for prospective experimental trials to confirm and quantify the potentially pressing need to screen for post-stroke cancer.

Joel Neves Briard et al. (UdeM) investigated the impact of the COVID-19 pandemic on the incidence, management and outcomes of acute ischemic stroke using an observational cohort study. Findings suggest that the pandemic affected acute ischemic stroke management through increased delays to hospital presentation and reperfusion treatment.

TRANSLATIONAL RESEARCH

Cancer biology

Matthew Dankner et al. (McGill) presented their histopathological and scRNAseq analysis and evidence from PDX models of resected brain metastases (BrM), all of which suggest that, in the majority of BrMs, invasion of cancer cells into the adjacent brain was associated with local recurrence, leptomeningeal metastasis and overall survival.

Alvin Qiu et al. (UBC) demonstrated that primary synovial sarcoma could be subgrouped based on the epigenomic landscape using chromatin immunoprecipitation sequencing (ChIP-seq) for histone modifications. They found that the subgroups were associated with differences in BAF activity and that histone deacetylase inhibitor may be a therapeutic strategy in syncovial scarcoma to increase the expression of genes characteristic of the less aggressive sub-group.

Cardiovascular sciences

Mark Trinder et al. (UBC) identified the association of a rare gain-of-function variant of cholesteryl ester transfer protein (CETP) with lower HDL levels during sepsis and increased risk of 28-day mortality. Their work underscored CETP as a promising target for pharmacological inhibition to improve sepsis survival.

Tina Marvasti et al. (UofT) demonstrated that heart failure remodels the bone marrow stem cell and progenitor cell populations and their response to myocardial repair. The study found that heart failure was correlated with bone marrow stem and myeloid progenitor cell remodelling, which can negatively impact the pathophysiological disease progression. Thus, isolating bone marrow cells from post-MI patients for autologous bone marrow stem cell should be re-considered.

The markers of neutrophil extracellular traps (NETs), which can contribute to vascular occlusion and edema associated with primary graft dysfunction (PGD), were quantified in blood samples and graft lung tissues by Steven Bonneau et al. (UdeM). In the presence of severe PGD, grafted lungs showed a marked increase in activated neutrophils, and the markers were identified as associated predictive factors for the development of PGD.

Cell and developmental biology

Hannah Kozlowski et al. (UofT) developed a rapid, sensitive and easy to adapt colorimetric nano-diagnostic platform that can identify disease-causing pathogens and their associated antibiotic resistance genes within two hours. This platform can efficiently detect bacteria, and DNA/RNA viruses including (SARS-CoV-2, influenza A virus and hepatitis B virus) from different biological samples (i.e., blood, serum, swabs). The equipment-free workflow and readout allows utilization in centralized and remote settings and could help reduce the global burden of infectious disease.

To better understand the antibody response directed against SARS-CoV-2, Jérémie Prévost et al. (UdeM) evaluated the humoral responses against the SARS-CoV-2 spike glycoprotein in a cross-sectional study of 106 SARS-CoV-2-infected individuals. Their results indicated that the body's neutralizing activity decreased after the first two weeks of infection.

Roy Hajjar et al. (UdeM) proposed the use of fermentable fibres to increase the activity of butyrate-producing bacteria, given that butyrate can improve mucosal healing and prevent anastomotic leak (AL) after colorectal surgery. Mouse modelling of dietary supplementation before colonic anastomosis, followed by macroscopic and histological analysis, provided supporting evidence that diet modification can result in the healing benefits of butyrate for AL.

Clinical and basic pharmacology

Given that M3 receptors (M3Rs) mediate bronchoconstriction in asthma patients, but that M3R antagonists can aggravate respiratory symptoms over time, Samuel Mailhot-Larouche et al. (UdeM) proposed an alternative treatment: M3R desensitization through uncoupling and/or downregulation. Their murine and cell-based desensitization models, using the M3R agonist methacholine, suggested long-term clinical benefits of M3R desensitization.

OTHER

Medical education

Sydney McQueen et al. (UofT) presented their work on the experience of cognitive flow among surgeons through a multidimensional lens. They highlighted that understanding flow in clinical practice may lead to new avenues for enhancing career satisfaction, combating burnout and promoting physician wellness.

Laura Morrison et al. (UofC) presented their investigation on research education in Canadian orthopedic surgery residency programs. The result of this study provides Canadian orthopedic surgery programs with a feasible model for implementing research education training and informs updates to the Royal College objectives and Entrustable Professional Activities.

Carlie Montpetit et al. (UofC) presented a mixed-methods study protocol to identify indicators of eating disorders at an earlier and more treatable stage. They sought to perform a retrospective cohort analysis of emergency data from young patients in the Calgary Eating Disorders Program (CEDP), as well as to interviews these patients.

Sawayra Owais et al. (McMaster) conducted a comprehensive scoping review to identify how MD/PhD programs have integrated the concepts of equity and diversity into their admissions process, and how these concepts may affect prospective applicants and current students. While this research is ongoing, the authors have identified 10 articles for inclusion in their scoping review. This work has the potential to inform program-level changes to promote equity and diversity in MD/PhD programs.

Sociology/philosophy/ethics

Mark Sorin et al. (McGill) presented their work on a thematic analysis of cancer patient perspectives during the COVID-19 pandemic. They found that COVID-19 significantly affected cancer patients and family members through perceived medical abandonment, patient mental health and the impact of previous cancer trauma, highlighting the need for oncologists to be cognizant of evolving patient concerns in these exceptional pandemic circumstances.

Jasmine Mah et al. (Dalhousie) performed a scoping review and narrative synthesis on social factors that influence home care utilization in community-dwelling older adults in high income countries. They reported a wide range of social factors with their own association with home care utilization and discussed the policy implications of these complex interactions in the Canadian home care context.

CONCLUDING REMARKS

In 2020, CSCI and CITAC were able to rapidly adapt to the landscape of the COVID-19 pandemic and host the annual meeting using a virtual platform. This meeting was the largest meeting to date with close to 180 attendees. Clinician-investigator trainees from across Canada joined online lectures and participated in interactive digital workshops to acquire new knowledge and skills, in addition to delivering outstanding presentations on groundbreaking research themselves.

The virtual format of the CSCI-CITAC 2020 AGM helped break down many barriers to attendance of in-person meetings, such as cost and accessibility. An overall increase in trainee attendance was observed from most of the academic institutions across Canada. Francophone and eastern Canadian institutions had a stronger representation at this meeting compared with previous years. These findings suggest that the online format of the 2020 AGM improved the accessibility of the meeting, which provided a greater number of clinician-investigator trainees with the opportunity to disseminate their research.

FINANCIAL SUPPORT

CITAC-ACCFC acknowledges financial support from the Canadian Institute of Health Research, the Burroughs Welcome Fund and MD Financial Management.

REFERENCES

1. Castanov V, Zhou TE, Balestrini CS et al. Overview of the Canadian Clinician Investigator Trainees' research presented at the 2019 CSCI-CITAC Joint Meeting. *Clin Invest Med*. 2020; 43(3): E5-14.
2. Castanov V, Ma X, Pietrobon A et al. Scientific Overview on CSCI-CITAC Annual General Meeting and 2018 Young Investigators' Forum. *Clin Invest Med*. 2019; 42(3): E6-13.
3. Barton KI, Ma X, Babadagli ME et al. Scientific overview on CSCI-CITAC Annual General Meeting and 2017 Young Investigators' Forum. *Clin Invest Med*. 2018; 41(3): E156-E164.
4. Keow J, Zhao E, Samuel N et al. Scientific overview: CSCI-CITAC Annual General Meeting and Young Investigators' Forum 2014. *Clin Invest Med*. 2015; 38(4): E143-E153.