CARDIOVASCULAR SCIENCES COLLABORATIVE SPECIALIZATION
23rd ANNUAL STUDENT RESEARCH DAY

The 23rd Annual Cardiovascular Science Collaborative Specialization (CSCS) Student Research Day was held on Wednesday, April 13, 2022. The event used the virtual platform Spatial Chat. This day allows graduate students to present their research to their peers in a welcoming environment to promote discussion and the free flow of ideas. Ultimately, this event is a platform for expressing scientific ideas and inspiration for the mind, pushing the boundaries of current scientific paradigms in cardiovascular research.

Dr. Anthony Gramolini, CSCS Director, led the day with opening remarks and highlighted the excellence and diversity of the CSCS. Omar Kanny, Chair of the Organizing Committee, then briefed the attendees on the day's events.

The day included two CSCS student presentation sessions focused on different areas of cardiovascular research: basic to translational science and clinical considerations and therapeutic interventions. In addition, two parallel workshops were held: “Strategies for Writing Effective Research Proposals”, hosted by Dr. Fiona Coll from the University of Toronto Graduate Centre for Academic Communication, and “Pathways to Financial Wellness”, hosted by Adam Devine-Turriff from RBC on Campus. In the afternoon, the recipients of both prestigious awards, 'Lorne Phenix Graduate Award' and 'Bigelow Book Prize', were recognized, certificates were awarded to students who completed the CSCS program, and ‘Best Presentation’ awards were handed out to presenters. Our keynote speaker, Dr. Phyllis Billia, Assistant Professor in the Department of Medicine, engaged in discussion with the students. The day closed by completing a group mediation exercise hosted by Melissa Campagnolo, from the University of Toronto Mindfulness Moments.

STUDENT PRESENTATIONS

All CSCS students are required to present their research a minimum of one time during their graduate training. The presenters had a standard 8-minute presentation followed by a 2-minute question period. Below is a summary of the 2 sessions, with excellent and innovative presentations throughout.

Session I: Basic to Translational Science (Chairs: Coulter Montague & John Dauz)

Annie Zhou, PSL/MSc
NF-κB signaling regulates vasopressin receptor 2 promoter activity

Steven Botts, IMS/PhD
Characterizing the endothelial transcription factor ERG: A safeguard against vascular dysfunction and disease

Michelle Di Paola, PSL/PhD
Sarco(endo)plasmic reticulum membrane protein REEP5 regulates subcellular structure and function in the heart

Fahad Ehsan, PSL/MSc
Characterizing the expression of latent transforming growth-factor binding protein 2 in cardiac fibrosis

Michael Dewar, PSL/PhD
Elucidating heterogeneity between left and right ventricle-derived cardiac fibroblasts

The first speaker, Annie Zhou, presented on NF-κB signaling regulates vasopressin receptor 2 promoter activity, which represents the early processes of elucidating how the vasopressin receptor 2 promoter is responsive to NF-κβ signaling and identifying its role in BP homeostasis. Up next, Steven Botts presented his work characterizing the endothelial transcription factor ERG, which he demonstrated serves as a regulatory safeguard against vascular dysfunction and disease, the removal of which can lead to aberrant gene expression in aortic endothelial cells and atherosclerotic plaque development. The third speaker was Michelle Di Paola who covered her work studying how the loss of Receptor Expression-Enhancing Protein 5, key in maintaining sarco(endo)plasmic reticulum (SR/ER) integrity, affects endoplasmic reticulum homeostasis as well as SR/ER structure and function. Fahad Ehsan presented his work studying latent transforming growth factor binding protein 2's role in the myocardium in infarcted hearts and activated fibroblasts. To conclude the session, Michael Dewar presented on his work elucidating the differential expression of genes in between right and left ventricular cardiac fibroblasts and their gene expression in following cardiac injury.

Session II: Clinical Considerations and Therapeutic Interventions (Chair: Aaron Troy and Doris Adao)

Fu-Tsuen (Kelvin) Lee, PSL/MSc
Maternal hyperoxygenation in single ventricle defects: Interim findings

Shouka Nejad, BME/PhD
A comparative study of human umbilical cord perivascular cells and bone marrow derived MSCs in serum and xeno-free culture for pediatric heart valve tissue engineering applications

Frank Yu, PSL/MSc
Dialysis improves myocardial preservation during ex situ heart perfusion

Coulter Montague, LMP/MSc
Scalable maturation of human pluripotent stem cell-derived cardiomyocytes using a high-density adherent scaffold bioreactor

Fu-Tsuen (Kelvin) Lee began by presenting his interim trial findings on maternal hyperoxygenation during pregnancy as a therapeutic strategy to improve neural development in fetuses with single ventricle defects. Results to date are encouraging, but have also revealed a potential safety concern in the form of a lower birth weight in the treatment group - an observation that led to lively discussion amongst the attendees. This was followed by Shouka Parvin Nejad, who detailed a comparative study of human umbilical cord perivascular cells (hUCPVCs) and bone marrow derived MSCs in serum and xeno-free culture for pediatric heart valve tissue engineering applications. Shouka's presentation explored the use of huCPVCs as a more efficient and accessible alternative to MSCs for heart valve tissue engineering. Frank Yu presented promising results on the use of hemodialysis for improved myocardial preservation during ex situ heart perfusion. Hemodialysis blunted a decline in systolic function normally observed during 8 hours of perfusion, while preserving vasodilation in response to both endothelial dependent and endothelial independent agonists. To conclude the session, Coulter Montague showcased a method for the scalable maturation of human pluripotent stem cell-derived cardiomyocytes using a high-density adherent scaffold bioreactor. His work leverages 3D printing to produce novel scaffold geometries, and represents a potential solution to current challenges to the large-scale manufacture of mature human pluripotent stem cell-derived cardiomyocytes.

Congratulations once again to our amazing presenters and their interesting research!

SESSION PRESENTATION AWARD WINNERS

Following the last presentation of each session, the attendees had the opportunity to judge all the presenters to determine who received the Best Presentation Award. Criteria was based on assessing

their presentation skills, slide content and structure, and explanation of research and ability to answer questions. The presenters who received the highest number of votes were the recipients.

Congratulations to Michael Dewar and Shouka Nejad for winning the Best Presentation Award for their respective session, which included a certificate and cash prize.

GUEST SPEAKER

This year, the CSCS Student Day was fortunate to host the distinguished clinician-scientist, Dr. Phyllis Billia as our Guest Speaker. The session was structured as an open discussion during which Dr. Billia shared her path to becoming a leader in cardiovascular sciences and answered questions from students. This format provided students an engaging opportunity to gain insight into life as both a cardiovascular researcher and clinician. Dr. Billia provided advice on facing the challenges of an academic career framed through her own story, while also touching on the key events that helped her pave her path as a clinician-scientist. She also openly shared her personal approach to maintaining balance and perspective while continuing to push new frontiers in research. As well as discussing how her clinical work and research endeavors complement one another in different ways. Thank you to Dr. Billia for sharing her story and insightful advice.

Dr. Billia is an Assistant Professor in the Department of Medicine at the University of Toronto. She has graduate membership in the Departments of Medical Biophysics and Physiology. She is a member of the Division of Cardiology at the University Health Network and a Senior Scientist at the Toronto General Research Institute. She completed both her medical and research training at the University of Toronto and is a graduate of the Medical Biophysics PhD program. She later completed a postdoctoral fellowship with Dr. Tak Mak at the Campbell Family Institute for Cancer Research. Currently, Dr. Billia is the Co-Director of the Peter Munk Cardiovascular Biobank and Medical Director of the Mechanical Circulatory Assist Program. She has embarked on her own research career with funding from the Canadian Institutes of Health Research, focusing on understanding the molecular underpinnings of disease progression in patients with heart failure. Her laboratory is specifically interested in examining how tumor suppressors and regulators of metabolism can coax the terminally differentiated cardiomyocyte back into the cell cycle as a potential means for post-injury repair. She is also particularly interested in cell culture-based disease modeling using induced pluripotent stem cell technology. In 2014, Dr. Billia was awarded a Young Investigator Award from the Canadian Cardiovascular Society for her research contributions to cardiac regeneration involving the manipulation of tumor suppressor genes to refocus them on damaged heart cells.

WORKSHOPS

Strategies for Writing Effective Research Proposals – Dr. Fiona Coll

The CSCS was delighted to host Dr. Fiona Coll from the University of Toronto Graduate Centre for Academic Communication for one of two simultaneous professional development workshops. Dr. Coll delivered a highly interactive presentation on foundations for the clear writing of research and academic proposals. In tackling this core skill for research trainees she detailed essentials to highlighting funding priorities, identifying and mitigating points of reading friction, and building a writing process that sustains a research direction beyond the pressure of application deadlines. These fundamentals are certain to be of great benefit to attendees throughout their

academic careers and beyond. Deepest thanks to Dr. Coll for leading this engaging and constructive workshop!

Budgeting Basics 101 & Building a Good Student Credit - Adam Devine-Turriff
We had the pleasure to host Mr. Adam Devine-Turrif, the RBC On Campus Manager at the University of Toronto, to share good habits graduate students can leverage to better budget their money and build student credit. Mr. Devine-Turrif delivered a clear and robust presentation on how to make your budget work for you today and strategies when adapting to changing circumstances in the future. He emphasized it is all about tracking your cash flow and planning for the unexpected. Furthermore, he introduced the ins and outs of credit and to set up good student credit in case you need to borrow in the future. All in all, he wanted students to understand that building good habits and managing your money and credit is one of the secrets of alleviating financial stress. Our CSCS students were extremely receptive and we are grateful to have Mr. Devine-Turrif unconditionally support student learning and development towards their personal lives!

Mindfulness Moments - Melissa Campagnolo
Melissa is a facilitator in the Mindful Moments program at the University of Toronto. After a long day of presentations and invigorating discussions on the new frontiers of cardiovascular research, Melissa led the students to take a moment of mindfulness. Beginning with a bit of gentle mindful movement to address neck and shoulder tension, she followed this with a guided meditation to help busy minds unwind, cultivating focus and a sense of ease. This reminded us to practice more mindfulness moments such as this in order to take care of our mental health and weather the storms of graduate school. Thank you Melissa for leading this workshop and ending our day off on a high note! This program offers year round drop in yoga and meditation sessions, and is available to all students. Details can be found here: http://uoft.me/mindfulmoments

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AWARDS & CERTIFICATES

CSCS PRESTIGIOUS AWARDS

Dr. Gramolini presented the Bigelow Book Prize and Dr. Margaret Rand, Chair, Awards Committee, presented the Lorne Phenix Graduate Award. These two awards are flagship to our program and recognize excellence and potential in our trainees. Congratulations to Dakota Gustafson for being the recipient of both awards, the first time in CSCS history!

2022 Bigelow Book Prize Recipient
2021-2022 Lorne Phenix Graduate Award Recipient

Dakota Gustafson, PhD Candidate
Department of Laboratory Medicine & Pathobiology
Temerty Faculty of Medicine
Supervisor: Dr. Jason Fish

THE BIGELOW BOOK PRIZE

This award, consisting of a book written by Dr. W.G. Bigelow entitled “Mysterious Heparin” and a plaque, was established in 1995 by the Cardiovascular Sciences Collaborative Program to recognize and honor a pioneer clinician and scientist in the field of cardiovascular sciences. The award will be given in every year that a qualified student is identified. Special account will be taken of sustained academic scientific excellence, innovative experimental approaches, original discoveries, and good scientific productivity.

Some weight will be given to work that has recognizable clinical relevance, especially that which promises to improve patient care. As much as possible, awardees should exemplify the personal traits of Dr. Bigelow, including drive, curiosity, and scientific integrity.

LORNE PHENIX GRADUATE AWARD

This award was made possible by a generous donation in the memory of Mr. Lorne Phenix by the Phenix family. It is awarded to graduate students in the Cardiovascular Sciences Collaborative Specialization on the basis of research and academic excellence. First preference will be given to full-time graduate students doing cardiovascular research related to women. Second preference will be given to full-time graduate students doing cardiovascular research. The award will be given in every year that a qualified student is identified. This award consists of a cash prize and certificate.

Making Survivorship Matter: Elucidating Biomarkers for the Prediction of Cancer Therapy-Related Cardiac Dysfunction in Women with HER2+ Breast Cancer.

Breast cancer is the most common cancer in Canadian women and their leading cause of cancer death. Nearly 1 in 8 women are expected to develop breast cancer in their lifetime. However, women with newly diagnosed breast cancer are increasingly likely to have a curable early-stage disease because of improved screening. Research has shown that cardiovascular (CV) disease – specifically heart failure (HF) – is an important competing risk for mortality in breast cancer survivors in Ontario. This is driven by shared risk factors and the direct impact of cancer therapy on the CV system. Since the development of HF (defined as cancer therapy-related cardiac dysfunction [CTRCD]) is associated with poor prognosis, risk mitigation strategies at an early stage of cancer treatment (e.g., initiation of statins; closer cardiac surveillance) have become a priority. In this respect, while cardiac magnetic resonance imaging, serial echocardiography, and measurement of traditional cardiac biomarkers are mainstays of cardiac surveillance, they represent sub-optimal approaches capable of detecting cardiac damage only after it has occurred. As a result, the morbidity and mortality associated with CTRCD significantly reduce the quality of life associated with cancer survivorship. As such, we need robust markers to identify women at risk of CTRCD, before treatment or early during treatment. To accomplish this, we've leveraged a cohort of one-hundred and thirty-six individuals, having a biological female sex, that underwent dual chemotherapy (Anthracycline-Herceptin) for breast cancer and had thorough cardiovascular imaging (i.e., cardiac magnetic resonance imaging) as well as biobanking. Using these biobanked samples we've identified circulating endothelial, microRNA, and extracellular vesicle biomarkers that are associated with CTRCD and were detectable both before initiation of cancer therapy. Currently, we're applying machine learning algorithms to quantify the incremental value of these newly identified biomarkers over the traditional clinical, imaging, and protein biomarkers data as predictors for CTRCD.

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CSCS COMPLETION CERTIFICATES

Dr. Gramolini announced the names of those students who had successfully completed the Cardiovascular Sciences Collaborative Specialization program over the past year.

PhD

Rachel Adams, PhD, Institute of Biomaterials and Biomedical Engineering (Supervisor: C. Simmons): "The Regulation of C-Type Natriuretic Peptide Signalling in Aortic Valves: Sex Differences and Shear Stress-Dependency"
(Industry)

Lynne Jean Alis Bonsignore, PhD, Department of Kinesiology (Supervisor: S. Thomas): "Cardiovascular Disease Risk and Cardio-oncology Rehabilitation (CORE) Referral in Breast Cancer Survivors"
(Health Promotion/Policy or Public Health)

Jessie Mei Lim, PhD, Department of Physiology (Supervisor: M. Seed): "Cerebral Hemodynamics, Oxygen Metabolism and Brain Growth in Congenital Heart Disease"
(Clinician Scientist – Perfusion Program)

Antonio Mauro, PhD, Institute of Medical Science (Supervisor: K. Connelly): "Protocol Development for the Discovery of Angiogenesis Inhibitors via Automated Methods Using Zebrafish and the Discovery and Validation of PD81723 as a Novel Angiogenesis Inhibitor"
(Post-doctoral and Industry Options)

Brahmdeep Saini, PhD, Institute of Medical Science (Supervisor: M. Seed): "Quantifying Placental Function Using Cardiovascular Magnetic Resonance Imaging"
(Post-doctoral Fellowship)

Dorrin Zarrin-Khat, PhD, Department of Laboratory Medicine and Pathobiology (Supervisor: M. Husain): "Cardioprotective Effects of Combined Treatment with Sodium-Glucose Co-Transporter-2 Inhibitor and Glucagon-Like Peptide-1 Receptor Agonist in a Mouse Model of Ischemia-Reperfusion Injury"
(University of Toronto, Medical School)

MSc/MASc

Ambuja Banerjee, MSc, Department of Pharmacology and Toxicology (Supervisor: J. Parker): "Preventing the Development of Nitrate Tolerance and Assessing Endothelial Function"
(Physician Scientist)

Christian Delayun, MSc, Institute of Medical Science (Supervisor: B. McCrindle): "Patient- Specific and Program Outcome Evaluation of a Novel Pediatric Exercise Medicine Program"
(Clinical Research)

Natasha Rose Girdharry, MSc, Institute of Medical Science (Supervisor: S. Mak): "Cardiovascular Physiology in Individuals with Obesity"
(Medical School)

Jillian Larkin, MSc, Department of Kinesiology (Supervisor: S. Thomas): "Breast Cancer Patients' Experiences While Transitioning to a Virtual Cardiovascular Rehabilitation Program During a Pandemic (COVID-19)"
(University of Ottawa, Medical School)

Rebecca Christina Laundos, MSc, Department of Kinesiology (Supervisor: J. Goodman): "Left Ventricular Diastolic Function in Middle-Aged Endurance Athletes: Considering the Effects of Training Volume, Exercise Modality and Sex"
(PhD Degree and/or Industry Options)

Jennifer Lewis, MSc, Department of Kinesiology (Supervisor: J. Goodman): "Quantification of Exercise Burden in Recreational Masters Endurance Athletes"
(Kinesiologist/Exercise Physiologist)

Neha Parmar, MSc, Institute of Medical Science (Supervisor: S. Mital): "Investigating Targeted Therapies for Genetic Heart Disease"
(Doctor of Medicine)

Kayla Soon, MASc, Institute of Biomaterials and Biomedical Engineering (Supervisor: S. Vasconcelos): "Development and Characterization of a Human Model of Arteriovenous Malformations (AVM)-on-a-Chip"
(NRC – Technical Officer)

Aylin Visram, MSc, Department of Physiology (Supervisor: K. Connelly): "Role of Dapagliflozin in Attenuating Right Ventricular Remodelling: Transverse Aortic Constriction Model"
(Medical Career)

Elizabeth Whyte, MSc, Department of Kinesiology (Supervisor: S. Thomas): "Muscle Oxygenation of the Paretic and Nonparetic Legs Measured During Arterial Occlusion and Exercise in Chronic Stroke"
(University of Alberta, Medical School)

CLOSING

The 23rd CSCS Student Research Day was a significant success. It would not have been possible without the combined efforts and hard work of the following.
Organizing Committee: Omar Kanny, Chair; Kelvin Lee, Co-Chair; Doris Adao, John Dauz, Aaron Troy, Sarah Shawky, Coulter Montague, Members,
Victoria Simpson for her support and knowledge,
Dr. Phyllis Billia, for sharing her wisdom and inspiring journey,
Dr. Fiona Coll and Mr. Adam Devine-Turriff for hosting incredible workshops,
Ms. Melissa Campagnolo for facilitating a group mediation exercise.

Thank you to all for making this day a great success!

ACKNOWLEDGEMENTS

Thank you to Student Life for providing us with the financial capability to host our 23rd CSCS Student Research Day!

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