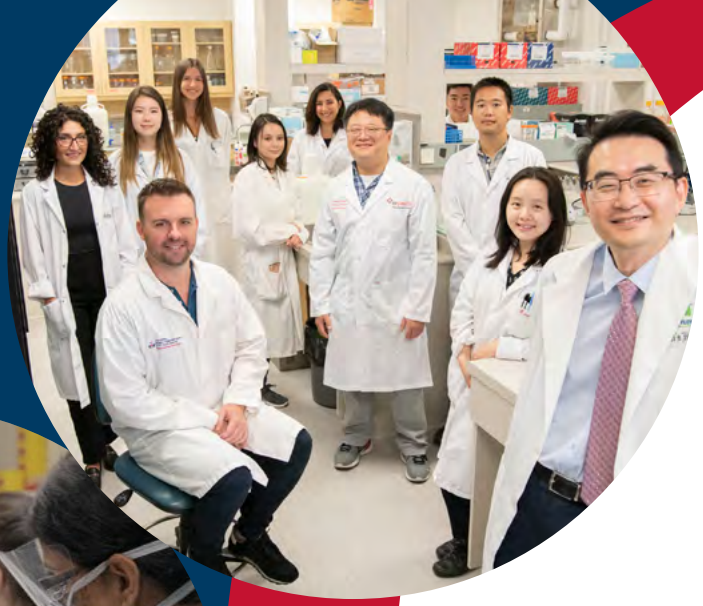

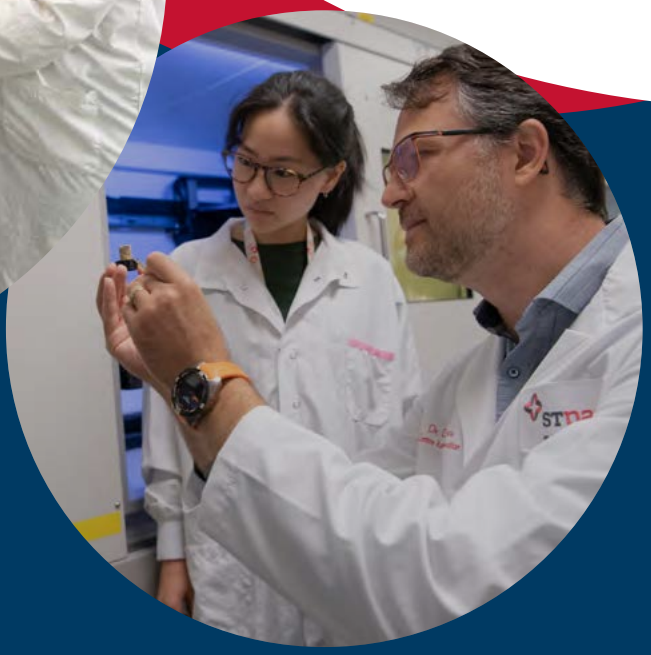

2022 ANNUAL REPORT

Centre for
Heart Lung Innovation
UBC and St. Paul's Hospital

Exceptional care through exceptional science in heart, lung and blood vessel diseases

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Established in 1977 by Drs. James Hogg and Peter Paré, the HLI is a University of British Columbia Senate-approved research centre located within St. Paul's Hospital in downtown Vancouver.

The Centre is now led by Dr. Don Sin (Director) and Dr. Jordan Guenette (Associate Director).

76 Principal Investigators and Affiliated Investigators

37 Research Associates and Postdoctoral Fellows

55 Graduate Students

53 Undergradate Students

6 Visiting Scientists

53 Support, Operations, and Administrative Staff

>50,000 ft²
laboratory and office space

9 Core Facilities

Cardiovascular and Lung Tissue Biobanks
Cellular Imaging and Biophysics
Histology
Molecular Phenotyping
Tissue Culture
Pre-clinical Services
Digital Slide Scanning and Imaging
Magnetic Resonance Imaging
Freezer Program

>$16.0 M
in external funding*

$11.2 M
Peer-Reviewed Grants

$2.0 M
Clinical Trials

$1.2 M
Contracts and Agreements

$1.5 M
Salary Awards

*April 2022 to March 2023. Details in Appendix A. Total funding held at HLI: $7.5M.

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Dear Friends and Colleagues;

It is with great pride and joy that we unveil HLI's 2022 Annual Report. The Centre for Heart Lung Innovation (HLI), established in 1977, is a world leading T1 translational research centre for heart, lung, critical care and blood vessel diseases, including COVID-19. Clinical translational research plays an incredibly important role in our society, as it bridges the gap between basic scientific discoveries and their practical application in improving human health. This type of research involves taking findings from the laboratory and testing them in real-world clinical settings, with the ultimate goal of translating these discoveries into tangible benefits for patients, including development of new and better diagnostic tools and disease-altering therapeutics. Clinical translational research is especially important in the context of complex and multifactorial diseases, such as chronic obstructive pulmonary disease (COPD), valvular heart disease, atherosclerosis, sepsis, pulmonary fibrosis and many others, which require a multidisciplinary approach and a deep understanding of the underlying mechanisms. This type of research also plays a critical role in addressing health disparities and ensuring that all members of our society have access to high-quality medical care. HLI stands at the forefront of translation. At the heart of this translation is our patients, who provide us with daily inspiration for our research and are crucial partners in our pursuit of new knowledge and innovation.

In 2022, we launched HLI's 5-year strategic plan where we pledged "to discover solutions to improve the heart and lung health of the people of British Columbia, Canada and throughout the world" and to "attract, support, and connect world class researchers to discover patient-centred therapeutic and biomarker solutions to improve cardiovascular and respiratory health" (www.hli.ubc.ca). We will achieve these goals through "Excellence, Innovation, Integrity, Compassion, Collaboration and Equity." HLI's Strategic Plan fully aligns with the UBC Faculty of Medicine's strategy to "catalyze innovation and excellence in foundational, clinical and health systems research to accelerate translation across the continuum and enhance precision and population research" (http://stratplan.med.ubc.ca). Our 9 CORE facilities, including our two large biobanks (the Bruce McManus Cardiovascular Biobank and the James Hogg Lung Biobank) will provide foundational support for all HLI programs to catalyze and accelerate cutting-edge research that will ultimately improve the lives of our patients with heart and/or lung disorders.

Beyond the >$16 M in research funding secured by our investigators and >345 peer-reviewed papers published by our team last year, including in the world's leading journals such as the New England Journal of Medicine, Lancet and Lancet Respiratory Medicine, we are extremely proud that we were the preferred training destination of ~100 graduate students and post-doctoral fellows (PDFs) and many more undergraduate and summer students, representing 39 countries across 5 continents. HLI is a hotbed for training the next generation of translational scientists and clinician-scientists who will transform the world.

In 2023, HLI will assist Providence Research and Providence Health Care (PHC) in the planning and development of the Clinical Support and Research Centre (CSRC) on Station Street. This will be a once-in-a-generation opportunity to create a rich research ecosystem that is fully integrated and aligned with clinical programs and for our research programs to meet our patient partners where they are, enhancing HLI's ability to conduct world-leading research that matters most for our patients.

There are, however, some storm clouds on the horizon including inflation, reduced research funding, and the increased cost of services owing to the pandemic. As we navigate through these challenging times, I would like to acknowledge the incredible resilience and strength of our staff and trainees at HLI. Their determination and courage to succeed are a testament to their character and their commitment to HLI.

I would like to thank also our partners, including the UBC Faculty of Medicine, Providence Research, PHC, St. Paul's Foundation, SFU Faculty of Health Sciences and many others, whose sage advice and unwavering support have enabled us to have a banner 2022 and embrace an even greater future. With our partners and patients, HLI remains fully committed to excellence in translational research because "research is the key to progress, and the key to unlocking the future" (Edith Wharton, The Age of Innocence).

Thank you and all the best for 2023!
The best is yet to come.

Don D. Sin, MD
Professor of Medicine, UBC
Director of HLI and the De Lazzari Family Chair
Canada Research Chair in COPD

The Centre for Heart Lung Innovation (HLI, previously known as iCapture and the James Hogg Research Centre) is a University of British Columbia (UBC) Senate-approved Centre of Cardiovascular, Pulmonary, and Critical Care expertise, housed within Providence Health Care at St. Paul's Hospital.

GOVERNANCE STRUCTURE

Providence Health Care

a place of mind THE UNIVERSITY OF BRITISH COLUMBIA

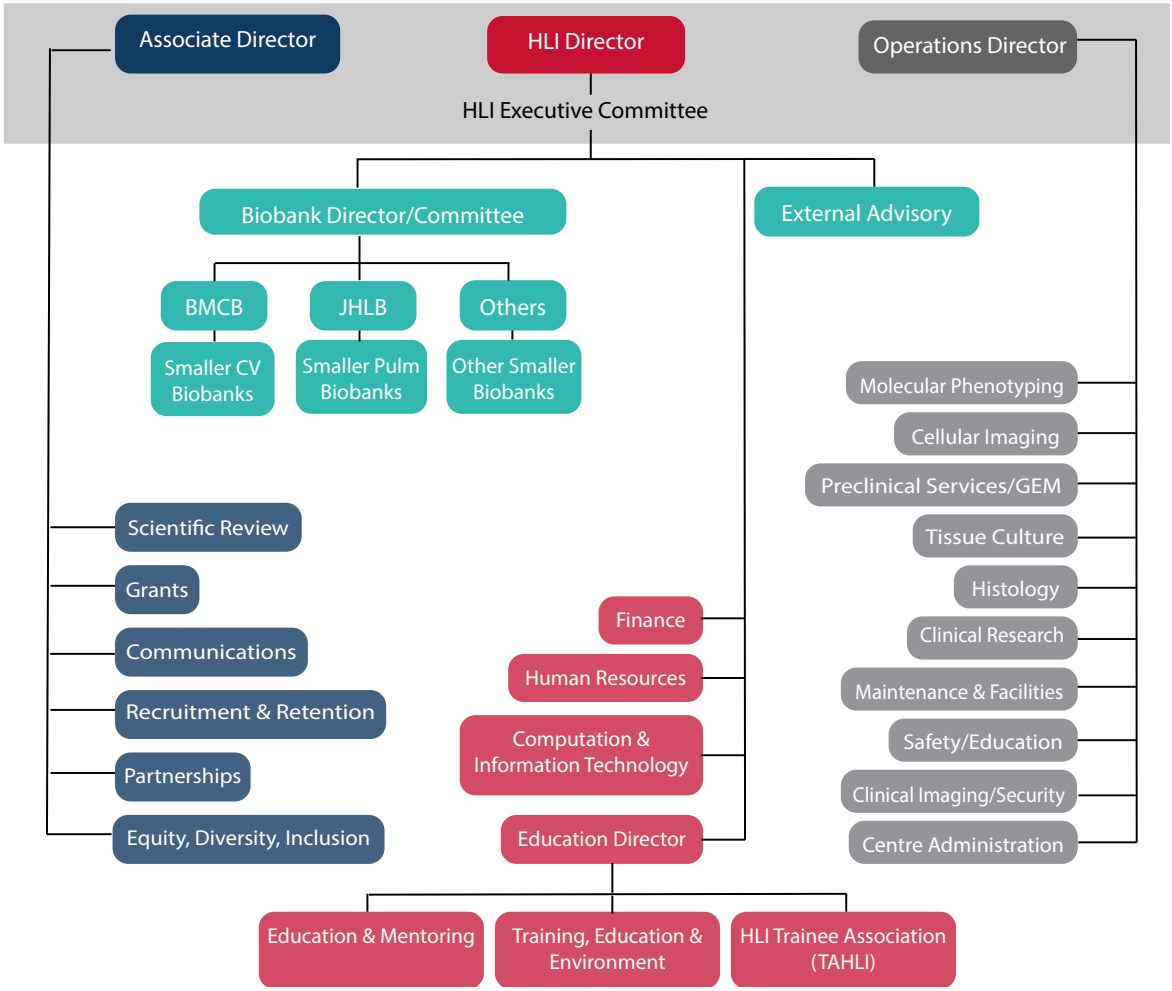
Board of Directors

CEO

Providence Research

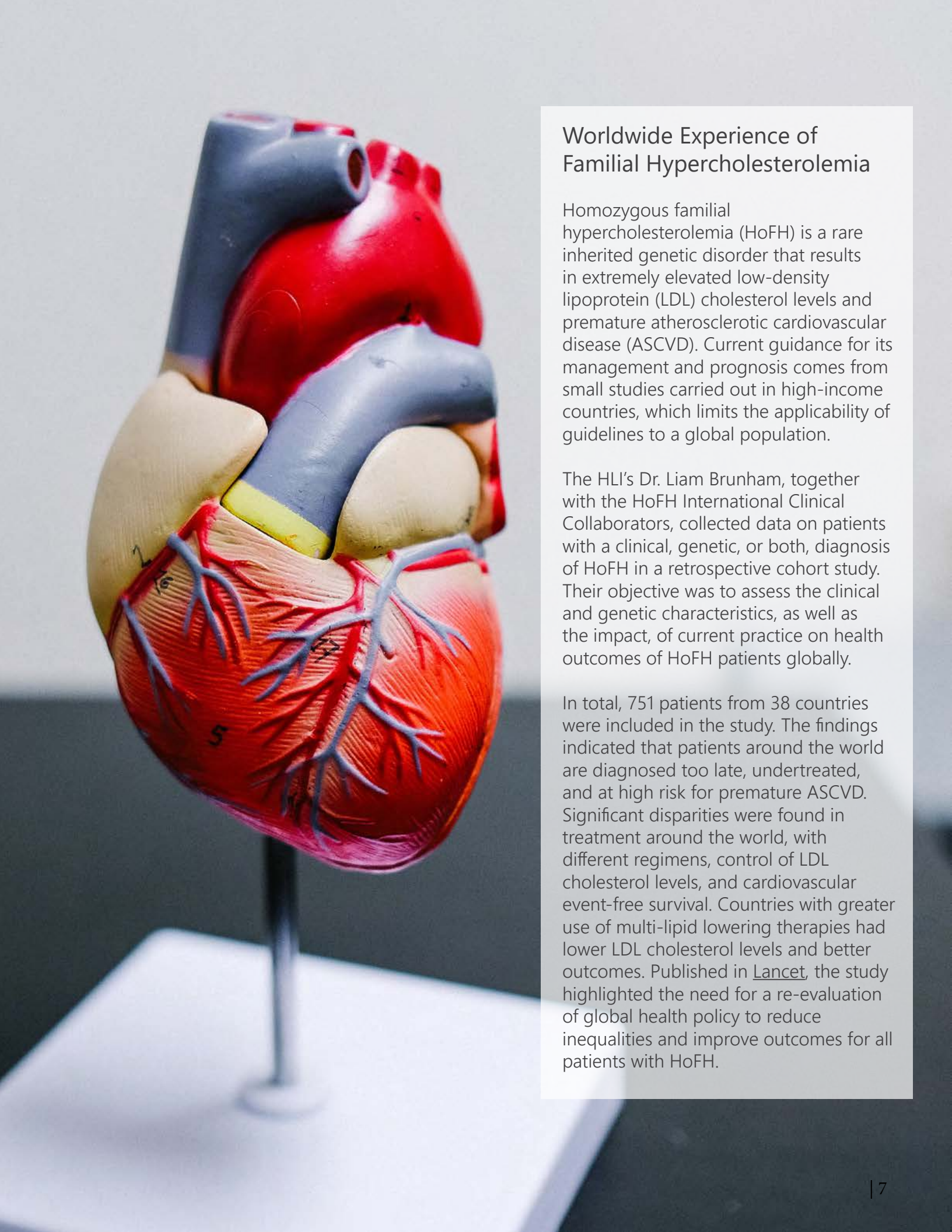
Faculty of Medicine

Centre for Heart Lung Innovation UBC and St. Paul's Hospital



Research Spotlights

Top HLI research stories from 2022

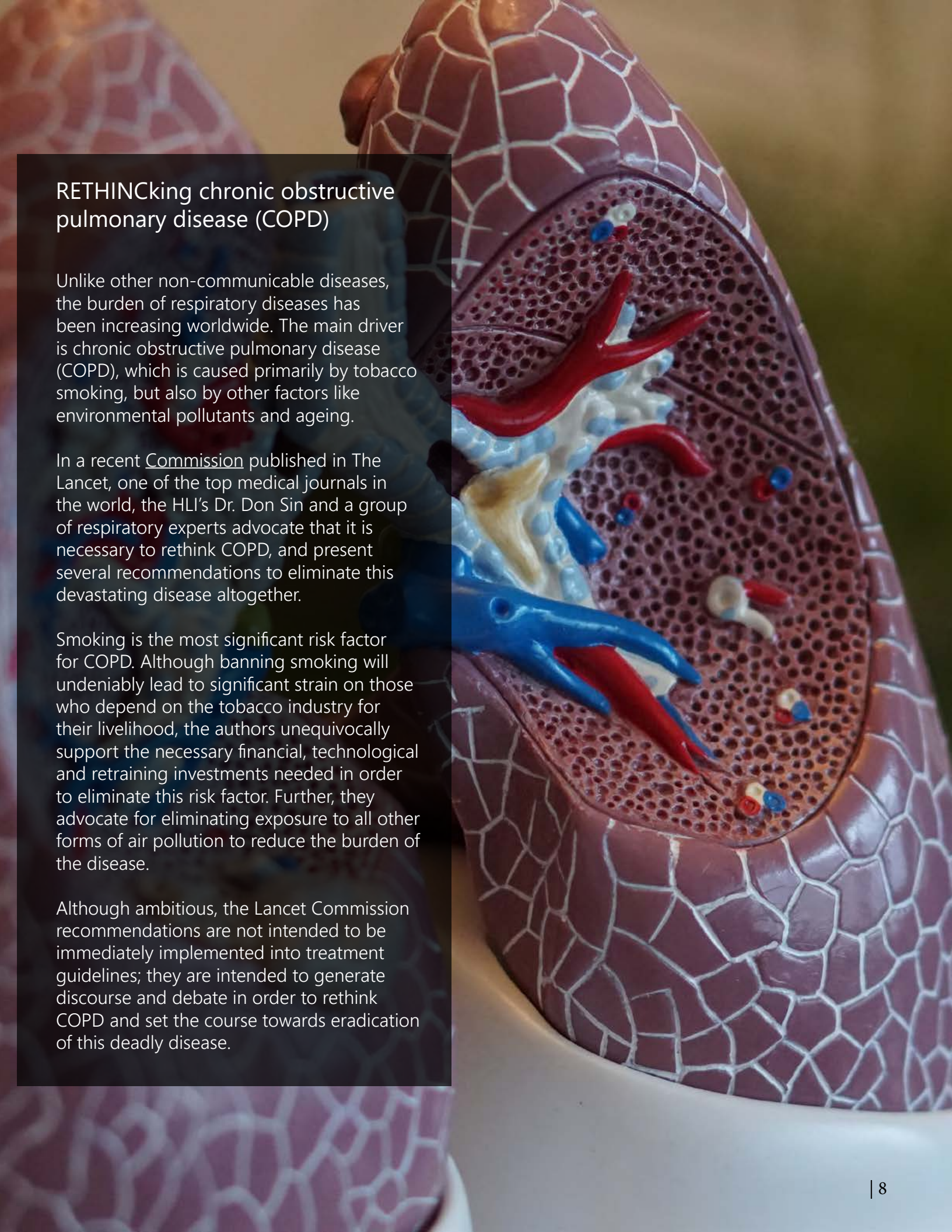


Worldwide Experience of Familial Hypercholesterolemia

Homozygous familial hypercholesterolemia (HoFH) is a rare inherited genetic disorder that results in extremely elevated low-density lipoprotein (LDL) cholesterol levels and premature atherosclerotic cardiovascular disease (ASCVD). Current guidance for its management and prognosis comes from small studies carried out in high-income countries, which limits the applicability of guidelines to a global population.

The HLI's Dr. Liam Brunham, together with the HoFH International Clinical Collaborators, collected data on patients with a clinical, genetic, or both, diagnosis of HoFH in a retrospective cohort study. Their objective was to assess the clinical and genetic characteristics, as well as the impact, of current practice on health outcomes of HoFH patients globally.

In total, 751 patients from 38 countries were included in the study. The findings indicated that patients around the world are diagnosed too late, undertreated, and at high risk for premature ASCVD. Significant disparities were found in treatment around the world, with different regimens, control of LDL cholesterol levels, and cardiovascular event-free survival. Countries with greater use of multi-lipid lowering therapies had lower LDL cholesterol levels and better outcomes. Published in Lancet, the study highlighted the need for a re-evaluation of global health policy to reduce inequalities and improve outcomes for all patients with HoFH.



RETHINCking chronic obstructive pulmonary disease (COPD)

Unlike other non-communicable diseases, the burden of respiratory diseases has been increasing worldwide. The main driver is chronic obstructive pulmonary disease (COPD), which is caused primarily by tobacco smoking, but also by other factors like environmental pollutants and ageing.

In a recent Commission published in The Lancet, one of the top medical journals in the world, the HLI's Dr. Don Sin and a group of respiratory experts advocate that it is necessary to rethink COPD, and present several recommendations to eliminate this devastating disease altogether.

Smoking is the most significant risk factor for COPD. Although banning smoking will undeniably lead to significant strain on those who depend on the tobacco industry for their livelihood, the authors unequivocally support the necessary financial, technological and retraining investments needed in order to eliminate this risk factor. Further, they advocate for eliminating exposure to all other forms of air pollution to reduce the burden of the disease.

Although ambitious, the Lancet Commission recommendations are not intended to be immediately implemented into treatment guidelines; they are intended to generate discourse and debate in order to rethink COPD and set the course towards eradication of this deadly disease.

Characterizing COVID-19 Associated Cardiac Injury

Though initially considered primarily a respiratory disease, as the pandemic has evolved, coronavirus disease 2019 (COVID-19) has been increasingly implicated in heart injury. Reports indicate cardiac damage in over 20% of patients, with evidence of direct viral injury, thromboembolism with ischemic complications (circulating clot that causes an obstruction in the blood vessels), and cytokine storm (excessive activation of the immune system). These patients are at significantly higher risk of dying from COVID-19, but it is not clear how infection leads to these injuries.

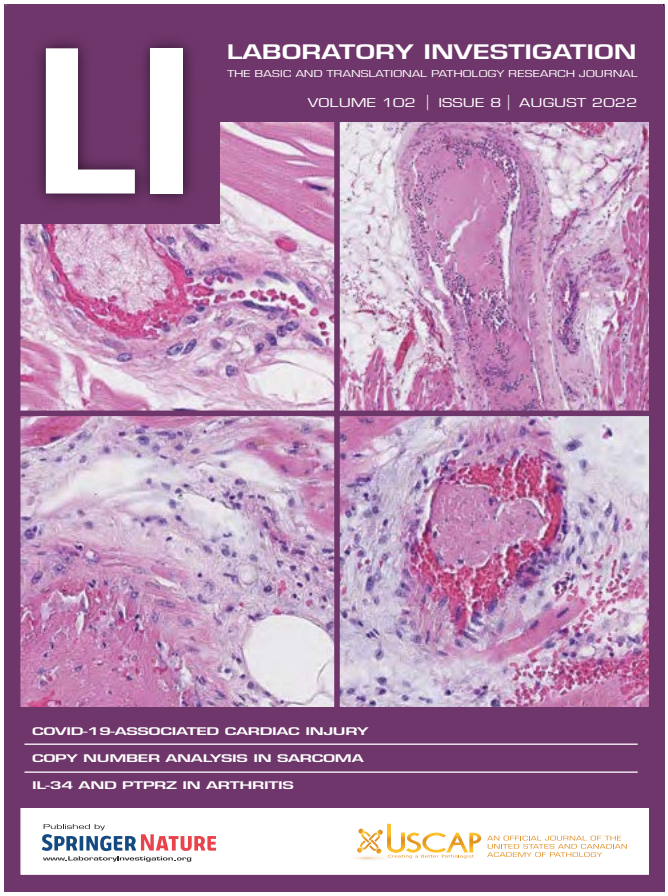
The Bruce McManus Cardiovascular Biobank (BMCB) team recently studied the explanted hearts of 21 COVID-19 positive decedents. Using a custom tissue microarray on regions of pathological interest and immunohistochemistry and *in situ* hybridization, they compared these hearts to clinically matched controls and patients with other causes of viral myocarditis.

The COVID-19 samples displayed signs of direct and indirect viral injury, demonstrating the multifactorial nature of COVID-19 injury.

Signs of direct injury included depleted troponin and increased cleaved caspase-3; these markers may be helpful in prognosing and diagnosing COVID-19 heart failure in the future.

Indirect mechanisms of injury, including clots in the arteries and veins, inflammation of the blood vessels, and enhanced blood vessel formation, were unique to the COVID-19 samples, and not observed in other virus-associated heart failure samples.

This work was highlighted in a feature publication in Laboratory Investigation, with the cover showing the characteristic histopathologic features of COVID-19-associated cardiac injury in critically ill patients.



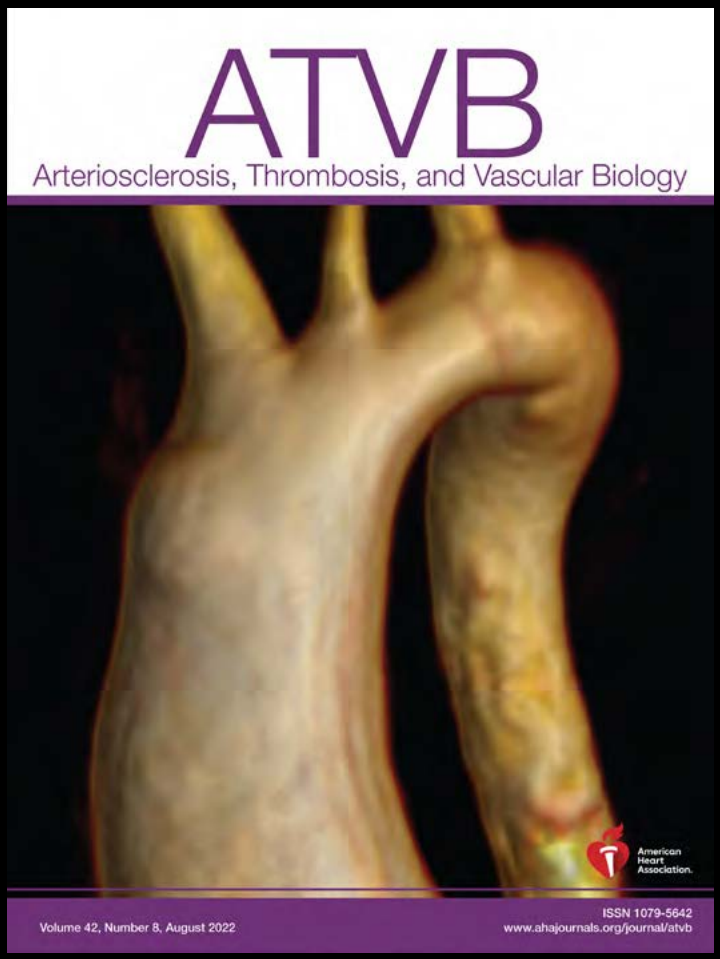
A Marker For High Risk Aneurysms

The aorta is the largest artery in the body and connects the heart to the vital organs. In 1 in 100 people, the closest part of the aorta to the heart widens, becoming an aneurysm.

In the majority of cases, an aneurysm of the aorta forms when it is weak. People with an aneurysm of the aorta are at risk of sudden tearing of the aorta (aortic dissection), which carries a high death rate. Most people with an aneurysm of the aorta receive regular scans to monitor the size of the aneurysm. Once the aneurysm reaches a certain size - often between 50 and 55 mm - guidelines recommend surgery to replace the diseased part. Sadly, this strategy misses 70% of patients who eventually experience tearing of the aorta.

Dr. Stephanie Sellers, a Principal Investigator at the HLI, Dr. Alex Fletcher and Prof. David Newby (University of Edinburgh) along with international team members from the University of British Columbia, University of Edinburgh and University of Liverpool, explored whether microscopic calcification, which is formed in areas of the body under stress, could be used as a marker for those with high-risk aneurysms. The team found that in mild aneurysm disease there is a rise in microscopic calcification, but in severe disease - when the aneurysm is very weak - this calcification is lost. The team also demonstrated that this microscopic process could be tracked using a special scan test called a PET scan using a special tracer called 18F-NaF.

This study was published in Atherosclerosis Thrombosis & Vascular Biology and featured as the journal cover.



"Our study is an important step towards identifying patients at the highest risk of aortic aneurysm disease. Using these PET scans, our hope is to find patients who can be treated with early, life-saving surgery."

– Dr. Stephanie Sellers

New Discoveries in ARBs CORONA Research Program

The HLI's Dr. Jim Russell leads the ARBs CORONA research program, a pan-Canadian randomized controlled trial investigating the effect of losartan, an angiotensin II type 1 receptor blocker (ARB) vs. usual care on outcomes and mortality in COVID-19. In 2022, the team made several exciting discoveries.

Novel biomarkers and therapeutic targets in acute COVID-19

The host response to COVID-19 over the first days of SARS-CoV-2 infection remains largely unclear. Using a comprehensive proteomics analysis, Dr. Russell and the ARBs CORONA team found unique patterns of proteins in acute COVID-19 that were different in males versus females, and in patients treated with ARBs versus not treated with ARBs. Further, the patterns of evolution of the proteins were distinct over 14 days of hospitalization. These unique proteins could be used in future diagnostic tests and/or as treatment targets in acute COVID-19.

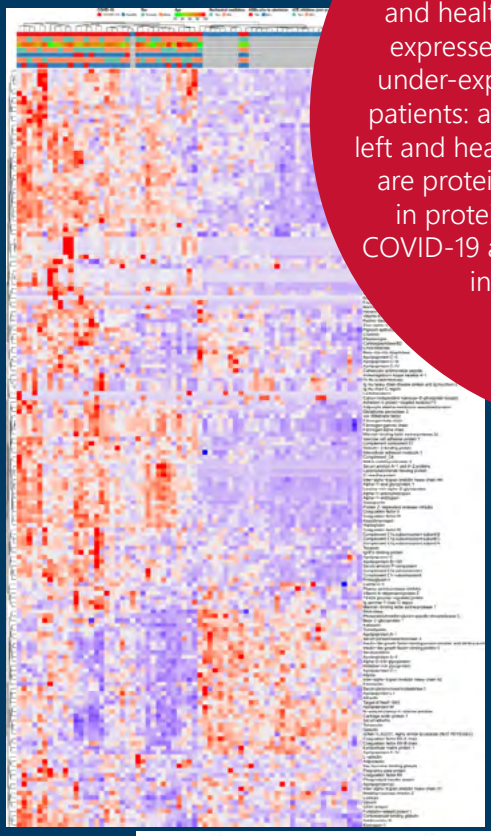


Fig 1. Heat map of proteomic levels in hospitalized acute COVID-19 patients and healthy controls. Red shows over-expressed proteins and purple shows under-expressed proteins. Columns are patients: acute COVID-19 patients on the left and healthy controls on the right. Rows are proteins. There are clear differences in protein expression between acute COVID-19 and healthy controls. Published in J Proteome Research.

Early increase in IgG antibody to COVID-19 associated with lower mortality and vital organ dysfunction in acute COVID-19

Although it was known that the antibody response to COVID-19 is important in protecting against bad outcomes, it was unclear whether specific (IgG, IgA and IgM) antibody levels against the COVID-19 virus are associated with mortality, use of ventilation, vasopressors (to raise blood pressure in COVID-19 patients with shock) and kidney support (an acute form of dialysis). Dr. Russell, Dr. Mari DeMarco (senior author) and colleagues showed that increases early in hospitalization in one specific type of antibody – IgG against the spike protein of the virus that causes COVID-19 – are associated with lower mortality and less use of ventilation and vasopressors.

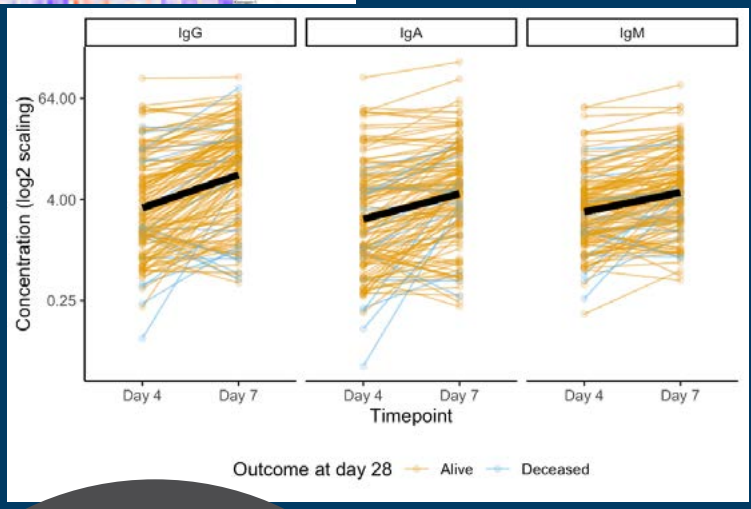


Fig 2. Plasma anti-SARS-CoV-2 RBD IgG, IgM and IgA on days 4 and 7 of patients (n=137) hospitalized for acute COVID-19. Line color denotes whether a patient was alive at day 28 (n = 120, yellow) or deceased (n = 17, blue), with the average trajectory noted as a thick black line. Published in Int Care Med.

How biobanks can advance atherosclerosis research

Heart attacks and strokes are leading causes of death around the world, and many are caused by atherosclerosis, or the buildup of plaque on the walls of blood vessels. The best way to fully understand how atherosclerosis develops and progresses is by studying plaques from human tissues. Biobanks, or tissue registries, are collections of human biospecimens from the people who consented to donate their excised tissues for research. For example, the Bruce McManus Cardiovascular Biobank (BMCB) at the HLI contains over 14,000 cases of specimens from hearts, blood vessels, and other cardiovascular tissues. These specimens were collected from autopsies and cardiac surgeries.

Recent advances in technologies like next-generation sequencing present new opportunities for more in-depth studies on the molecular features of atherosclerosis. In a review published in Frontiers in Cardiovascular Medicine, Maria Elishaev (first author) and Dr. Ying Wang (corresponding author) from the BMCB led a discussion on how to leverage biobank resources for translational research. From genetic studies supported by large biobanks to "Proof of Concept" studies that have changed the traditional view of atherosclerosis using only a dozen biobanked samples, the authors summarized a roadmap for both basic and clinical scientists to utilize biobank resources.

The authors also outline some major roadblocks for translating exciting bench discoveries to new biomarkers and therapies for atherosclerosis. These include the lack of bioinformatics or data analytic tools to interpret omics data, as well as the difficulty of making connections between features found in the plaque and blood-based biomarkers, which are more appropriate for clinical testing. To address these challenges, more collaborations between biobanks and researchers are needed to link complementary resources and datasets so that results from individual studies can be validated to benefit broader patient populations. Sample collection and storage protocols also need to be updated to ensure that sample quality is appropriate for new downstream technologies and applications. Overcoming these challenges will maximize the utilization of precious human biospecimens, and will reveal important biological information on the underlying mechanisms of atherosclerosis, leading to better therapies and improved outcomes for patients.

40 PRINCIPAL INVESTIGATORS

Michael Allard
Pascal Bernatchez
John Boyd
Liam Brunham
Pat Camp
Chris Carlsten
Denise Daley
Mari DeMarco
Del Dorscheid
Gordon Francis
David Granville
Jordan Guenette
Ilker Hacihaliloglu
Tillie Hackett
James Hogg
Graeme Koelwyn
Andrew Krahn
Zachary Laksman
Jonathon Leipsic
Janice Leung
Honglin Luo
Paul Man
Bruce McManus
Kelly McNagny
Peter Paré
Brad Quon
James Russell
Chris Ryerson
Andrew Sandford
Stephanie Sellers
Chun Seow
Don Sin
Amrit Singh
Wan-Cheng Tan
Scott Tebbutt
Andrew Thamboo
Stephan van Eeden
Keith Walley
Ying Wang
Decheng Yang

36 ASSOCIATE INVESTIGATORS

Jamil Bashir
Philipp Blanke
Sammy Chan
Karen Cheung
Ed Conway
Harvey Coxson
Raouf Dridi
James Dunne
Jeremy Hirota
Andrew Ignaszewski
Kevin Keen
Miranda Kirby
Ismail Laher
Scott Lear
Samuel Lichtenstein
John Mancini
Yannick Molgat-Seon
Ed Moore
Raymond Ng
Ma'en Obeidat
Emmanuel Osei
Simon Pimstone
Jonathan Rayment
Fabio Rossi
Mohsen Sadatsafavi
Janar Sathananthan
Robert Schellenberg
Michael Seidman
Bill Sheel
Peter Skaarsgard
Stacey Skoretz
Steven White
Pearce Wilcox
David Wood
Jian Ye
Xuekui Zhang

New Principal Investigator

Dr. Amrit Singh, PhD
UBC Department of Anesthesiology, Pharmacology and Therapeutics

Dr. Singh leads the computational biology lab (https://cbl-hli.med.ubc.ca/) which is focused on biomarker discovery and developing methods and tools for multiomics data integration and visualization. Dr. Singh's research focuses on the identification of biomarkers for heart and lung disease such as asthma and heart failure using high throughput biological ("omics") datasets. Dr. Singh developed DIABLO, an integrative multiomics classification method as part of the mixOmics data integration project (mixomics.org). Through active collaborations with clinicians and wet-bench scientists, Dr. Singh's research incorporates patient cohorts with model systems and with single cell and spatial technologies dissecting molecular mechanisms of disease. The eventual goal of Dr. Singh's collaborative work is drug repurposing.

Dr. Michael Allard, MD
UBC Department of Pathology and Laboratory Medicine

Dr. Allard's research program focuses on adaptation of the heart to physiological states, such as endurance exercise, and pathological processes, such as hypertension, that result in cardiac hypertrophy. He is particularly interested in how these conditions alter substrate use by the heart and how changes in substrate use influence heart function. A major recent focus of his research has been delineation of the cellular and molecular mechanisms that account for the alterations in substrate use by the hypertrophied heart.

Dr. Pascal Bernatchez, PhD
UBC Department of Anesthesiology, Pharmacology, and Therapeutics

Dr. Bernatchez's research program is aimed at the dynamic interplay between blood vessel homeostasis and chronic diseases, such as hypertension, atherosclerosis, rare muscular dystrophies and aortic aneurysm associated with Marfan syndrome, as well as exploring novel pharmacological approaches to treat and prevent endothelial dysfunction and its consequences. Dr. Bernatchez's most recent work focuses on the novel regulation mechanism of nitric oxide bioavailability and its role in vascular disease, and how plasma lipid levels influence the loss of muscle function in dystrophic patients.

Dr. John Boyd, MD
UBC Department of Medicine

Dr. Boyd's clinical research program is focused on defining and reversing the elements of the host response that causes sudden organ failure during severe infection. In collaboration with Dr. Robert Hancock, he recently identified a 31 gene endotoxin tolerance profile which predicts subsequent organ failure. Following the recent discovery of the role of the PCSK9 enzyme in the clearance of pathogenic bacterial and fungal lipids from the bloodstream, he collaborates with Drs. Keith Walley and James Russell to develop an anti-PCSK9 therapy as a novel treatment for sepsis.

Dr. Liam Brunham, MD, PhD
UBC Department of Medicine | CRC in Precision Cardiovascular Disease Prevention (Tier 2)

Dr. Brunham's research focuses on genetic susceptibility to cardiovascular and metabolic diseases. He is the PI of the BC Familial Hypercholesterolemia Registry, and together with Dr. Simon Pimstone, is the co-PI of the Study to Avoid cardioVascular Events in BC (SAVE BC). His laboratory uses genome-wide association studies and next-generation sequencing to investigate the role of genetic variation in these phenotypes. His laboratory also studies genetic susceptibility to adverse drug reactions, using patient-specific induced pluripotent stem cells as a model to understand variation in drug response. Recently, his laboratory has identified an important role for high density lipoprotein (HDL) cholesterol in protecting against the risk of infections and sepsis.

Dr. Pat Camp, PhD, PT
UBC Department of Physical Therapy

Dr. Camp's research focuses on improving the physical activity of individuals with chronic lung disease. Currently, she has three main pillars of research: 1) rehabilitation for hospitalized patients with an acute exacerbation of COPD; 2) Indigenous lung health, including epidemiological studies of COPD and developing an Indigenous pulmonary rehabilitation program; and 3) health service delivery and quality indicators for pulmonary rehabilitation programs in Canada. Her research utilizes methodologies based in implementation sciences, health services delivery, community-based research and knowledge translation. Ultimately, Dr. Camp's research will lead to improved quality of life and physical activity for individuals with chronic lung disease.

Dr. Christopher Carlsten, MD
UBC Department of Medicine | CRC in Occupational and Environmental Lung Disease (Tier 2)

Dr. Carlsten's clinical and research interests centre on occupational airways disease, including the effects of inhaled exposures on asthma induction and exacerbation. His laboratory investigates the pulmonary-immunological health effects of inhaled environmental and occupational exposures, using diesel exhaust, western red cedar, and phthalates as model inhalants. His research addresses the fundamental question of the synergism of inhaled particles and allergens in mediating health effects. Dr. Carlsten's lab uses an interdisciplinary, team-focused approach to ask related questions at the genetic, cellular, functional, and epidemiologic levels.

Dr. Denise Daley, PhD
UBC Department of Medicine

Dr. Daley is utilizing cutting-edge statistical, epigenetic, and bioinformatics techniques to obtain a better understanding of how inherited genetic variants and environmental exposures interact to modify the risk for developing disease. Her lab has recently completed several genome-wide association and sequencing studies to identify genetic susceptibility to common complex diseases such as asthma and COPD, and initiated new studies focused on the evaluation of the "epigenome", or the genome's response to environmental exposures. Dr. Daley's overall research goal is to better understand the etiology of disease and the modifiable environmental risk factors to identify individuals at greatest risk and develop biomarkers and public health interventions.

Dr. Mari DeMarco, PhD
UBC Department of Pathology and Laboratory Medicine | MSHR Scholar

With a strong interest in bridging protein biochemistry and laboratory medicine, Dr. DeMarco's research group focuses on building innovative biofluid tests for direct translation into patient care. A particular area of interest is advancing protein-based clinical diagnostics for dementias, such as Alzheimer's disease, frontotemporal dementia, and Lewy body dementia. The goal of this program of research is to ensure that these new biomarker tools make the challenging jump from research into healthcare. A key outcome of Dr. DeMarco's research (and role as a Clinical Chemist at St. Paul's Hospital) is the first-in-Canada biomarker testing program for Alzheimer's disease.

Dr. Delbert Dorscheid, MD, PhD
UBC Department of Medicine | MSHR Health Professional Investigator

Dr. Dorscheid leads an active research group investigating the role of the airway epithelium in the genesis of inflammatory airways diseases. The research program studies the role for inappropriate injury-repair cycles in the development of both chronic diseases such as asthma and acute illnesses like ALI/ARDS. Specific projects include the role of glucocorticoid-induced airway epithelial cell apoptosis, novel glycoproteins and the glycomics involved in the repair of an injured epithelium, and the expression of FasL as an immune barrier for the airway. Related to the ongoing pandemic, the Dorscheid research team is studying the role of Spike S1 protein in airway epithelial repair in partnership with Dr. Janice Leung.

Dr. Gordon Francis, MD
UBC Department of Medicine | MSHR Health Professional Investigator

Dr. Francis's research involves understanding the mechanisms of cholesterol accumulation in atherosclerosis, and how to remove this cholesterol to prevent coronary heart disease and stroke. For example, his lab recently demonstrated that smooth muscle cells, rather than monocyte-derived macrophages, are the primary site of cholesterol overaccumulation in human and mouse atherosclerotic plaque, which may lead to a major paradigm shift in the understanding of the pathogenesis and treatment of ischemic vascular disease.

Dr. David Granville, PhD
UBC Department of Pathology and Laboratory Medicine

Dr. Granville's research group focuses on vascular injury, inflammation and remodeling in the context of atherosclerosis, transplant vasculopathy, and ischemia and reperfusion injury. In recent years, Dr. Granville's group discovered a key pathogenic role for a family of serine proteases known as granzymes in autoimmune and/or age-related chronic diseases. Granzymes are a family of 5 serine proteases that play unique roles in tissue injury, inflammation, vascular permeability, loss of structural integrity and impaired remodeling. This has led to the filing of over two dozen patents, development of novel therapeutics, and the formation of a UBC spinoff company, viDA Therapeutics.

Dr. Jordan Guenette, PhD
UBC Department of Physical Therapy

The primary aim of Dr. Guenette's research program is to better understand the physiological mechanisms of dyspnea and exercise intolerance across the spectrum of health and chronic lung disease. His lab uses a number of novel measurement techniques to simultaneously assess the respiratory, cardiovascular, sensory, muscular and neurophysiological responses to exercise. His team conducts both mechanistic exercise physiology experiments and clinical trials in patients with interstitial lung disease (ILD), cystic fibrosis, and chronic obstructive pulmonary disease.

Dr. Ilker Hacihaliloglu, PhD
UBC Departments of Radiology and Medicine

Dr. Hacihaliloglu's research is aimed at developing innovative machine learning methods for processing medical imaging data. A core mission of his research is to drive innovation in artificial intelligence (AI) towards industrial and clinical services and products. With a long-standing track record of working collaboratively with clinicians, his research aims to diminish the gap between exploratory engineering research and clinical research and bring technologies from bench-to-bedside.

Dr. Tillie-Louise Hackett, PhD
UBC Department of Anesthesiology, Pharmacology, and Therapeutics | CRC in Asthma and COPD Pathobiology and Therapeutics (Tier 1)

Dr. Hackett 's research program is focused on understanding and treating airway remodeling in obstructive lung diseases, which daily affects the ability of over 4.5 million Canadians to breathe. Her lab uses ultra-resolution biomedical imaging and human in vitro models to investigate and identify new treatments for the pathobiology of asthma and chronic obstructive pulmonary disease (COPD). She has also served as the Director of the HLI, James Hogg Lung Biobank since 2014, which was established in 1977 and is one of the largest lung registries in the world.

Dr. James Hogg, MD, PhD (Emeritus)
UBC Department of Pathology and Laboratoy Medicine | Order of BC | Order of Canada

Dr. Hogg has been with UBC St. Paul's Hospital since 1977 and is currently an Emeritus Professor. He maintains an active research program focused on the inflammatory process in the lung with particular reference to the structure and function of the lungs in COPD. Recently he and his colleagues used microCT to show that terminal and respiratory bronchioles are sequentially destroyed in COPD. Dr. Hogg collaborated with Dr. Avrum Spira's group at Boston University to demonstrate a 127 gene expression signature for emphysematous destruction that showed this signature could be reversed toward control levels by the tripeptide GHK. He began to study the lung microbiome in COPD and is currently examining the host response to this microbiome in human lung.

Dr. Graeme Koelwyn, PhD
SFU Faculty of Health Sciences | CRC in Public Health 'Omics in Exercise and Disease (Tier 2) | Dr. James Hogg Research Chair in Public Health 'Omics in Exercise and Disease

The overarching goal of the Koelwyn lab is to apply a translational, 'omics-based approach for understanding how heart, lung and/or oncologic diseases communicate with each other through immune-specific mechanisms, leading to adverse systemic, tissue, and cellular responses. It also seeks to demonstrate how exercise – a low-cost public health strategy – can therapeutically improve immune function to protect from these diseases and their deleterious interactions.

Dr. Andrew Krahn, MD
UBC Department of Medicine | Sauder Family and HSF Chair

Dr. Krahn' research is funded by a CIHR Foundation grant through 2027, with >416 peer-reviewed publications. Current research interests include investigation of genetic causes of arrhythmias, causes of loss of consciousness, and implantable arrhythmia devices. He is the founder of the Hearts in Rhythm Organization (HiRO, www.heartsinrhythm.ca), a Canadian network of inherited arrhythmia clinics. HiRO aims to facilitate collaborative research and engage patients and families with inherited arrhythmias, as well as ensure high quality and standardized care across Canada. Dr. Krahn is also the President of the Canadian Cardiovascular Society and second Vice President of the Heart Rhythm Society.

Dr. Zachary Laksman, MD
UBC Department of Medicine | MSHR Health Professional Investigator

Dr. Laksman's research focus is on the genetic basis for diseases of the heart muscle, heart rhythm, and causes of sudden cardiac death. An element of Dr. Laksman's work involves using a stem cell model and growing heart cells in a dish. In doing so, Dr. Laksman's laboratory can model an individual patient's specific disease, apply therapeutic compounds to it, and study the cause of the disease and the effect of treatment.

Dr. Jonathon Leipsic, MD
UBC Department of Radiology | CRC in Advanced Cardiopulmonary Imaging (Tier 2)

Dr. Leipsic's research program is at the forefront of advanced imaging for structural heart disease and has helped guide the use of computed tomography in transcatheter aortic valve implantation procedures on a global scale. His team has published extensively in this realm as well as in coronary artery atherosclerosis, prognosis, and the interplay between ischemic heart and chronic obstructive pulmonary disease. He is extremely excited about the opportunity to continue to learn about how advanced imaging can help improve clinical practice at present, as well as allow for the potential for deeper understanding of the mechanisms and drivers of acute myocardial infarction, sudden cardiac death, and chronic pulmonary obstructive disease exacerbations.

Dr. Janice Leung, MD
UBC Department of Medicine | CRC in Translational Airway Biology (Tier 2) | MSHR Health Professional Investigator

Dr. Leung is studying the clinical outcomes, manifestations, and underlying mechanisms of HIV-associated chronic obstructive pulmonary disease. In particular, she is interested in the pathogenesis of accelerated aging in the lung and has detected signs of accelerated aging using the blood and airway epithelial cells from HIV-infected patients. Platforms for this research include next generation sequencing methylomics and transcriptomics as well as the microbiome.

Dr. Honglin Luo, MD
UBC Department of Pathology and Laboratory Medicine

Dr. Luo's research is focused on defining the molecular and pathogenic determinants of virus-host interactions in enterovirus-induced cardiac and neurodegenerative diseases. Ongoing projects include: 1) Understanding molecular mechanisms of impaired cardiac function in enteroviral myocarditis; (2) Determining the possible role of enteroviral infection in the development of amyotrophic lateral sclerosis; and (3) Developing coxsackievirus B3 (CVB3) as an oncolytic virus for lung cancer treatment. Using cell and mouse models, Dr. Luo's group found that CVB3 is an extremely potent anti-tumor virus. The present research aims to genetically engineer CVB3 to further enhance its safety and anti-tumor potency for the treatment of lung cancer.

Dr. S.F. Paul Man, MD (Emeritus)
UBC Department of Medicine

Dr. Man's research expertise is in clinical trials and translational research, particularly in chronic obstructive lung disease. The clinical outcomes in COPD are unexpectedly influenced by the premature development of atherosclerosis. In close collaboration with Dr. Don Sin, he has been trying to understand epidemiological observations in clinical context, and to design and execute clinical studies and trials to test specific hypotheses.

Dr. Bruce McManus, MD, PhD (Emeritus)
UBC Department of Pathology and Laboratory Medicine | Order of BC | Order of Canada

Professor McManus' research program probes mechanisms, consequences, detection and prevention of injury and aberrant repair in inflammatory diseases of the heart and blood vessels. Dr. McManus works on molecular biomarker signature development which is critically enabled by computational sciences. He continues to enable the heart pathology registry function and development. He has a major focus on the multi-institutional clinical validation of the HEARTBiT rejection exclusion biomarker assay. In 2019, Dr. McManus was appointed to the Order of British Columbia and received the Cy Frank Distinguished Service Award from FCIHR.

Dr. Kelly McNagny, PhD
UBC Department of Medical Genetics

Dr. Kelly McNagny is a Professor in the Department of Medical Genetics at the University of British Columbia (UBC). His research program is focused on hematopoietic stem cell biology, specifically in understanding the signaling networks that regulate stem cell differentiation and how these cells interact with their microenvironment. These processes have important implications in chronic allergy, asthma, and other inflammatory diseases. Dr. McNagny's research interests also include the innate immune response, kidney function, immuno- and cell-based therapies. He is a Michael Smith Foundation for Health Research Senior Scholar, a member of the Stem Cell Network of Canada, as well as the Associate Director of the AllerGen NCE network.

Dr. Peter Paré, MD (Emeritus)
UBC Department of Medicine

Dr. Paré is an Emeritus Professor of Respiratory Medicine and Pathology. Dr. Paré's research expertise is in the pathophysiology and genetics of asthma and COPD. Dr. Paré and colleague Dr. Chun Seow investigated the molecular and bio-mechanical events which relate broncho-constricting stimuli to the ultimate airway narrowing in asthma and other obstructive airway diseases. They examined isotonic and isometric length-tension properties, and the plastic behaviour of smooth muscle using physiologic, morphologic and biochemical approaches. With colleagues Drs. Don Sin and Ma'en Obeidat, he studied the genetic control of gene expression in the lung and blood of COPD patients.

Dr. Bradley Quon, MD
UBC Department of Medicine | MSHR Scholar | Gilead Sciences Research Scholar

Dr. Quon is a clinician-scientist with a primary focus in cystic fibrosis (CF). He is currently searching for novel biomarkers of inflammation and infection to improve disease monitoring in CF. He also has expertise in clinical epidemiology and is part of an international collaboration examining health outcomes for individuals with CF living in Canada and the United States using national registry data. He is also actively involved in several clinical trials investigating new therapies in CF, several of which have transformed patient care. He is also the Medical Director of the newly formed CF Canada Clinical Trial Network (CF CanACT).

Dr. James Russell, MD
UBC Department of Medicine

Dr. Russell has published over 285 articles and 45 book chapters; he serves on the editorial boards of 5 journals. He also wrote the septic shock chapter for the prestigious Goldman's Cecil Medicine. Dr. Russell has three major current themes of research: 1) randomized controlled trials in patients with septic shock, 2) genomics and pharmacogenomics of septic shock, and 3) defining the operating characteristics and predictive value of short-term versus long-term outcome measures in sepsis and their utility as primary endpoints in pivotal randomized controlled trials in sepsis and septic shock. Recently, Dr. Russell initiated a Canada wide clinical trial on the use of angiotensin II type 1 receptor blocker for COVID-19 treatment.

Dr. Christopher Ryerson, MD
UBC Department of Medicine | MSHR Health Professional Investigator

Dr. Ryerson specializes in interstitial lung disease (ILD), idiopathic pulmonary fibrosis (IPF), dyspnea, and pulmonary rehabilitation. His current research is focused on the diagnosis and prognostication of ILD, as well as how to best manage patients using non-pharmacological therapies. This area of research is particularly important given the lack of a cure from existing ILD pharmacotherapies. Dr. Ryerson also leads the Canadian Registry for Pulmonary Fibrosis, which is among the largest multicentre registries in the world, and has participated in numerous guideline documents on the diagnosis and management of ILD.

Dr. Andrew Sandford, PhD
UBC Department of Medicine

The focus of Dr. Sandford's research is the genetic basis of obstructive lung disease. His current work includes identification of genetic risk factors for the development of asthma and chronic obstructive pulmonary disease as well as genetic modifiers of disease severity in cystic fibrosis. He is also investigating the functional impact of genetic variants that have been associated with respiratory disease.

Dr. Stephanie Sellers, PhD
UBC Department of Medicine

Dr. Sellers directs translational and basic science research for the cardiovascular imaging group at HLI. Supported by CIHR trainee awards, she completed her Master's at the UNBC and her PhD at UBC. Her graduate work centered on the development of new models of cardiovascular disease and defined mechanisms of vascular remodeling and endothelial dysfunction. The author of >70 publications, she serves on the editorial boards of Cardiovascular Pathology and European Heart Journal Case Reports. Her current work is supported by CIHR, the British Heart Foundation, the Michael Smith Foundation for Health Research, and the Jon DeHaan Foundation and primarily focuses on determining the mechanisms of valvular heart disease and bioprosthetic heart valve degeneration as well as the development of new imaging techniques for cardiovascular disease using in-vivo and ex-vivo models.

Dr. Chun Seow, PhD
UBC Department of Pathology and Laboratory Medicine

Dr. Seow specializes in smooth and skeletal muscle cell physiology, biochemistry, and pharmacology. His current research focus is on the mechanical function, ultrastructure and biochemistry of airway and vascular smooth muscle in health and disease. He is also interested in the mechanical function and structure of isolated lungs from sheep and human donors. His other interests include skeletal muscle mechanics, ATPase cycle associated with the crossbridge cycle, energetics of muscle contraction, and mathematical modeling of muscle structure and function.

Dr. Don Sin, MD
UBC Department of Medicine | CRC in COPD (Tier 1) | De Lazzari Family Chair

Dr. Sin's research is geared towards biomarker discovery in COPD and related conditions such as lung cancer, ischemic heart disease and stroke. His group has shown that patients with COPD experience persistent low-grade systemic inflammation, which can be assessed by interrogating their peripheral circulation. By deploying this strategy, they found that certain pneumoproteins (proteins that are synthesized predominantly in lungs but secreted into the systemic circulation) are promising biomarkers of COPD clinical endpoints. Currently, Dr. Sin's team is using high throughput and high volume proteomics and genomics platforms to accelerate biomarker discovery in COPD.

Dr. Wan-Cheng Tan, MD
UBC Department of Medicine

Dr. Tan is a co-principal investigator of the Canadian Cohort of Obstructive Lung Disease (CanCOLD), a multi-centre cohort study conducted across Canada, dedicated to increasing the understanding of COPD and related co-morbidities, to improve its management and to reduce its burden. The objectives are to characterize the severity of COPD and patient response to disease (link of structural/physiological, clinical variables and health perception), while taking into account lifestyle risk factors (smoking and other modifiable risk factors), age and sex, and associated co-morbidities (cardiovascular diseases, osteoporosis, anxiety and depression).

Dr. Scott Tebbutt, PhD
UBC Department of Medicine

Dr. Tebbutt's research program is focused on systems biology and the use of multi-omics to unravel the molecular signatures of complex disease and other health-related conditions, including asthma, allergic rhinitis, heart failure, neonatal vaccinology, and the interaction between Aspergillus fumigatus and airway epithelial cells. His research combines hypothesis-driven studies of biological mechanisms with the development of advanced tools and technology (including bioinformatics and computational biology) to better facilitate basic and translational research. Dr. Tebbutt is also CEO of PROOF Centre, a not-for-profit organization dedicated to developing non-invasive biomarkers that can diagnose and/or predict organ failure (heart, lung and kidney).

Dr. Andrew Thamboo, MD
UBC Department of Surgery | MSHR Health Professional Investigator

Dr. Andrew Thamboo medically and surgically manages chronic sinusitis and sinonasal tumours at St. Paul's Sinus Centre and at Surrey Memorial Hospital. He also has a cross appointment with Vancouver General Hospital and Royal Columbian Hospital performing skull base procedures with the Neurosurgery team. He is the Research Director of the St. Paul's Sinus Centre. In collaboration with Respirologists, he has a lab associated with the Heart and Lung Institute. Dr. Thamboo has an interest in areas of unified airway hypothesis, upper airway physiology, office based rhinology and outcomes research.

Dr. Stephan van Eeden, MD, PhD
UBC Department of Medicine | CIHR/GSK Professor of COPD

The focus of Dr. van Eeden's research is on the mechanisms of lung inflammation caused by infection and inhalation exposures, particularly cigarette smoking and air pollution. His group demonstrated that following exposure to ambient air pollutants, pro-inflammatory mediators are generated in the lung and spill over in the blood stream, which are responsible for the downstream adverse cardiovascular health effects. These adverse effects are particularly important for subjects with underlying lung diseases such as COPD. He currently works on understanding the molecular mechanisms underlying these exacerbations and exploring novel methods for early identification and treatment of these exacerbations.

Dr. Keith Walley, MD
UBC Department of Medicine

The focus of Dr. Walley's research is to investigate: (1) the mechanism of decreased left ventricular contractility and other organ failure during sepsis, and (2) the impact of genotype on patient outcomes in sepsis and systemic inflammatory states. Dr. Walley translates basic discoveries into clinical practice in the ICU. Together with Drs. Russell and Boyd, he recently demonstrated that blocking the function of PCSK9, an enzyme that inhibits the clearance of endogenous cholesterol from blood, is associated with increased pathogen lipid clearance via the LDLR, a decreased inflammatory response, and improved septic shock outcome. This important discovery facilitated the emergence of anti-PCSK9 therapies as one of the most promising treatments for sepsis.

Dr. Ying Wang, PhD
UBC Department of Pathology and Laboratory Medicine | HSF New Investigator | MSHR Scholar

Dr. Wang's research is focused on studying cell-cell and cellmicroenvironment interactions to determine why diseased cells accumulate in atherosclerotic lesions and how we can remove them. 'Functional omics on a tissue slide' is the current theme of Dr. Wang's research. With a combination of biobank associated studies, spatial biology technology, and molecular biology, the Wang Lab aims to develop new therapeutic and diagnostic tools for better treatment and prediction of atherosclerotic disease.

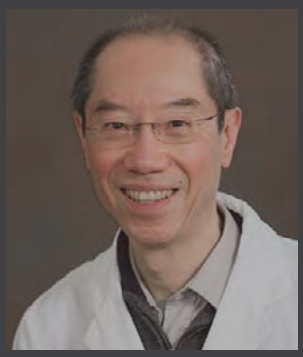
Dr. Decheng Yang, PhD
UBC Department of Pathology and Laboratory Medicine

Dr. Yang's research is focused on the pathogenesis of coxsackievirus B3 (CVB3)-induced myocarditis. Ongoing research projects include: 1) Molecular mechanisms of CVB3 replication, specifically focusing on the role of cellular 5'TOP, 2) The role of m6A methylation in viral replication efficiency and pathogenesis, and 3) Host response to viral infection. These studies are aimed at identifying the key genes involved in signal transduction pathways leading to cardiomyocyte injury/death or hypertrophy. The identified novel genes may serve as potential targets to design nucleic acid-based therapeutics (siRNA, artificial miRNA) for the treatment of the disease.

ASSOCIATE INVESTIGATORS

Dr. Jamil Bashir
Surgery, UBC

Dr. Philipp Blanke
Radiology, UBC

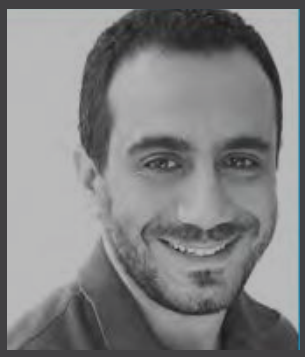


Dr. Sammy Chan
Medicine, UBC

Dr. Karen Cheung
Biomedical Engineering, UBC

Dr. Ed Conway
Medicine, UBC

Dr. Harvey Coxson
Boehringer Ingelheim



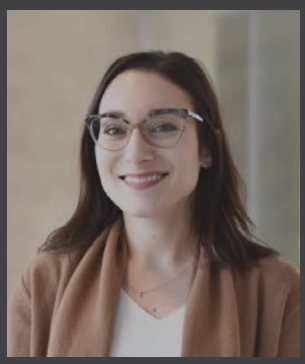
Dr. Raouf Dridi
Quantum Computing

Dr. James Dunne
Medicine, UBC

Dr. Jeremy Hirota
Medicine, McMaster

Dr. Andrew Ignaszewski
Medicine, UBC

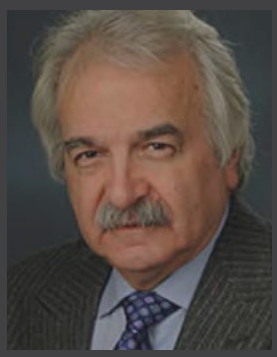
Dr. Kevin Keen
Mathematics, UNBC



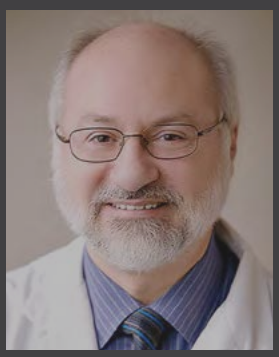
Dr. Miranda Kirby
Physics, Toronto Metropolitan University

Dr. Ismail Laher
Anesthesiology, UBC

Dr. Scott Lear
Health Sciences, SFU



Dr. Samuel Lichtenstein
Surgery, UBC



Dr. John Mancini
Medicine, UBC

Dr. Yannick Molgat-Seon
U. Winnipeg

Dr. Ed Moore
Physiology, UBC

Dr. Raymond Ng
Computer Science, UBC

Dr. Ma'en Obeidat
Novartis

Dr. Emmanuel Osei
Biology, UBC-O

Dr. Simon Pimstone
Medicine, UBC

Dr. Jonathan Rayment
Pediatrics, UBC

Dr. Fabio Rossi
Biomedical Engineering, UBC

Dr. Mohsen Sadatsafavi
Pharmaceutical Sciences, UBC

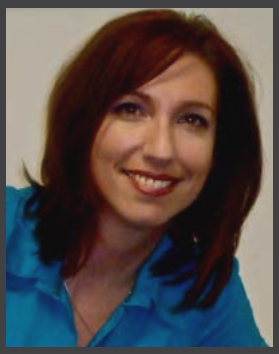
Dr. Janar Sathananthan
Medicine, UBC

Dr. Robert Schellenberg
Medicine, UBC

Dr. Michael Seidman
UHN

Dr. Bill Sheel
Kinesiology, UBC

Dr. Peter Skaarsgard
Surgery, UBC



Dr. Stacey Skoretz
Audiology, UBC

Dr. Steven White
Pathology, UBC

Dr. Pearce Wilcox
Medicine, UBC

Dr. David Wood
Medicine, UBC

Dr. Jian Ye
Surgery, UBC

Dr. Xuekui Zhang
Mathematics, UVic

PI GRANTS

Awarded in 2022

CIHR Project Grant

Dr. Gordon Francis
- The importance of smooth muscle foam cells in atherosclerosis development and treatment

Dr. David Granville (Priority Announcement and Award in Excellence in Aging)
- Novel mechanisms and therapeutic approach for aging-related pruritus

Dr. Janice Leung (Bridge Grant)
- Imaging, Molecular, and Clinical Biomarkers of Accelerated Lung Aging in People Living With Human Immunodeficiency Virus (AGEHIV)

Dr. Don Sin (Bridge Grant)
- Blood Epigenetic Age Biomarkers and Health Outcomes in COPD

Dr. Chun Seow
- Mechanisms underlying the bronchodilatory effect of deep inspiration in health and asthma: from airway smooth muscle to the whole lung

Dr. Ying Wang
- Targeting efferocytosis to reduce risk of cardiovascular events

NSERC Discovery Grant

Dr. Honglin Luo
- Autophagy mechanism of coronaviral infection: Lessons from enteroviruses

Canada Foundation for Innovation - JELF

Dr. Ilker Hacihaliloglu
- Infrastructure for AI-integrated Point of Care Ultrasound Imaging for Decentralized Healthcare

Dr. Ying Wang
- Spatial characterization of human atherosclerotic disease for therapeutic and biomarker development

New Frontiers in Research Fund

Dr. Ying Wang
- Beyond morphology: Convert disease-related gene networks to pixels in digital pathology to solve the puzzle of "vulnerable plaques" that lead to cardiovascular events

CIHR COVID Gaps & Priorities

Dr. Jim Russell
- COVID-19 And Severe Community-Acquired Pneumonia Dynamic Evaluation Study (CASCADES- ARBS CORONA III)

BC Lung Foundation Research Grant

Dr. Pat Camp (2021)
- Rehabilitation Service Capacity for COVID19 Survivors

Dr. Chris Ryerson (2021)
- Investigating differential gene expression profiles predictive of interstitial lung disease morphology, progressive phenotypes, and mortality

Dr. Scott Tebbutt (2021)
- Understanding molecular responses of bronchial epithelium to plicatic acid exposure

Drs. Alyson Wong and Chris Ryerson (2021)
- Connecting clinical research and economic evaluation by mapping lung function to EQ5D utility scores in patients with fibrotic interstitial lung disease

Dr. Jordan Guenette (2022)
- Physiological mechanisms of sex differences in exertional dyspnea and its response to therapy in patients with fibrotic interstitial lung disease

Dr. Honglin Luo (2022)
- Novel Oncolytic Virus for Lung Cancer Treatment

Dr. Amrit Singh (2022)
- Development of triple co-culture airway model systems for asthma pathogenesis and evaluation using single cell multiomics

Dr. Scott Tebbutt (2022)
- Circulating metabolites as non-invasive biomarkers of chronic lung allograft dysfunction in humans

Drs. Ana Hernandez Cordero & Janice Leung (2022)
- Airway Immunosenescence in HIV-associated Chronic Obstructive Pulmonary Disease

UBC Faculty of Medicine Distinguished Achievement Award: Excellence in Basic Science Research

Dr. Zachary Laksman

CIHR/CLA Respiratory Effects of Long COVID-19
Dr. Jordan Guenette
Cardiopulmonary exercise testing and functional imaging determinants of dyspnea post-COVID-19
Dr. Alyson Wong
Identifying long COVID phenotypes and their association with long-term quality of life

Michael Smith Health Research Scholar Award
Dr. Stephanie Sellers
Valvular Heart Disease and Bioprosthetic Heart Valves: Defining Mechanisms of Degeneration and Therapeutic Discovery from Bedside to Bench
Dr. Ying Wang
Targeting efferocytosis to reduce risk of cardiovascular events

Heart and Stroke New Investigator Award
Dr. Ying Wang
Targeting efferocytosis to reduce risk of cardiovascular events

VCHRI Innovation and Translational Research Award
Drs. John Boyd & Graeme Koelwyn
Aerobic exercise training as a therapeutic intervention to improve outcomes in sepsis survivors

Genome BC Data Access, Integration and Analysis Program
Drs. Chris Ryerson & Tillie Hackett
Understanding how an individual's genes and their environmental exposures lead to the development of interstitial lung disease
Drs. Liam Brunham & Simon Pimstone
Clinical Utility of Using Genomic Data to Assess Cardiovascular Risk and Guide Lipid-lowering Therapy in Patients with High Risk of Premature Cardiovascular Disease
Drs. Zachary Laksman & Jonathon Leipsic
Developing a blood test for risk of heart failure in HCM
Drs. Scott Tebbutt & Raymond Ng
Identifying molecular surrogates of optimal immunosuppression by leveraging short- and long-term outcomes in heart transplantation

Michael Smith Health Research - Reach
Dr. Liam Brunham
Familial Hypercholesterolemia Patient Engagement Forum: Family Care and Women's Health

Cystic Fibrosis Canada Grant
Robbie Award for Top Ranked Grant
Dr. Brad Quon
Inflammatory and Immune Biomarkers of Response to Elexacaftor/Tezacaftor/Ivacaftor in People with CF

UBC Faculty of Medicine Distinguished Achievement Award: Overall Excellence (Mid-Career)

Dr. Liam Brunham

Canadian Society of Clinical Chemists Award for Research Excellence

Michael S. Bereman Award for Innovative Clinical Proteomics

Dr. Mari DeMarco

National Institutes of Health
Dr. Tillie Hackett (subaward; UBC PI)
Exploring the biology of persistent type 2 airway niches in asthma
Dr. Scott Tebbutt (subaward; UBC PI)
Immune development in early life (IDEAL) shapes vaccines response, respiratory infectious disease and asthma

UBC Grants for Catalyzing Research Clusters
Dr. Pascal Bernatchez
AATHEN - The UBC Advanced Angiotensin Therapeutics Network

Leducq Foundation
Dr. Scott Tebbutt
Acute Rheumatic Fever Diagnosis Collaborative Network (ARC Network)

UBC Research Facility Support Grant
Dr. Ying Wang
Centre for Heart Lung Innovation Heart and Lung Tissue Biobanks

MITACS
Dr. Ilker Hacihaliloglu
Point of Care Ultrasound for Lung and Heart Disease Risk Assessment
Dr. Brad Quon (Trainee: Naomi Potter)
Model systems to Assess The in vitro efficacy of CFTR modulator tHerapies in Cystic Fibrosis (MATCH-CF)
Dr. Amrit Singh (Trainee: Maryam Ahmadzadeh)
Integrating digital pathology with electronic health records for predicting outcomes in heart transplantation
Integrating public and in-house multiomics data to identify drug repurposing candidates for scleroderma
Dr. Scott Tebbutt (Trainee: Jinelle Panton)
Natural products in bronchial asthma

UBC Martin M. Hoffman Award for Excellence in Research

Dr. Gordon Francis

In 2022,

HLI PIs published

345 Peer-reviewed journal articles, together receiving

1,247 Citations

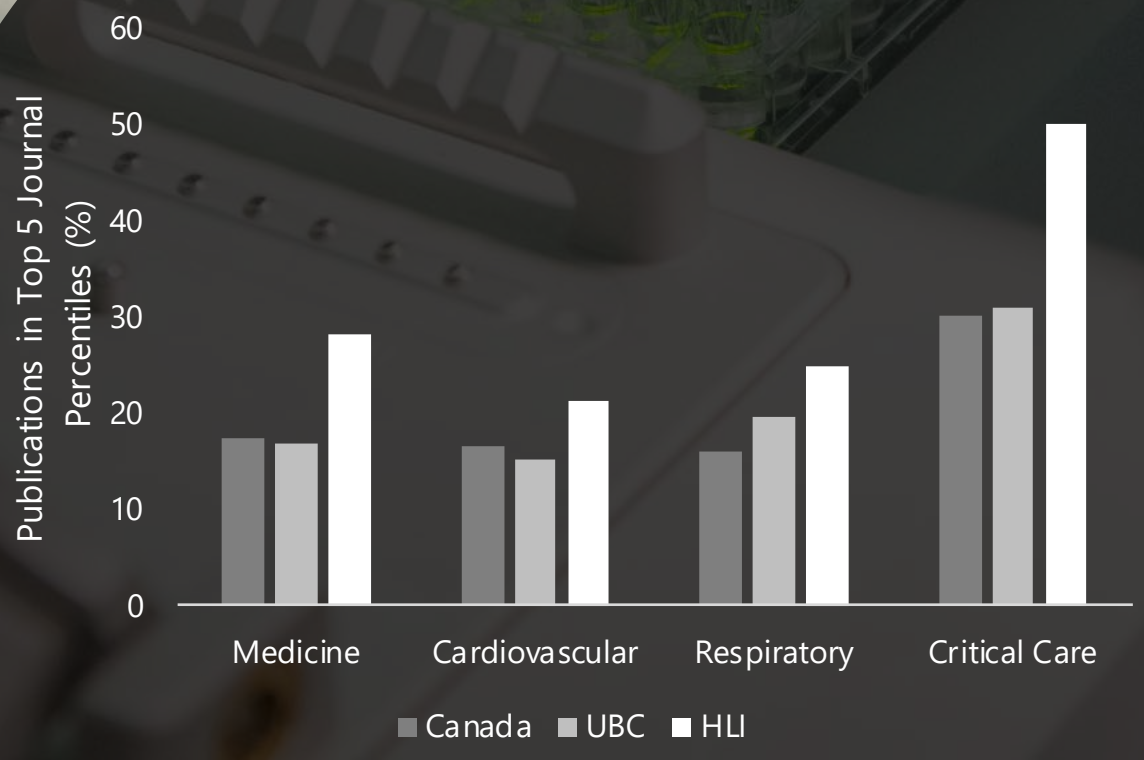
In 2022, HLI researchers published more frequently in top journals compared to UBC and Canadian researchers, and are cited

2.16 times more than the average paper in the field.*

*Data obtained from SciVal. Comparisons were made using Field Weighted Citation Impact. A full list of publications can be found in Appendix B.

High-impact publications in 2022

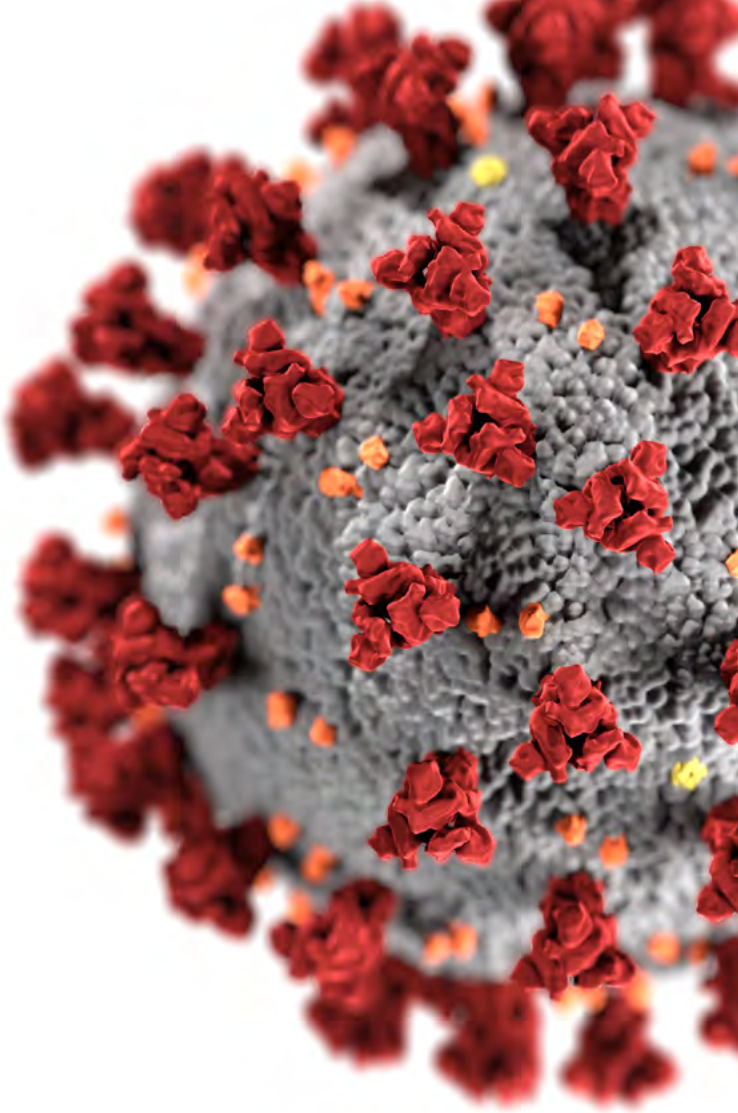
Lancet (IF: 202)
New England Journal of Medicine (IF: 176)
Lancet Respiratory Medicine (IF: 102)
JAMA Internal Medicine (IF: 44.4)
Circulation (IF: 39.9)
European Heart Journal (IF: 35.8)
European Respiratory Journal (IF: 33.8)
American Journal of Respiratory and Critical Care Medicine (IF:30.5)
JAMA Cardiology (IF: 30.2)



Knowledge Mobilization

HLI Researchers In The News

Long COVID may be an autoimmune disease



Six months after catching COVID, 80% of long COVID patients still had antibodies targeting their own cells and tissues, and 41% of long COVID patients still showed signs of autoimmune disease, a year after infection.

Autoimmune disease is when the body's own immune system attacks healthy parts of the body, instead of defending against invading viruses and other pathogens.

Co-led by Dr. Chris Carlsten, the team collected blood samples from 106 people who had been diagnosed with COVID-19 between August, 2020, and September, 2021. High concentrations of autoantibodies were detected up to 12 months after contracting COVID and were associated with persisting symptoms and residual inflammation. Patients also reported fatigue, coughing and shortness of breath at three, six and 12 months into the testing.

Although most patients would be free of these autoantibodies after 12 months, those with persistent autoantibodies were more likely to continue struggling with long COVID symptoms. The next step is to study how levels of autoantibodies change over a longer stretch of time. The researchers hope that their findings will provide clues about the nature of long COVID to improve diagnosis and treatment.

This study was published in the European Respiratory Journal and the team was interviewed in the Vancouver Sun.

"This research is suggesting that these autoantibodies are part of the pathology of what's known as post-COVID or long-COVID or post-acute COVID syndrome, the different names we use...we're trying to understand the different types of disease that all contribute to this symptom profile, these persistent symptoms after COVID."

-- Dr. Chris Carlsten

New Drug For Cystic Fibrosis Patients

Cystic fibrosis is an inherited disorder that damages the lungs, digestive tract and other organs. Trikafta is a new "breakthrough" drug that has been approved by Health Canada for patients who have a single copy of the F508del mutation. This represents 90% of the Canadian CF population. If started early enough, Trikafta can prevent irreversible damage to the lungs and pancreas.

Dr. Bradley Quon, a Principal Investigator at the HLI, is also the Medical Director of the Cystic Fibrosis Canada Accelerating Clinical Trials (CF CanACT) network. This network was created in 2018 to increase recruitment for CF clinical trials and ensure that patients are engaged in the research process. The network now represents more than 60% of the Canadian CF population, allowing more patients to have access to the trials; the trials at various study sites played a pivotal role in the Health Canada approval of Trikafta.

"At St. Paul's Hospital alone, we've been able to get 25 patients on the drug through these trials, which represents about 10% of our CF clinic. Most patients describe Trikafta as a miracle drug as it's the best they've felt in years, and many are now planning for the future. There's been a marked reduction in hospitalizations and lung transplants."

Learn more about a patient's experience with Trikafta in this article published in The Daily Scan.

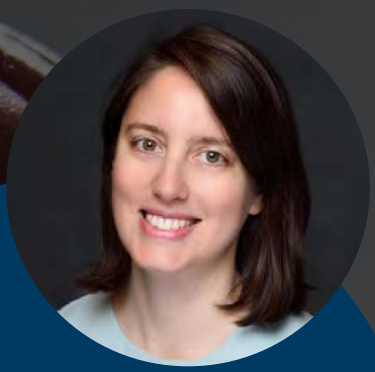
Pioneering Testing Program for Alzheimer's Disease

The HLI's Dr. Mari DeMarco talks with Gloria Macarenko on CBC's On the Coast

Over half a million Canadians are currently living with Alzheimer's or a related form of dementia, which are progressive, degenerative brain diseases that cause memory impairment and deterioration of thinking ability. With the rapidly aging population, this number is projected to double by 2031. Current diagnosis depends on physician evaluation of the signs and symptoms of neurodegeneration, coupled with traditional imaging; unfortunately, by the time most people are diagnosed, they often already have significant mental decline and cognitive impairment.

Dr. DeMarco and her team have developed a testing program that allows doctors to make an earlier diagnosis of Alzheimer's disease with greater confidence. This has been a pivotal step for people living with Alzheimer's disease or other dementias, their caregivers and families, who now have access to timely information to plan for the future.

On February 26, 2022, Dr. DeMarco spoke with CBC's Gloria Macarenko about the new testing program.



"The Alzheimer's disease biomarker test, which we have now made available to all Canadians, can help doctors accurately diagnose the disease even when only mild symptoms are present."

-- Dr. Mari DeMarco

In Alzheimer's disease, the proteins amyloid-beta and tau clump together in the brain to form amyloid plaques and tau tangles, respectively. These clumps cannot be detected using regular imaging techniques. The new test measures these same proteins in cerebrospinal fluid, where the amount of these proteins serves as a signal of the changes that occur in the brain if Alzheimer's disease is present. Performed early-on in the disease course, such testing can help predict whether mild symptoms are likely to progress to dementia.

With the goal of understanding the value of an earlier and accurate diagnosis of Alzheimer's disease, Dr. DeMarco and her team launched the IMPACT-AD study (www.impactAD.org). As part of this Canada-wide study, patients and their family members provided their perspectives on testing, and how the findings impacted their lives. The team also engaged doctors using this testing to assess the value of the test results in making medical decisions and improving patient care. With this input from patients, their families and their doctors, DeMarco and her colleagues are addressing barriers to uptake and use in the Canadian healthcare system.

"Our aim is to gain a better understanding of how this testing impacts personal and medical decision making, and health care costs. We want to inform positive change in the Canadian health care system and improve care and support for individuals living with Alzheimer's disease and their families," said Dr. DeMarco.

The perspectives from doctors, patients, and their families, gathered as part of the IMPACT-AD study, paved the way for the first national Alzheimer's disease testing program – a medical testing program based at St. Paul's Hospital in Vancouver and serving all of Canada.

Peripheral blood biomarkers at ICU admission predict COVID-19 clinical outcomes

Patient response to COVID-19 can range from asymptomatic or mild flu-like symptoms to severe symptoms, including acute respiratory distress syndrome (ARDS) and even death. Those patients who suffer from a severe response to the SARS-CoV-2 virus often end up in the hospital ICU. Yet, even into the third year of the pandemic, ICUs struggle to properly allocate resources to those patients in most need of extended management.

Now, HLI researcher Dr. Kelly McNagny and his team have identified blood prognostic biomarkers that, at time of ICU admission, can prospectively distinguish patients in two clinical outcome groups: those who will recover after short ICU stays (< 6 days) and those who will subsequently die or only recover after long ICU stays (≥6 days). These biomarkers have 91% sensitivity and 91% specificity (positive likelihood ratio 10.1).

Evaluating serum levels of four cytokines (IL-1β, IL-6, IL-10 and TNFα), as well as standard clinical and laboratory measurements, McNagny and colleagues, including the HLI's Dr. Don Sin, found that serum IL-10 and $CD11c^{low}$ classical monocytes were consistently elevated in those patients who either subsequently died, or required a long ICU stay.

These biomarkers offer an insight into the immune-mediated determinants of disease response in COVID-19. With further testing and refinement, they could serve to triage patients for timely and appropriate care, with the hope of improving outcomes for those patients in the high risk group. Finally, the biomarkers provide a roadmap for future studies aimed at guiding and monitoring response to therapy.

This work was published in Frontiers in Immunology and covered by News-Medical.net.

Familial Hypercholesterolemia Patient Engagement Forum

Familial hypercholesterolemia, or FH, is a common genetic disease that affects 1 in 300 around the world. If a parent has it, there is a 50% chance that it will get passed on to the child. Yet, 90% of people with FH are estimated to be undiagnosed.

To increase awareness of this condition, Dr. Liam Brunham, Medical Lead of the Healthy Heart Program Prevention Clinic at St. Paul's Hospital, and Principal Investigator at HLI, held a patient forum for people with FH and their relatives on September 24, 2022. This was the first public forum for FH at St. Paul's Hospital since the pandemic began.

Supported by a Michael Smith Health Research BC Reach Award, the focus of this forum was on Family Care and Women's Health. Women with FH face specific challenges, such as having to stop using cholesterol-lowering drugs while trying to conceive, during pregnancy, and while breastfeeding. This could potentially mean years without treatment, and cholesterol typically rises by around 30% during pregnancy.

This forum included talks from scientists, health care providers, trainees, and patient representatives, allowing people with FH to better understand their condition and empower them to take control of their health. The goal was also to create a community for patients with FH and their family members, contribute to their well-being, and promote peer support.

Read more about Dr. Brunham's research in FH in The Daily Scan.

HLI Researchers Awarded BC Knowledge Development Funds (BCKDF)

In 2022, the HLI's Drs. Tillie Hackett, Janice Leung, Ying Wang and Ilker Hacihaliloglu were among UBC researchers awarded BC Knowledge Development Fund (BCKDF) funding.

"As part of our StrongerBC Economic Plan and commitment to prepare people for the jobs of tomorrow, we are investing in research capabilities at B.C. post-secondary institutions to help solve some of our society's most pressing issues." -Brenda Bailey, Minister of Jobs, Economic Recovery and Innovation

Featured in BIV, or Business Intelligence for BC, Dr. Hacihaliloglu's project to build a new, artificial intelligence-guided point-of-care ultrasound imaging platform aims to detect disease at an earlier stage.

Spatial Single Cell Imaging in the Lung

Dr. Tillie Hackett

Optical Coherence Tomography to Phenotype Small Airways in Chronic Obstructive Pulmonary Disease

Dr. Janice Leung

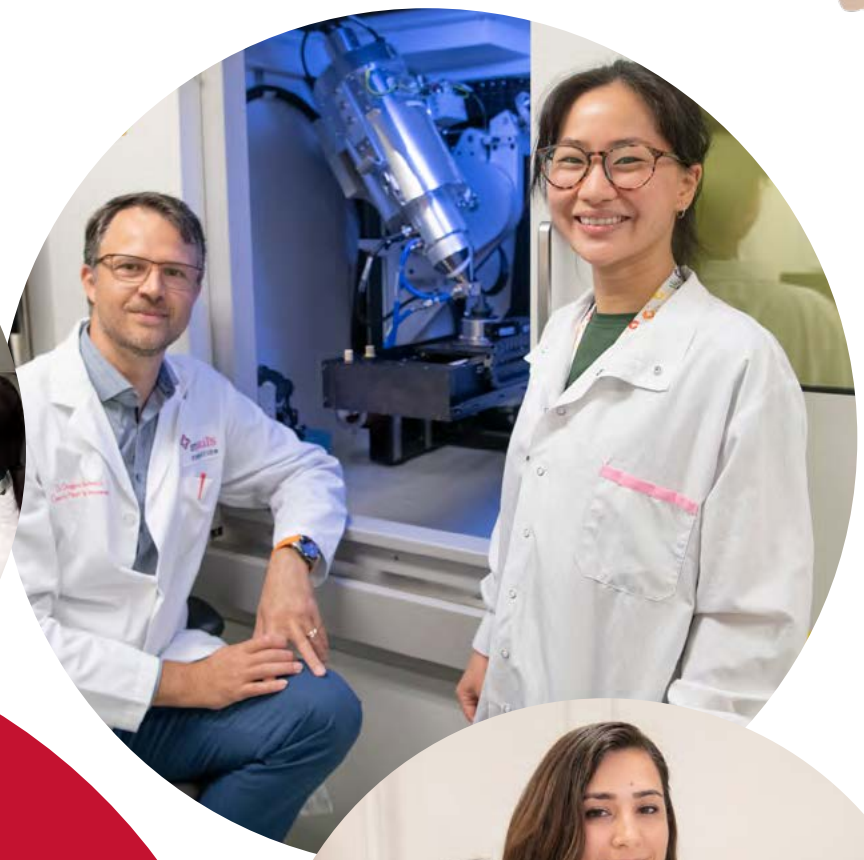
"The knowledge and the fundamental technologies that we will develop during the project period [will] allow Canadians to reach a better health, reduce health-care costs associated with quality management, as well as reduce the overcrowding of hospitals, which we have seen during the COVID 19 pandemic."

Spatial characterization of human atherosclerotic disease for therapeutic and biomarker development

Dr. Ying Wang

Infrastructure for AI-integrated Point of Care Ultrasound Imaging for Decentralized Healthcare

Dr. Ilker Hacihaliloglu



Education

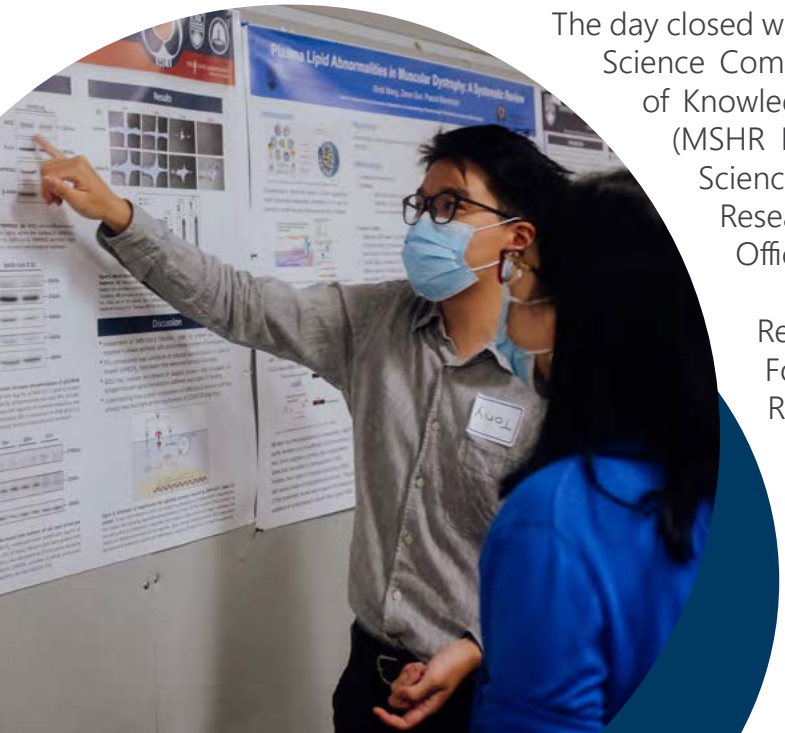
Training the next generation of scientists

Research Day 2022

At the annual Research Day, HLI graduate students, postdoctoral fellows and summer students showcase their research. Following two years of virtual Research Days and weeks, this year's Research Day was held fully in person in the St. Paul's Cullen Theatre on August 19th. Following opening remarks by HLI Associate Director Dr. Jordan Guenette, as well as an excellent keynote address by Dr. Timothy Caufield entitled "Battle Bunk: It Works! It's Needed!" trainees presented their own work. This year, 15 oral and 25 poster presentations were held, with trainees presenting their work to peers and a panel of judges comprised of senior researchers, Principal Investigators, postdoctoral fellows, and graduate students at the Centre.

Congratulations to the oral and poster presentation award winners!

Oral 1st place	$200	Michelle Fan (Luo)
Oral 2nd place	$150	Phoebe Lu (DeMarco)
Oral 3rd place	$100	Hattie Luo (Laksman)
Oral 4th place	$50	Meng Wang (DeMarco)
Oral Rising Star	$50	Keith Wu (Hackett)
Oral People's Choice	$50	Michelle Fan (Luo)
Poster 1st place	$200	Joshua Matsui (Sin)
Poster 2nd place	$150	Nicole Coxson (Hackett)
(tie)	$150	Tony Guo (Dorscheid)
Poster 3rd place	$100	Cara Kovacs (Sin)
(3-way tie)	$100	Jinelle Panton (Tebbutt)
	$100	Kauna Usman (Hackett)
Poster 4th place	$50	Morgan Flynn (Guenette)
Poster Rising Star	$50	Harjot Bhandol (Quon)
Poster People's Choice	$50	Estefanía Espín (Tebbutt)



The day closed with a panel discussion about Knowledge Translation and Science Communication. Panelists included Kevin Sauvé, Manager of Knowledge Translation at Michael Smith Health Research BC (MSHR BC); Dr. Tania Bubela, Dean of the Faculty of Health Sciences at SFU; Dr. Jillianne Code, Director of the ALIVE Research Lab at UBC; and Dr. Stirling Bryan, Chief Scientific Officer at MSHR BC.

Research Day was generously supported by the St. Paul's Foundation, Providence Research, Michael Smith Health Research BC, and the HLI.

Seminars

The Research in Progress Seminar Series and the HLI Friday Seminar Series both run from September through June each year. In 2022, all seminars were held in a hybrid format (in person and on Zoom).

The Friday Seminar Series features invited experts in specific fields from all over the world to give talks which encourage education and collaboration (Appendix C). The Research in Progress seminar series gives graduate students and postdoctoral fellows at the HLI the opportunity to present their ongoing research to other HLI researchers (Appendix D). The idea behind these seminars is for a critical, but supportive, audience to give feedback at the conceptual or analytic stage of the trainees' research programs.

James Hogg Awards ($500 each)
Yun Li (DeMarco)
Hattie Luo (Laksman)
Tony Guo (Dorscheid)
Aileen Hsieh (Hackett)

Peter Paré Awards ($1,000 each)
Naomi Potter (Quon)
Abhinav Kumar Checkervarty (Tebbutt)

Bruce McManus Awards

Yasir Mohamud (Luo)	$800
Eric Xiang (Francis)	$500
Kate Huang (Brunham/Laksman)	$800

Awards and Scholarships

In 2022, TAHLI established a Scholarship Committee, with the aim of renewing the internal HLI awards as well as providing trainees with the tools and resources to write successful award applications. This committee updated the application process and criteria for the James Hogg, Peter Paré and Bruce McManus Awards for trainees. These awards are designed for summer students, as well as any HLI trainee at the graduate or postdoctoral level, and fund activities that enhance trainee education. Each award is valued at up to $1,000.

In 2022, the TAHLI awarded Dr. Amrit Singh the Keith Walley Trainee Mentorship award, for his involvement in TAHLI, support of trainee activities, mentorship and enthusiasm.

Finally, the scholarship committee worked together with the HLI Grants Team to host two grant-writing "tips and tricks" workshops for HLI trainees in 2022. In July, the workshop's focus was general advice for how to write a successful grant application. This workshop was geared towards first-time applicants and the HLI internal James Hogg, Peter Paré and Bruce McManus awards. In November, the workshop provided advice for the Canada Graduate Scholarships - Master's Program applications.

HLI Trainee Association (TAHLI) Executive Team

Co-chairs: Katrina Besler and Naomi Potter
VP's of mentorship: Firoozeh Gerayeli and Eric Xiang
Internal communications: Sunaina Chopra and Rishika Daswani
Trainee wellness committee chair: Maria Elishaev
Biostatistics training committee chair: Dr. Linda Lapp
Research Day Chair: Nina Huang

Mentorship

In 2022, the TAHLI-organized mentorship program continued for its second year. At the kickoff event, 7 mentor-mentee pairs were created, matching junior and senior trainees. The program included events such as a career panel event with HLI alumni, various professional career development events, and social opportunities. Mentors and mentees met once a month at minimum and feedback on the program was collected at a mid-point check-in for mentees and after the program completed through focus groups for all participants. Once again, the program was a great success!

Social Events and Training

TAHLI organized numerous events in 2022, including a snowshoeing trip to Cypress, trivia night, a paint night, hiking trip to Whyte Lake, soccer game, a yoga class, regular trainee tea time, and a pizza social. At Christmas, a Holiday Social was organized with ornament painting, games, and snacks. A Trainee Wellness committee was created to help organize these events going forward.

In addition to social events, TAHLI organized numerous workshops on topics including R and bioinformatics, and established a Biostatistics Training Committee.

A Globe-Trotting PhD at the HLI

The HLI's Dr. Tillie Hackett and former PhD Dr. Emmanuel Osei (now Assistant Professor at UBCO) were part of UBC's joint PhD program – a program that gives candidates who would otherwise never have had the chance, an opportunity to become leaders in their fields.

The program is essentially a partnership arrangement between UBC and other universities around the world, designed to share doctoral candidates, and the costs, as candidates work towards earning their PhD. Following two years at the University of Groningen, the Netherlands, Dr. Osei moved to Vancouver to join Dr. Hackett's lab at the UBC Centre for Heart Lung Innovation to investigate factors that play a role in asthma.

Their story was highlighted by the UBC Vice-Provost International.

People applying for this opportunity are very motivated, highly qualified students. These people wouldn't have this opportunity otherwise to pursue what they love: research.

-- Dr. Tillie Hackett

TRAINEE SCHOLARSHIPS & AWARDS

Awarded in 2022

Amirhossein Bahreyni (Luo)
UBC FoM Laurel L. Watters Research Fellowship

Dr. Eric Deng (Brunham)
MSHR BC Research Trainee Award

Hacina Gill (Sellers)
CGS-M Award

Dr. Gillian Goobie (Hackett & Ryerson)
MSHR BC Research Trainee Award
Canadian Lung Association Breathing As One Award
Academic Enhancement Fund Transition to Faculty Award

Tony Guo (Dorscheid)
CAAIF Graduate Student Award
Best Poster Award, "Building the Future" Research Trainee Day, UBC FoM

Aileen Hsieh (Hackett)
CGS-M Award

Dr. Jordan Hamden (DeMarco)
MSHR BC Research Trainee Award

Daniel He (Tebbutt & Ryerson)
Canada Graduate Scholarships - Michael Smith Foreign Study Supplements

Cyril Helbing (DeMarco)
CCNA Best Abstract: Doctoral, MD/PhD, Diagnosis & Treatment

Kate Huang (Brunham & Laksman)
CGS-D Award
UBC 4-Year Fellowship
CCS Trainee Research Award - Basic Science
Canadian Heart Rhythm Society Travel Award

Hattie Luo (Laksman)
UBC FoM Graduate Award

Dr. Daniel Marinescu (Ryerson)
MSHR BC Research Trainee Award

Rylan McCallum (Brunham)
BC NEIR Master's Scholarship
CGS-M Award
UBC Aboriginal Graduate Fellowship

Khushbu Patel (DeMarco)
CCNA Best Abstract: Master's, Diagnosis & Treatment

Naomi Potter (Quon)
CGS-D Award
UBC Friedman Award for Scholars in Health

Dr. Stephen Milne (Sin)
MSHR BC Research Trainee Award

Dr. Yasir Mohammud (Luo)
MSHR BC Research Trainee Award

Justin Turner (Camp)
Canadian Respiratory Health Professional Research Poster Award
Indigenous Mentorship Network Program of the Pacific Northwest Travel Award

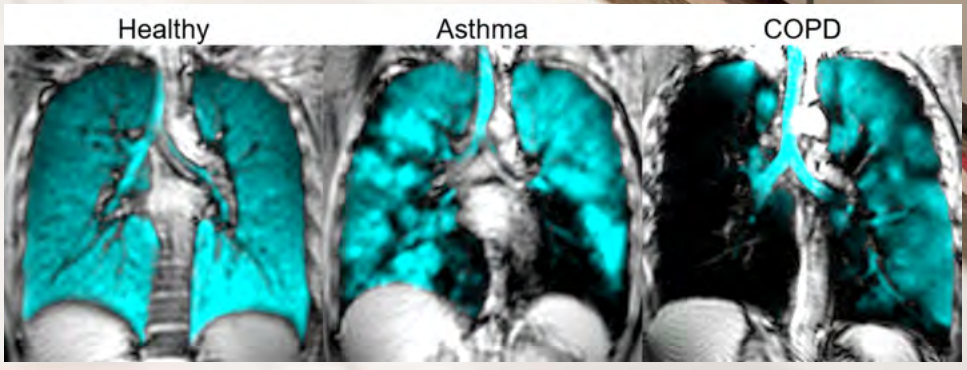
Operations

MRI Core: First Year's Progress

The MRI core has been operating since November 2021 and to date supports five clinical studies in research areas of long COVID, cannabis smoking, vaping, COPD and cystic fibrosis. Across these studies, over 180 participants have been enrolled and completed hyperpolarized xenon MRI to measure pulmonary ventilation, gas exchange, and/or lung microstructure. Example images of hyperpolarized xenon gas ventilation images in chronic lung disease and a healthy volunteer are shown below.

Preliminary results from some of these studies have been accepted for presentation at international conferences in 2023. Additional MRI hardware including multiple flexible vest radiofrequency coils of different sizes and a xenon imaging phantom have also been added to the core facility. This equipment will allow for better accommodation of patient size and corresponding image quality, and support effective imaging quality control, respectively.

HLI is one of ~25 centres worldwide with hyperpolarized xenon gas MRI capabilities, and cardiac MRI capabilities on the system are expanding. Research time on the MRI scanner remains available, and new studies with MRI endpoints are always welcome. HLI PIs have prioritized use of this research time for studies dedicated to heart and lung health and disease.



Molecular Phenotyping

For the Molecular Phenotyping Core lab (MPCL), 2022 was a busy year for training. We trained over 30 HLI trainees and staff on how to use various equipment located in the MPCL. This also included countless number of hours discussing and demonstrating best practice guidelines for sample preparation as well as helping troubleshoot problems with sample prep. We also provided our Flow Cytometry Basics workshops twice during the year. Both workshops were well attended by HLI trainees. These workshops provided a basic understanding of how a flow cytometer works, including what type of assays can be run on the instrument, the need for proper control samples and how to select proper antibodies, fluorophores and dyes.

MPCL staff also received new training, and have added two new techniques to our list of services. For Investigators wanting 10x Chromium Single Cell Multiome ATAC + Gene Expressions analysis, we are now able to perform their nuclei isolation protocol. This is needed to prepare the samples before running them on the instrument. This assay is used to perform transcriptomic and epigenomic analysis at the single cell level. Our second new technique is the measurement of telomere length. Telomeres are a part of the DNA that shorten progressively with age thus making them an indicator of chronological aging. This technique can be useful when looking at variations in aging and age-related disease.

In 2022 we also started providing support to The BC Centre on Substance Use (BCCSU) very long-standing biobank. The Vancouver Injection Drug Users Study (VIDUS) is a prospective cohort of people who inject drugs. This study began in 1996 and now includes the At-Risk Youth Study (ARYS) as well as The AIDS Care Cohort to Evaluate Exposure to Survival Services study (ACCESS). During the pandemic, collection of blood samples for these biobanks was put on hold until resuming in 2022. We welcome these studies to our growing long list of clinical biobanks we provide support for.

Bruce McManus Cardiovascular Biobank

In 2022, the Cardiovascular Registry (CVR) facilitated and promoted research collaborations, mentorship, and education. In September 2022, Dr. Ying Wang was appointed the new Director. Under Dr. Wang's guidance, the CVR recognized the exceptional vision of Dr. Bruce McManus, who established the registry in 1993. Since its inception, CVR has significantly contributed to advancing our understanding of the mechanisms underlying heart diseases. In recognition of Dr. McManus's pioneering contributions to cardiovascular research and his recent retirement, the CVR was officially renamed the Bruce McManus Cardiovascular Biobank (BMCB) on October 7, 2022. This new name symbolizes the biobank's evolution from a mere registry into a multifaceted resource that facilitates high-quality research in cardiovascular science.

The BMCB has taken a proactive approach toward meeting the needs of end users of the biobank, enabling the collection of an even greater range of surgically-excised cardiac tissues, including explanted hearts, native and artificial heart valves, ventricular assist devices, and more.

The BMCB's extensive tissue repository is the foundation for various research studies. In 2022, the BMCB published three peer-reviewed manuscripts. One of these studies, highlighting the BMCB's innovative work in COVID-19-related cardiac injury (see page 9 of this report), was featured on the cover of the August issue of Nature's Laboratory Investigation (see page 52).

The BMCB continues to make a conscious effort to enhance It's visibility among its partners. In November, the biobank hosted two tours, during which Providence Health Care's clinical operating room (OR) staff members were invited to visit the biobank facilities at the Centre for Heart Lung Innovation. The tours gave the OR team a glimpse of the BMCB's meticulous process of biobanking. The success of these tours is underscored by their role in fostering productive and transparent dialogues between the biobank and the OR team.

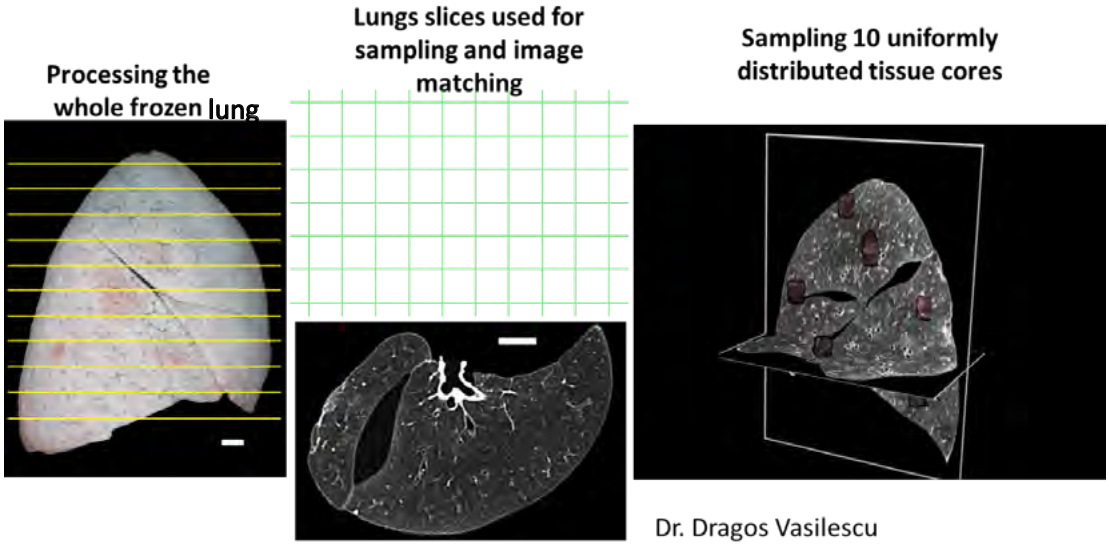
Additionally, the biobank held eight heart-viewing sessions as part of its community outreach engagement. These sessions allowed heart transplant recipients to visit the biobank and view their explanted hearts in a compassionate and private environment, bringing closure to patients and their families. With a productive year behind, the BMCB anticipates further collaborations, partnerships, and advancements in the upcoming years.

James Hogg Lung Biobank

2022 has been a busy year for the James Hogg Lung Biobank (JHLB) which continues its mission to support the advancement of respiratory research through the inventory of biospecimens and associated clinical data to enable researchers to understand both the pathology and molecular determinants of lung disease. Over the last year, 337 lung tissue specimens and associated clinical data were provided not only to researchers at HLI, but also to the University of Tasmania, the University of California at San Francisco, the University of North Carolina and Ikomed Technologies, resulting in six research publications.

Over the last year, the JHLB has been involved in several large collaborations to provide researchers with biospecimens to be used with current imaging and molecular technologies. In one study, the JHLB initiated a collaboration with Fraser Health – Surrey Memorial Hospital to obtain lung tissue from cancer resection patients to provide the opportunity for single-cell sequencing of lung tissues. In a second study, the JHLB has been very active in supporting the biotech company Ikomed with their preclinical models of COPD including tissue processing, imaging and histology. In a third study, the JHLB is working with the Université Laval and the University of Groningen, the Netherlands to perform one of the largest expression quantitative trait loci (eQTL) studies on the lung in the world.

As we move into 2023 and look forward to the New St. Paul's, the JHLB will continue to digitize clinical data. In 2022, we embarked on two large projects to enter all radiological data and environmental exposure questionnaires into our database to enable the use of this valuable data. This will allow for more precise phenotyping of patient samples for researcher requests.



Preclinical Services

The Preclinical Services Team working in the Genetically Engineered Models (GEM) Facility welcomed three new members in 2022 so training and teamwork were a large part of our focus during the year. We continue to contribute to facility design for the new St. Paul's Clinical Services Research Support building where our future Preclinical Services facility will be located.

The team made major contributions to a number of research projects on Sepsis, Amyotrophic Lateral Sclerosis (ALS) Disease, Marfan's Syndrome, Muscular Dystrophy, Oncology, Atherosclerosis and Myocarditis, while ensuring animal welfare was maintained at the highest standards and in compliance with the University of British Columbia's standards of animal care.

Facilities and Maintenance

The Maintenance Department continued to work closely with the CSRC Team as the project itself came to grips with a fundamental change to development/delivery of the overall project. We will be continuing to look at equipment and maintenance issues that may or will arise as the new building completion dates are extended.

The continued implementation of the Freezer Core and Leasing Program slowed throughout the year as challenges of implementing a new equipment monitoring system arose. IT personnel wisely chose not to continue to expand the current monitoring system but rather work through the issues of installing the new system. Once the issues have been resolved we look forward to the installation process and using the updated system for many years to come.

Cellular Imaging and Biophysics

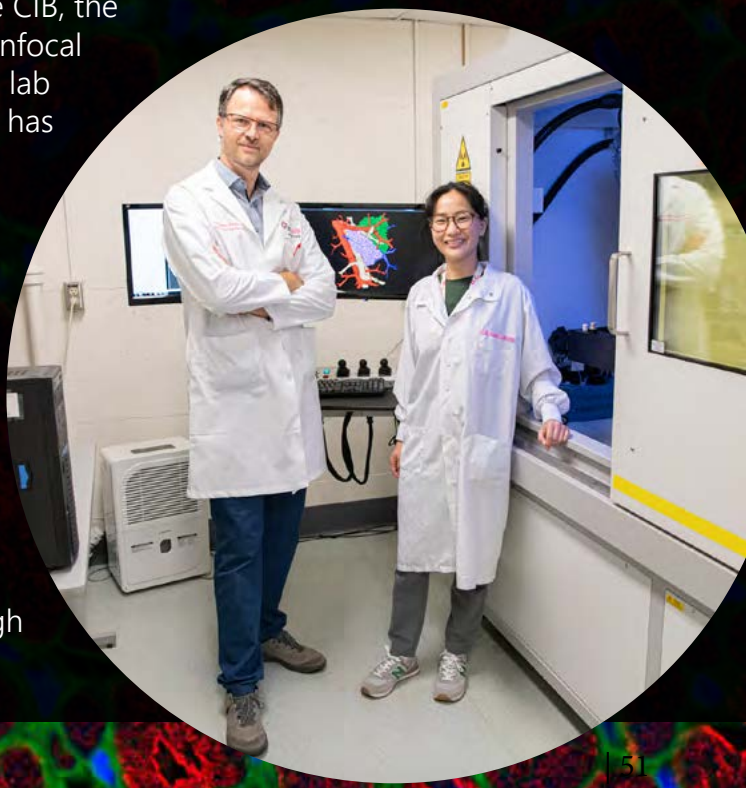
Under the scientific direction of Dr. Dragos Vasilescu and led by Core Manager Dr. Aaron Barlow, the Cellular Imaging and Biophysics Core (CIB) is a multi-user facility that supports research groups within the HLI, providing access to cutting-edge imaging technology and expertise. Featured instruments include the Zeiss LSM 880 confocal microscope with super-resolution and multiphoton capabilities, the Nikon XTH 225-ST high-resolution microCT scanner, and the EVOS 5000 fluorescence microscope. 2022 was a busy year for the CIB team, with numerous major projects underway.

After suffering from maintenance issues for much of 2021 and early 2022, the longstanding repairs on the MicroCT system were finally completed in March 2022, and since then the CIB team has been working diligently to complete several projects that had been delayed. Highlights include:

The microCT was used in two major projects that required scanning frozen or FFPE lung tissue samples. The Sin lab is spearheading a new unilateral emphysema pig lung model for which more than 300 lung tissue samples have been scanned. In addition, the Hackett lab has started investigating airway remodeling in asthma patients. For this project, approximately 250 FFPE lung tissue samples have already been scanned using a unique imaging protocol only possible with our current microCT scanner.

The CIB has continued ongoing collaborations with the cardiology groups of Dr. Stephanie Sellers and Dr. John Webb, completing a major study where microCT was used to assess the compatibility between various transcatheter heart valves from different manufacturers, and the potential difficulties in coronary access in misaligned valves. Detailed measurements using the microCT scanned valves showed that poorly aligned valves can severely impact coronary access, leading to potential complications for future interventions. This work was published in JACC: Cardiovascular Interventions. Other labs such as the Brunham lab have also started to use the microCT scanner to test imaging of acute inflammation in a mouse model.

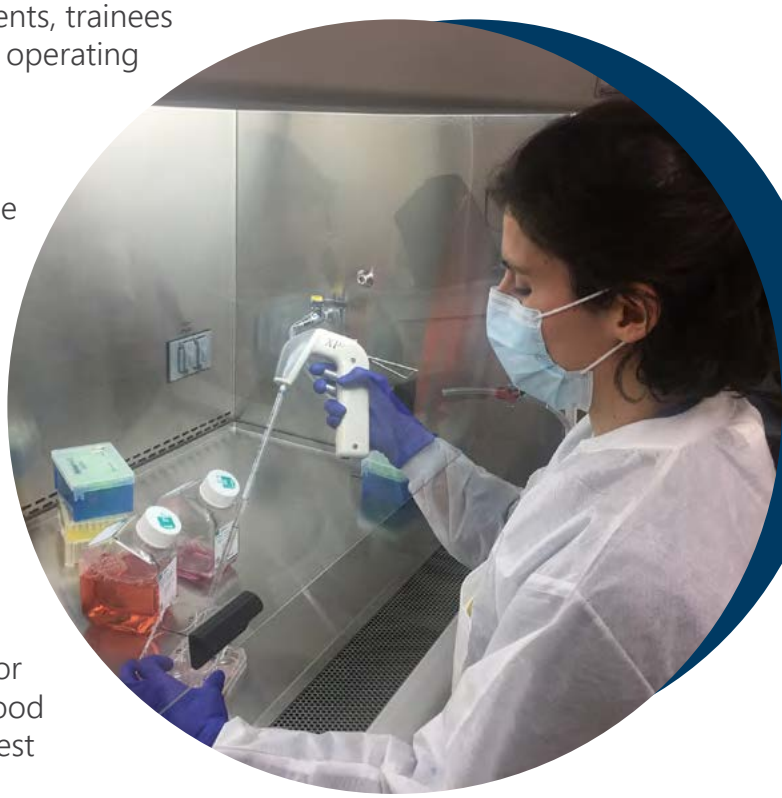
Besides the daily imaging done on the microscopes of the CIB, the core has provided essential imaging for multiple major confocal microscopy projects over the course of 2022. The Cheung lab has been developing a flow cell lab-on-a-chip design and has been using multiphoton microscopy and live cell imaging protocols from the CIB to assess the functionality of their device. The Laksman lab has been using confocal and super-resolution microscopy to image and quantify transcription factors in a novel model of mutated cardiomyocytes (background photo).



As a result of the high resolution and cutting-edge imaging performed at the CIB, the acquired images and data have been featured in a number of studies throughout the HLI, including research on COPD, IPF, transcatheter valve replacement, and atherosclerosis. In total, these have resulted in at least 15 publications through the 2022 calendar year.

Tissue Culture

The Tissue Culture (TC) core encompasses 8 tissue culture rooms (primary and secondary) and is vital to the Centre for Heart Lung Innovation's research activities. We are committed to providing excellent cell culture facilities to all of our users and ensuring a safe and sterile cell culture experience to support research outcomes and publications. In 2022, the TC core continued offering training (hybrid with in-person and Zoom options) to new students, trainees and staff. This training helped to maintain standardized operating conditions and to reduce any opportunity for incident/ accidents.



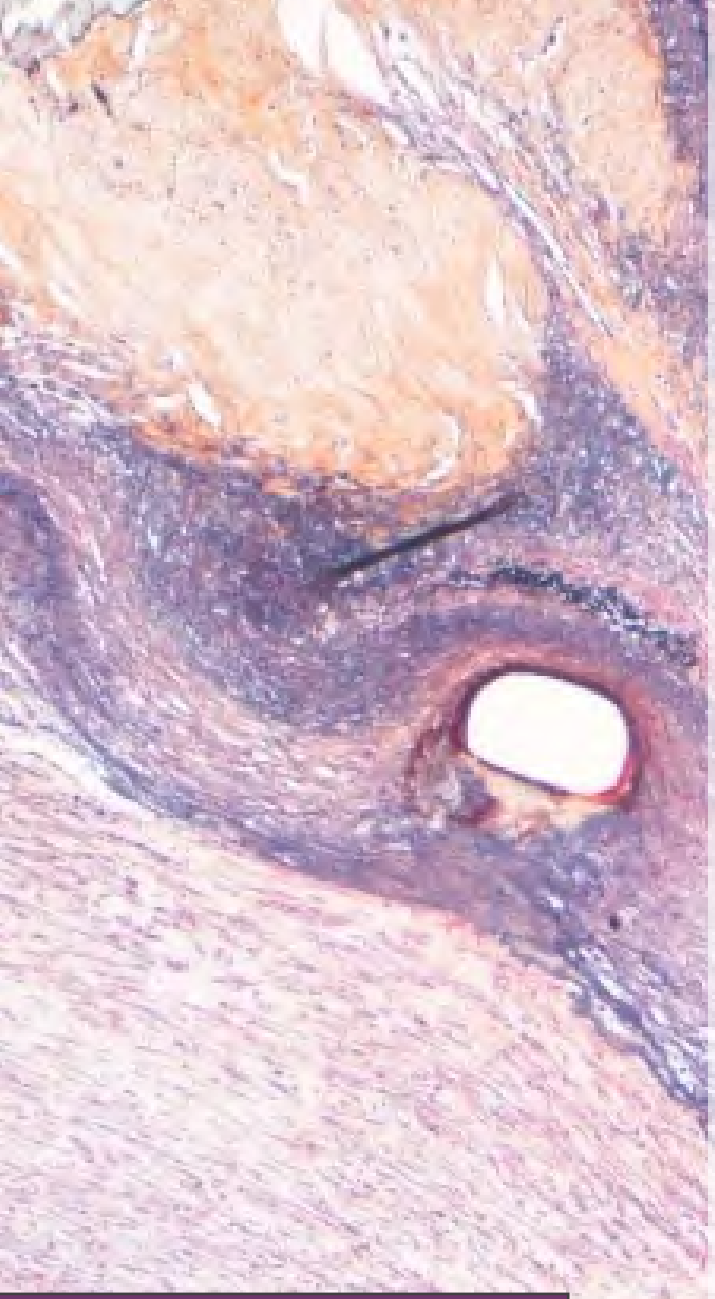
Patient-driven cell biobanking continued throughout the year. To expand our inventory of cryo-preserved cells and to plan for the future, a new cryo storage unit (with a capacity of ~5600 vials) was added to support PI-driven projects.

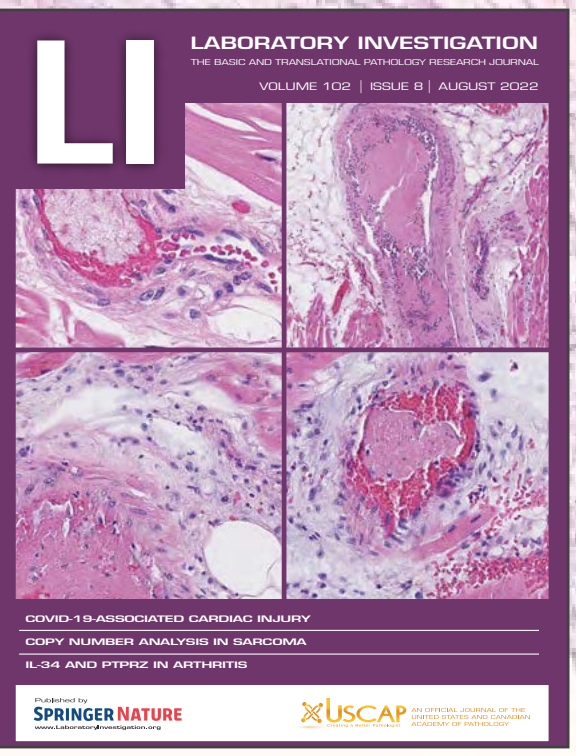
Our recently CFI purchased EVOS 5000 microscope with its trans-illumination and fluorescent image capabilities was one of the most frequently used pieces of equipment.

We continued to investigate best practices by inviting vendors to demonstrate the latest and best protocols for fast and cost-effective methods to isolate peripheral blood mononuclear cells (PBMC) and will incorporate these best practices in 2023.

In May, as part of our yearly maintenance, biosafety cabinets were certified by an accredited company under the supervision of our HLI facilities and maintenance team. In partnership with the HLI safety committee, the TC core created a series of 3 videos on how to safely handle liquid nitrogen. These videos are now part of our training program and are available to all HLI members on our intranet.

The TC core not only had a very productive year but was also within our allotted budget for the fiscal year. We look forward to increased collaborations and expanding training and support to our existing and new core users in 2023.





Histology

Over the last year, the Histology Core has been involved in several large collaborations to provide researchers with biospecimens that can be used with state-of-the-art imaging and molecular technologies. For example, the histology core has provided expertise on tissue microarrays and staining with metal conjugated antibodies to be used with the new Imaging Mass Spectrometry System at HLI/UBC that enables single cell imaging of tissues with over 35 antibodies at 1 µm resolution. This single cell technology is currently being used by Dr. Tillie Hackett and her lab to resolve the small airways in COPD, mucus plugs in asthma and fibrosis in IPF.

In addition, the core was involved in a study, led by Dr. Amrit Singh, to simultaneously apply single cell multiomics and spatial subcellular transcriptomics to the rat brain exposed to fentanyl. This study will provide valuable insights into the molecular mechanisms of opioid exposure on the circuitry of the brain.

Other projects supported by the core include two from Dr. Honglin Luo's lab. Postdoctoral fellow Yasir Mohamud's project involves investigating the role of innate immune pathways in viral myocarditis in order to identify novel inflammatory pathways that can serve as therapeutic targets to combat viral heart disease. To investigate the mechanism by which Coxsackievirus B3 (CVB3), a cardiotropic virus, infects and injures cardiac tissue, Dr. Mohamud is assessing samples from the Bruce McManus Cardiovascular Biobank as well as mouse tissue for key innate immune pathway activation.

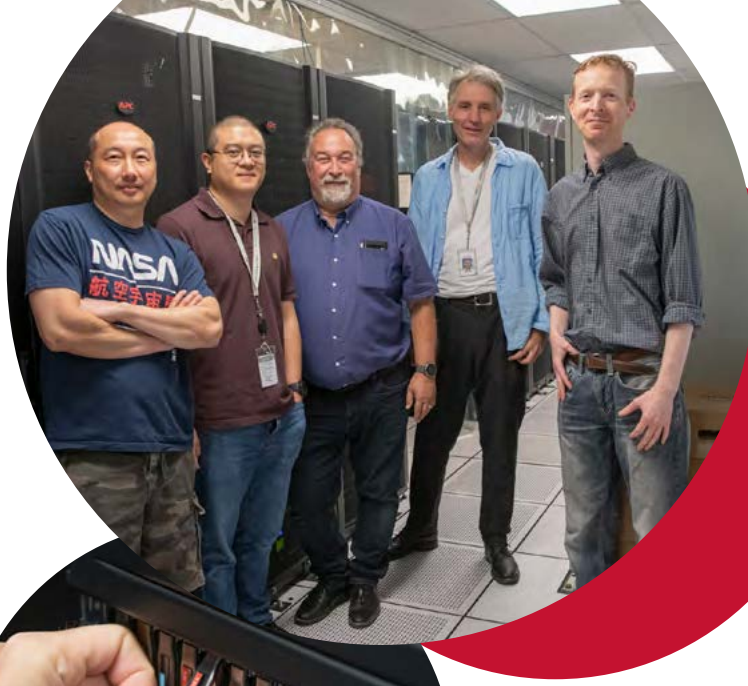
PhD student Amirhossein Bahreyni's project aims to genetically engineer the CVB3 genome in order to enhance the tumour-specificity of the CVB3 virus towards breast cancer and increase host anti-tumour immunity. Amirhossein is also evaluating the therapeutic efficacy and safety of engineered oncolytic CVB3 as a single treatment or in combination with other therapeutic drugs in an immunocompetent mouse model. Immune cell infiltration into the tumour microenvironment as response to different combination therapies will also be assessed.

The Histology Core was featured on the cover of *Laboratory Investigation* (left). The cover shows characteristic histopathologic features of COVID-19 associated cardiac injury in critically ill patients. Learn more about the story in our Research Highlights: Characterizing COVID-19 Associated Cardiac Injury.

Information Technology

2022 was a year that we saw a huge uptick in projects as people returned to work on site. As the world also returned to work, we were still faced with continued supply chain issues. It was also the time to start upgrading and replacing older systems, both hardware and software.

Focusing on the plans for the new St Paul's also took up much of our time as the delivery of IT resources will greatly change with the new hospital. A new staff member, Andy Chua, joined our team and is learning and adapting fast, giving us another pair of hands to help the staff and projects. We replaced a Secure File Transfer system (SFTP) with a new one capable of large transfers 5-10 TB or even larger and saw use right away. Storage continued to grow as more projects were added, which increases our backup requirement both locally and at our disaster recovery site.



Health and Safety

In 2022, as the Centre shifted to more hybrid and in-person events, the HLI Safety Committee worked hard on ensuring that health and safety protocols were integrated into all meetings, social events, and seminars. Ivan Leversage, the HLI Safety Coordinator, was also certified to conduct N95 mask testing on site, and the testing program may expand to include half-face and full-face respirators in the near future.

To enhance training for handling liquid nitrogen, the Safety Committee created three training videos, covering the safe handling, dispensing, and transportation of liquid nitrogen. These videos have been disseminated to UBC Safety and Risk Services and the Faculty of Medicine, and will be used for liquid nitrogen training for other departments.

Committee members continue to monitor sanitization stations and replenish when depleted. As the pandemic restrictions eased, more HLI personnel returned to the centre. As HLI is based in a hospital, many COVID-19 restrictions and regulations continue to be implemented. This includes room occupancy limits, mask wearing, and COVID-19 vaccination status declaration. A COVID-19 Safety Plan document and video was created by the Operations team and posted on the HLI intranet. Any individual who tests positive for COVID-19 is required to isolate and test negative before returning to work on-site.

PARTNERSHIPS AND ACKNOWLEDGEMENTS

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We wish to thank our current partners:

Adiga Life Sciences Inc.
Agartee Technology Inc.
AllerGen
Alpha-1 Foundation
Alzheimer Society of Canada
Amarin Pharma Inc.
AMGEN Canada Inc.
Asahi Kasei Pharma America
AstraZeneca Canada Inc.
Bayer AG
Boehringer Ingelheim (Canada) Ltd.
British Columbia Knowledge Development Fund (BCKDF)
British Columbia Lung Association
British Columbia Proteomics Network
Canada Foundation for Innovation
Canada Research Chairs
Canadian Diabetes Association
Canadian Foundation for AIDS Research
Canadian Institutes of Health Research (CIHR)
Cyon Therapeutics Inc.
Cystic Fibrosis Canada
Cystic Fibrosis Foundation (US)
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Genome British Columbia
Gilead Sciences Inc.
GlaxoSmithKline
Grifols Shared Services North America Inc.
Heart and Stroke Foundation of British Columbia and Yukon
Heart and Stroke Foundation of Canada
Hoffmann-La Roche Ltd. (Canada)
Networks of Centres of Excellence (NCE)
Industry Canada
Interior Health Authority
InterMune Inc.
Ionis Pharmaceuticals, Inc.
Janssen Inc.
Juvenile Diabetes Research Foundation International
La Jolla Pharmaceutical Company
Leading Biosciences Inc.
MedImmune LLC
Merck Sharp & Dohme Corp.
Michael Smith Health Research BC
National Institutes of Health
National Research Council
Natural Sciences and Engineering Research Council of Canada (NSERC)
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viDA Therapeutics Inc.

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SUPPORT US

Heart and lung diseases combined are still the world's number one cause of death and disability. Help us win this fight.

The Centre for Heart Lung Innovation has been extremely successful at attracting infrastructure grants and government research dollars. However, attracting funds to allow us to retain our expertly trained staff and purchase new equipment remains a challenge. We actively seek interest and donations from private and individual donors whose interests are in alignment with our research, with the help of the following organizations.

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Appendix A

Grants, Contracts, Clinical Trials, Agreements, and Salary Awards

April 2022 - March 2023

Bernatchez, Pascal

- Optimization of angiotensin II receptor type 1 blockers (ARBs) in chronic obstructive pulmonary disease (COPD). MITACS. Grant, $13,333.33.
- Reverse engineering the SARS-CoV2 virus variants for the rational design of anti-COVID therapeutics. MITACS. Grant, $50,000.
- AATHEN - The UBC Advanced Angiotensin Therapeutics Network. UBC VP Research & Innovation. Grant, $100,000.
- Infrastructure Operating Fund. Canada Foundation for Innovation. Grant, $5,112. Funding held at the Department of Anesthesiology, Pharmacology and Therapeutics.
- Targeting endothelial dysfunction in a genetic mouse model of aortic aneurysm: Implications for prevention and therapy. National Institutes of Health. Contract, $4,568.58. Funding held at the Department of Anesthesiology, Pharmacology and Therapeutics.
- Lipids in dysferlinopathies - more therapeutic options, better models. Jain Foundation. Contract, $109,290. Funding held at the Department of Anesthesiology, Pharmacology and Therapeutics.

Boyd, John

- A randomized, double-blind, placebo-controlled, study evaluating the efficacy and safety of otilimab IV in patients with severe pulmonary COVID-19 related disease.. GlaxoSmithKline (Canada). Clinical Trial, $25,000.
- A randomized, double-blind, placebo-controlled, two-arm parallel-group, multi-center Phase 3 pivotal trial to investigate the efficacy and safety of recombinant human alkaline phosphatase for treatment of patients with sepsis-associated acu. AM-Pharma BV. Clinical Trial, $13,220.80.
- A Randomized, Double-Blind, Placebo-Controlled, Phase III Study to Evaluate the Safety and Efficacy of Aerosolized Novaferon + SOC vs. Placebo + SOC in Hospitalized Adult Patients with Moderate to Severe COVID-19. Genova Biotech. Clinical Trial, $13,155.
- Aerobic exercise training as a therapeutic intervention to improve outcomes in sepsis survivors. Vancouver Coastal Health Research Institute (VCHRI). Grant, $37,500.

Brunham, Liam

- Infrastructure Operating Fund. Canada Foundation for Innovation. Grant, $20,110.
- An open label, active comparator extension trial to assess the effect of long term dosing of inclisiran and evolocumab given as subcutaneous injections in subjects with high cardiovascular risk and elevated LDL-C (ORION-3). The Medicines Co. Clinical Trial, $4,470.
- Improving the identification and treatment of young adults with heart disease: the Study to avoid vascular events in British Columbia. Canadian Institutes of Health Research. Grant, $130,815.
- CETP inhibition as a novel treatment to remove pathogen lipids and improve survival in sepsis. Canadian Institutes of Health Research. Grant, $122,400.
- The Advancing Cardiac Care Unit-based Rapid Assessment and Treatment of hypErcholesterolemia (ACCURATE) study. Genome British Columbia. Clinical Trial, $104,320.
- A long-term extension trial of the phase III lipid-lowering trials to assess the effect of long term-dosing of inclisiran given as subcutaneous injections in subjects with high cardiovascular risk and elevated LDL-C. Novartis Pharmaceuticals Canada Inc. Clinical Trial, $6,600.
- A randomized double-blind, placebo-controlled, multicenter trial assessing the impact of lipoprotein (a) lowering with TQJ230 on major cardiovascular events in patients with established cardiovascular disease (CVD) (HORIZON Phase III). Novartis Pharmaceuticals Canada Inc. Clinical Trial, $58,522.
- CEPHEUS - Achievement of Lipid Targets in Patients with Premature Atherosclerotic Cardiovascular Disease in Canada. Novartis Pharmaceuticals Canada Inc. Contract, $96,000.

- A randomized double-blind, placebo controlled, multicenter trial, assessing the impact of inclisiran on major adverse cardiovascular events in participants with established cardiovascular disease (VICTORION-2 PREVENT). Novartis Pharmaceuticals Canada Inc. Clinical Trial, $5,874.
- Randomized, Double-Blind, Placebo-Controlled, Phase 3 Study to Evaluatethe Long-Term Efficacy and Safety of LIB003 in Heterozygous FamilialHypercholesterolemia Patients on Stable Lipid-Lowering Therapy Requiring Additional Low-Density Lipoprotein. LIB Therapeutics. Clinical Trial, $4,877.75.
- Cholesteryl ester transfer protein-mediated regulation of HDL cholesterol levels and clinical outcomes in sepsis. Michael Smith Health Research BC. Grant, $26,250.
- Investigating atrial fibrilation caused by titin variants using patient induced pluripotent stem cell-derived atrial cells. Canadian Institutes of Health Research. Grant, $35,000.
- A Multicenter, Cross-sectional Study to Characterize the Distribution of Lipoprotein(a) Levels Among Patients With Documented History of Atherosclerotic Cardiovascular Disease (ASCVD). AMGEN Canada. Clinical Trial, $20,457.3.
- Familial hypercholesterolemia patient engagement forum: Family care and women's health. Michael Smith Health Research BC. Grant, $13,110.
- Cardiovascular genetics: phenotypes, genotypes and cellular mechanisms. Michael Smith Health Research BC. Salary, $3,750. Funding held at the Department of Medicine.
- Tier II Chair in Precision Cardiovascular Disease Prevention. Canada Research Chairs. Salary, $120,000. Funding held at the Department of Medicine.

Camp, Pat
- Niwh Yizt iyh Hilht iz Nets eelh iyh Strengthening our Bodies: A Community-based Research Project to Create Pulmonary Tele-Rehabilitation in Remote and Rural First Nations Communities in Northern British Columbia. Canadian Institutes of Health Research. Grant, $160,650.
- Bayis ll Tus a strong breath: a community-based research to identify the prevalence of and contributors to chronic obstructive pulmonary disease in remote and rural First Nations communities in British Columbia. Canadian Institutes of Health Research. Grant, $158,355.
- Wildfire smoke and emergency planning for First Nations people living with lung disease in remote and rural British Columbia. Canadian Institutes of Health Research. Grant, $150,376.
- Rehabilitation service capacity for COVID-19 survivors. British Columbia Lung Foundation. Grant, $25,000.
- Optimizing chronic respiratory disease virtual care in First Nations communities. Canadian Respiratory Research Network. Contract, $10,500.
- Rehabilitation service capacity for COVID-19 survivors. Provincial Health Services Authority. Grant, $15,000.
- Rehabilitation services and capacity for people with long COVID. British Columbia Lung Foundation. Grant, $12,500.

Carlsten, Christopher
- Does Traffic-Related Air Pollution Reduce the Effectiveness of Corticosteroids in Asthma. Canadian Institutes of Health Research. Grant, $134,640. Funding held at VCHRI.
- Epigenetic Health Benefits of Budesonide (AGnES). Genome BC. Grant, $447,730. Funding held at VCHRI.
- Analysis of multiomic Data to Accelerate Personalized health interventions against inhaled Toxicants (ADAPT). Canada Institutes of Health Research. Grant, $40,000. Funding held at VCHRI.
- Workplace Diesel Exhaust Exposure: Defining a Biosignature to Support Prevention. Workers Compensation Board Manitoba. Grant, $39,680. Funding held at VCHRI.
- Epigenetic Health Benefits of Budesonide (Project ACE). Johnson & Johnson. Grant, $175,311. Funding held at VCHRI.
- Epigenetic Health Benefits of Budesonide (Project ACE). Genome British Columbia. Grant, $56,250. Funding held at VCHRI.

- Respiratory Outcomes Following COVID-19 Infection in British Columbia. Michael Smith Health Research BC. Grant, $110,000. Funding held at VCHRI.
- COVID-19 Infection in British Columbia: A Prospective Patient Registry for Respiratory Outcomes. Vancouver Coastal Health Research Institute. Grant, $10,000. Funding held at VCHRI.
- Lung Health Benefits of E-cigarette Cessation (VAPE). Canadian Institutes of Health Research. Grant, $33,000. Funding held at VCHRI.
- Traffic-related air pollution, inhaled corticosteroids and host defence response in COPD (APIC). Canadian Institutes of Health Research. Grant, $179,316. Funding held at VCHRI.
- Effect of the airway microbiome on responses to diesel exhaust exposure in asthmatics. British Columbia Lung Foundation. Grant, $25,000. Funding held at VCHRI.
- Tier II Char in Occupational and Environmental Lung Disease. Canada Research Chair. Salary, $100,000. Funding held at VCHRI.

DeMarco, Mari
- The abcd consortium ("accelerating blood and cardiopulmonary covid-19 diagnostics"). Canada Foundation for Innovation. Grant, 24053.16.
- Advancing healthcare diagnostics for neurodegenerative disorders. Michael Smith Health Research BC. Salary, $67,500. Funding held at the Department of Pathology and Laboratory Medicine.
- In vitro diagnostics for frontotemporal dementia. Michael Smith Health Research BC. Grant, $20,625.
- ACTH Analysis. Abbott Laboratories. Contract, $31,745. Funding held at the Department of Pathology and Laboratory Medicine.
- Translating research into practice: Investigating the impact of Alzheimer's disease diagnostics in Canada. Brain Canada. Grant, $147,891.80. Funding held at the Department of Pathology and Laboratory Medicine.
- A Seamless Phase 2A-B Randomized Double-Blind Placebo Controlled Trial to Evaluate the Efficacy and Safety of PQ912 in Patients with Early Alzheimer's Disease. National Institutes of Health. Grant, $1,319,831. Funding held at the Department of Pathology and Laboratory Medicine.

Dorscheid, Delbert
- A Multicenter, Randomized, Double-blind, Parallel Group, Placebo-controlled, Phase 3b Study to Evaluate the Safety and Efficacy of Benralizumab 30 mg sc in Patients with Severe Asthma Uncontrolled on Standard of Care Treatment. AstraZeneca Canada. Clinical Trial, $1,400.
- A randomized, double-blind, parallel group, multicenter, stratified study evaluating the efficacy and safety of repeat doses of GSK3772847 compared with placebo in participants with moderately severe asthma. GlaxoSmithKline (Canada). Clinical Trial, $1,560.
- PONENTE: A Multicenter, Open-label, Phase 3b Efficacy and Safety Study of Benralizumab 30 mg Administered Subcutaneously to Reduce Oral corticosteroid Use in Adult Patients with Severe Eosinophilic Asthma on High-Dose Inhaled Corticosteroid. AstraZeneca Canada. Clinical Trial, $4,237.
- Open-label, interventional, cohort study to evaluate long-term safety of dupilumab in patients with moderate to severe asthma who completed the TRAVERSE-LTS12551 clinical trial. Sanofi-Aventis Canada. Clinical Trial, $1,500.
- International Severe Asthma Registry: Protocol. Optimum Patient Care Global Ltd. Clinical Trial, $8,340.
- Various Outcomes associated with Long-term Treatment in patients Switching to benralizumab (VOLTS). AstraZeneca Canada. Clinical Trial, $3,290.
- Patient Outcomes Real World Evidence Registry (POWER): A Non-Interventional Post-Authorization Primary Data Collection Study of FASENRA (benralizumab) in Adult Patients with Severe, Eosinophilic Asthma. AstraZeneca Canada. Clinical Trial, $2,406.
- A Randomized, Double-Blind, Double Dummy, Parallel Group, Multicenter 24 to 52 Week Variable Length Study to Assess the Efficacy and Safety of Budesonide, Glycopyrronium, and Formoterol Fumarate Metered Dose Inhaler (MDI) Relative to Budeso. AstraZeneca Canada.. Clinical Trial, $4,100.

- A Phase 2, Multicenter, Randomized, Double-Blind, Placebo-Controlled, Parallel-Group Study to Assess the Safety, Efficacy and Pharmacodynamics of TEV-53275 Administered Subcutaneously in Adult Patients with Persistent Eosinophilic Asthma. Teva Branded Pharmaceutical Products R&D. Clinical Trial, $6,228.
- Registry of asthma patients initiating dupixent. Regeneron Pharmaceuticals. Clinical Trial, $7,845.41.
- A Phase II, Randomised, Double-blind, Placebo-controlled Study to Assess the Efficacy and Safety of MEDI3506 in Adult Participants with Uncontrolled Moderate-to-severe Asthma. Protocol D9181C00001. AstraZeneca Canada. Clinical Trial, $1,001.
- lgE-mediated inflammation generated by the airway epithelium is antigen independent - a cause of a novel asthma phenotype. Michael Smith Health Research BC. Salary, $90,000. Funding held at the Department of Medicine.

Francis, Gordon
- Molecular and cellular phenotyping of smooth muscle cell foam cells for the prevention of atherosclerosis. Canadian Institutes of Health Research. Grant, $21,667.
- The importance of smooth muscle foam cells in atherosclerosis development and treatment. Canadian Institutes of Health Research. Grant, $134,921.
- Redefining atherosclerosis: Characterizing and targeting smooth muscle cell foam cells for the treatment and prevention of coronary heart disease and stroke. Michael Smith Health Research BC. Salary, $90,000. Funding held at the Department of Medicine.

Granville, David
- Granzymes in Tissue Injury, Inflammation and Repair. Canadian Institutes of Health Research. Grant, $225,683. Funding held at ICORD.
- Profiling granzymes in inflammatory neuromuscular diseases. Muscular Dystrophy Canada. Grant, $50,000. Funding held at ICORD.
- Defining novel roles for granzyme K in allergic airway inflammation. British Columbia Lung Foundation. Grant, $25,000. Funding held at ICORD.
- Granzyme B: A Novel Target for the Treatment of Radiodermatitis. Cancer Research Society. Grant, $60,000. Funding held at ICORD.
- Targeting granzyme B with a novel inhibitor for the treatment of radiodermatitis. MITACS. Grant, $46,666. Funding held at ICORD.
- A novel topical gel formulation of clinically-approved sulfaphenazole for the treatment of pressure injuries. ICORD/Rick Hansen Institute. Grant, $10,000. Funding held at ICORD.
- Granzyme B: A Novel Therapeutic Target in Cutaneous Leishmaniasis. LEO Foundation. Grant, $13,333. Funding held at ICORD.
- A Novel Therapeutic for Inflammatory Skin Diseases. Michael Smith Health Research BC. Grant, $75,000. Funding held at ICORD.
- Novel mechanisms and therapeutic approach for aging-related pruritus. Canadian Institutes of Health Research. Grant, $100,000. Funding held at ICORD.
- Novel mechanisms and therapeutic approach for aging-related pruritus. Canadian Institutes of Health Research. Grant, $174,420. Funding held at ICORD.
- Novel mechanisms and therapeutic approach for aging-related pruritus. Canadian Institutes of Health Research. Grant, $50,000. Funding held at ICORD.
- Anti-Microbial,Physical Property and Cytotoxicity Investigation of Drug-Loaded Polyvinyl Alcohol Films for Wound Care. Andira Pharmaceuticals. Contract, $140,000. Funding held at ICORD.
- Investigating an AMP-activated protein kinase activator in a murine wound healing model – a pilot study. Kallyope Inc. Contract, $71,925. Funding held at ICORD.

Guenette, Jordan
- Research Start-up Funds. Providence Health Care Research Institute. Grant, $1,064.
- Sex-differences in respiratory sensation and muscle function during conditions of physiological stress. Natural Sciences and Engineering Research Council of Canada. Grant, $47,000.
- The effects of 60% oxygen during exercise training in patients with fibrotic interstitial lung disease. Michael Smith Health Research BC. Grant, $8,645.83.
- Investigating sex differences in dyspnea across the spectrum of chronic obstructive pulmonary disease severity. Michael Smith Health Research BC. Grant, $22,500.
- Cardiopulmonary exercise and functional imaging determinants of dyspnea post COVID-19. Canadian Lung Association. Grant, $5,000.
- Phyiological mechanisms of sex differences in exertional dyspnea and its response to therapy in patients with fibrotic interstitial lung disease. British Columbia Lung Foundation. Grant, $25,000.

Hacihaliloglu, Ilker
- Application of deep learning generative network algorithms linked with super-resolution methods and fusion techniques to improve the quality of noisy and unlabeled ultrasound images. MITACS. Grant, $60,000.
- Point of Care Ultrasound for Lung and Heart Disease Risk Assessment. MITACS, Grant, $30,000.

Hackett, Tillie-Louise
- Infrastructure Operating Fund. Canada Foundation for Innovation. Grant, $9,375.
- The Role of Small Airways Disease Heterogeneity in Asthma. Canadian Institutes of Health Research. Grant, $135,068.
- Novel quantitative emphysema subtypes in MESA and SPIROMICS. National Institutes of Health. Contract, $29,428.07.
- Airway-On-A-Chip: Development and in vitro validation of a microfluidic cell culture model for chronic obstructive pulmonary disease (COPD). MITACS. Grant, $26,666.67.
- Jame Hogg Lung Registry, James Hogg Research Centre. Fred Hutchinson Cancer Centre. Contract, $906.25.
- Jame Hogg Lung Registry, James Hogg Research Centre. University of Manitoba. Contract, $1,438.8.
- The contribution of sex differences to small airways disease in chronic obstructive pulmonary disease. Canadian Institutes of Health Research. Grant, $146,115.
- B cell-adaptive immune profile in emphysema-predominant COPD. National Institutes of Health. Contract, $27,731.42.
- Exploring the biology of persistent type 2 airway niches in asthma. National Institutes of Health. Contract, $99,097.71.
- AIr pollution as amodulator of molecular, structural, and clinical outcomes in patients with fibrotic interstitial lung disease. Michael Smith Health Research BC. Grant, $9,791.65.
- Providence Health Care Research Institute New Investigator Award. St. Paul's Foundation. Grant, $186,165.91. Funding held at the Department of Anesthesiology, Pharmacology and Therapeutics.
- Tier I Chair in Asthma and Chronic Obstructive Pulmonary Disease Pathobiology and Therapeutics. Canada Research Chairs. Salary, $200,000. Funding held at the Department of Anesthesiology, Pharmacology and Therapeutics.
- Spatial Single Cell Imaging in the Lung. Canada Foundation for Innovation. Grant, $200,000. Funding held at the Department of Anesthesiology, Pharmacology and Therapeutics.

Hogg, James
- Comprehensive multi-resolution investigation of IPF pathology. Francis Family Foundation. Grant, $95,120.29.

Koelwyn, Graeme
- Precision Exercise Research Fund. St. Paul's Foundation. Grant, $130,469.
- Cardiovascular disease and its comorbidities: identifying the regulators of cross-disease communication. Canada Foundation for Innovation and BCKDF. Grant, $60,000. Funding held at SFU.
- HLI Start Up Funding. Providence Health Care. Grant, $40,000.
- SFU Start Up Funding. Simon Fraser University. Grant, $20,000. Funding held at SFU.
- Tier 2 Chair in Public Health Omics in Exercise and Disease. Canada Research Chairs. Salary, $120,000. Funding held at SFU.

Krahn, Andrew
- Hearts in Rhythm Organization (HiRO): Improving detection and treatment of inherited heart rhythm disorders to prevent sudden death. Canadian Institutes of Health Research. Grant, $540,386. Funding held at VCHRI.

Laksman, Zachary
- Uncovering the mechanisms of atrial fibrillation using lessons from the adverse atrial remodeling induced by intense exercise. Canadian Institutes of Health Research. Contract, $25,000.
- Polygenic scores in atrial fibrillation patients without cardiovascular comorbidities. Cardiovascular Network of Canada (CANet). Grant, $25,000.
- Developing personalized anti-arrhythmic drug therapy for atrial fibrillation. Michael Smith Health Research BC. Salary, $15,000. Funding held at the Department of Medicine.
- Improving Sudden Death Risk Stratification in Hypertrophic Cardiomyopathy. St. Jude Medical Inc. Clinical Trial , $13,600. Funding held at the Department of Medicine.
- Unrestricted Research Funds. UBC School of Biomedical Engineering. Grant, $20,000. Funding held at the Department of Medicine.
- Randomized Controlled Pivotal Trial of Autologous Bone Marrow Mononuclear Cells Using the CardiAMP Cell Therapy system in Patients with Post Myocardial Infarction Heart Failure (CardiAMP Heart Failure Trial). BioCardia. Clinical Trial, $10,730. Funding held at the Department of Medicine.

Leipsic, Jonathon
- Core lab services: Feasibility Study of the Neovasc Tiara Mitral Transcatheter Heart Valve. Neovasc. Contract, $31,314. Funding held at the Department of Radiology.
- Core lab services: Evaluation of Transcatheter Aortic Valve Replacement Compared to Surveillance for Patients with Asymptomatic Severe Aortic Stenosis: EARLY TAVR trial NCT03042104. Edwards Lifesciences. Contract, $116,000. Funding held at the Department of Radiology.
- Core lab services: Assess the Safety and Effectiveness of the SAPIEM M3 System in Patients with Symptomatic Severe Mitral Regurgitation. Edwards Lifesciences. Contract, $12,954. Funding held at the Department of Radiology.
- Core lab services: Multicenter Trial of Congenital Pulmonic Valve Dysfunction Studying the SAPIEN 3 THV With the Alterra Adaptive Prestent (ALTERRA). Edwards Lifesciences. Contract, $107,890. Funding held at the Department of Radiology.
- Core lab services: Transcatheter Mitral Valve Replacement with the Medtronic Intrepid™ TMVR System in patients with severe symptomatic mitral regurgitation – APOLLO Trial. Metronic. Contract, $80,600. Funding held at the Department of Radiology.
- Core lab services: Clinical Trial to Evaluate the Safety and Effectiveness of Using the Tendyne Mitral Valve System for the Treatment of Symptomatic Mitral Regurgitation (SUMMIT). Tendyne Holdings, Inc. (Abbott Laboratories). Contract, $586,927. Funding held at the Department of Radiology.
- Core lab Services: COMPLETE TAVR. Edwards Lifesciences & Centre for Cardiovascular Innovation. Contract, $12,857. Funding held at the Centre for Cardiovascular Innovation.
- Core Lab services: DISCORDANCE TAVR. Edwards Lifesciences & Centre for Cardiovascular Innovation. Contract, $8,000. Funding held at the Centre for Cardiovascular Innovation.
- Core Lab services: CAN-ACCESS. Medtronic Inc & Centre for Cardiovascular Innovation. Contract,

$12,500. Funding held at the Centre for Cardiovascular Innovation.
- Donation to support Dr. Jonathon Leipsic's cardiac research using computerized tomography at St. Paul's Hospital . Seoul National University Hospital. Contract, $100,000. Funding held at the Department of Radiology.
- Tier II Chair in Advanced Cardiopulmonary Imaging. Canada Research Chairs. Salary, $100,000. Funding held at the Department of Radiology.

Leung, Janice
- Sphingolipids in HIV-associated chronic obstructive pulmonary disease. National Institutes of Health. Contract, $4,480.45.
- Canadian users of cannabis smoke study (CANUCKs): Impact on lung health via clinical, imaging, and biologic measures. Canadian Institutes of Health Research. Grant, $249,905.
- Understanding the link between lung genomics, transcriptomics, and sex differences in COPD. Michael Smith Health Research BC. Grant, $23,166.64.
- Start-up funds. St. Paul's Foundation. Grant, $30,000.
- Airway immunosenescence i HIV-associated chronic obstructive pulmonary disease. British Columbia Lung Foundation. Grant, $25,000.
- Utilizing optical coherence tomography and exercise to develop novel biomarkers of respiratory impairment in people living with human immunodeficiency virus. Canadian Institutes of Health Research. Grant, $11,250.
- Understanding mechanisms of respiratory impairment in people living with human immunodeficiency virus (HIV) using optical coherence tomography (OCT). UBC VP Health. Grant, $25000.
- Understanding the aging HIV lung from dysbiosis to cell injury. Michael Smith Health Research BC. Salary, $2,500. Funding held at the Department of Medicine.
- Tier II Chair in Translational Airway Biology. Canada Research Chairs. Salary, $120,000. Funding held at the Department of Medicine.
- Understanding diverse COVID-19 outcomes at the cellular and moleular level. MITACS. Grant, $30,000. Funding held at the Department of Medicine.

Luo, Honglin
- Development of coxsackievirus B3 as oncolytic virus for KRAS-mutant lung cancer treatment. MITACS. Grant, $135,000.
- Enterovirus subversion of the autophagy pathway. Canadian Institutes of Health Research. Grant, $122,400.
- Autophagy mechanism of coronaviral infection: Lessons from enteroviruses. Natural Sciences and Engineering Research Council of Canada. Grant, $40,000.
- Innate mechanisms of viral myocrditis: Role of the cytosotic: DNA-sensing pathway. Michael Smith Health Research BC. Grant, $14,437.5.
- Novel oncolytic virus for lung cancer treatment. British Columbia Lung Foundation. Grant, $25,000.

McManus, Bruce
- Right Ventricular Myocardial Fibrosis from Bench-to-Bedside: Implications for Care. University Health Network. Contract, $1,062.5.

McNagny, Kelly
- Modulation of Innate Immune Responses as a Therapy for Muscular Dystrophy. Canadian Institutes of Health Research. Grant, $191,250. Funding held at Biomedical Research Centre.
- Maternal exposures during pregnancy as drivers of susceptibility to allergic asthma and Th2 inflammation. Canadian Institutes of Health Research. Grant, $237,150. Funding held at Biomedical Research Centre.
- Causational Roles of the Gut Microbiome in Childhood Asthma: Leveraging the CHILD Cohort Study. Canadian Institues of Health Research. Grant, $50,000. Funding held at Biomedical Research Centre.

- Contribution of the microbiome to asthma risk in premature infants. Canadian Institues of Health Research. Grant, $33,000. Funding held at Biomedical Research Centre.

Quon, Bradley
- Cystic Fibrosis Canada Accelerating Clinical Trials Network (CFCanAct). Cystic Fibrosis Canada. Grant, $25,000.
- A Phase 3, Open-label Study Evaluating the Long-term Safety and Efficacy of VX-445 Combination Therapy in Subjects With Cystic Fibrosis Who Are Homozygous or Heterozygous for the F508del Mutation. Vertex Pharmaceuticals. Clinical Trial, $39,173.8.
- A Phase 3, Open-label Study Evaluating the Long-term Safety and Efficacy of VX-445 Combination Therapy in Subjects With Cystic Fibrosis Who Are Heterozygous for the F508del Mutation and a Gating or Residual Function Mutation (F/G and F/RF G. Vertex Pharmaceuticals. Clinical Trial, $5,400.
- A Phase 2 Study of ABBV-3067 Alone and in Combination with ABBV-2222 in Cystic Fibrosis Subjects Who Are Homozygous for the F508del Mutation. AbbVie Corporation. Clinical Trial, $2,641.2.
- Refining the approach to cystic fibrosis pulmonary exacerbations - modeling data to improve assessment and predict etiology. Michael Smith Health Research BC. Grant, $20,625.
- Multi-OMIC biomarkers to predict neonatal vaccine response. MITACS. Grant, $15,000.
- A phase 1B randomized, double-blind, placebo-controlled trial to evaluate the safety of CB-280 in patients with cystic fibrosis CX-280-202. Calithera Biosciences. Clinical Trial, $3,401.19.
- Randomized Controlled Trial of Prednisone in Cystic Fibrosis (CF) Pulmonary Exacerbations (PIPE Study). Cystic Fibrosis Foundation (US). Clinical Trial, $22,761.17.
- Inflammatory and immune biomarkers of response to elexacaftor/tezacaftor/ivacaftor in people with CF. Cystic Fibrosis Canada. Grant, $95,200.
- A Phase 3, Randomized, Double-blind, Controlled Study Evaluating the Efficacy and Safety of VX-121 Combination Therapy in Subjects with Cystic Fibrosis Who Are Homozygous for F508del, Heterozygous for F508del and a Gating (F/G) or Residual . Vertex Pharmaceuticals (Canada). Clinical Trial, $121,941.46.
- Patient-derived model systems to assess the in vitro efficacy of cystic fibrosis transmembrance condctance regulator (CFTR) modulator therapies in cystic fibrosis. Canadian Institutes of Health Research. Grant, $35,000.
- A Phase 3 Double-blind, Randomized, Placebo- controlled Study Evaluating the Efficacy and Safety of ELX/TEZ/IVA in Cystic Fibrosis Subjects 6 Years of Age and Older With a Non-F508del ELX/TEZ/IVA-responsive CFTR Mutation.. Vertex Pharmaceuticals. Clinical Trial, $112,289.05.
- A Longitudinal Study on the Impact of ELX/TEZ/IVA Treatment in Patients With Cystic Fibrosis in the Real World. Vertex Pharmaceuticals. Clinical Trial, $7,035.
- The development of novel blood protein biomarkers to enable precision care in cystic fibrosis. Michael Smith Health Research BC. Salary, $67,500. Funding held at the Department of Medicine.
- Improving P. aeruginosa detection in non-expectorators via breath testing. Cystic Fibrosis Foundation (US). Grant, $16,500. Funding held at the Department of Medicine.

Russell, James
- COVID-19 and severe community-acquired pneumonia dynamic evaluation study (CASCADES -ARBS CORONA III - ARBs CORONA III). Canadian Institutes of Health Research. Grant, $375,000. Funding held at CHEOS.

Ryerson, Chris
- Multicenter, international, doubleblind, two-arm, randomized, placebo controlled phase II trial of pirfenidone in patients with unclassifiable progressive fibrosing ILD. Hoffmann-La Roche Ltd. Clinical Trial, $162.04.
- Randomized, Double-Blind, Parallel-group, Placebo-controlled, 52-week, Phase IIb Study to Assess Efficacy and Safety of GLPG1690 on Top of Pirfenidone or Nintedanib in Patients with Idiopathic Pulmonary Fibrosis. Galapagos NV. Clinical Trial, $24.13.

- Connecting clinical research and economic evaluation by mapping lung function to EQ-SD-5L in patients with interstitial lung disease. Michael Smith Health Research BC and St. Paul's Foundation. Grant, $24,750.
- Blood Single-cell RNA Sequencing of Fibrotic Interstitial Lung Disease Subtypes. Genome British Columbia. Clinical Trial, $90,637.
- A randomized, double-blind, placebo-controlled parallel group study IPF patients over 12 weeks evaluating efficacy, safety and tolerability of BI 1015550 18 mg taken orally b.i.d.. Boehringer Ingelheim. Clinical Trial, $5,883.77.
- Investigating differential gene expression profiles predictive of interstitial lung disease morphology, progressive phenotypes, and mortality. British Columbia Lung Foundation. Grant, $25,000.
- Air pollution as a modular of molecular, structural, and clinical outcomes in patients with fibrotic interstitial lung disease. Canadian Lung Association. Grant, $16,500.
- Long COVID, phenotypes, patient reported outcome measures, healthcare utilization and costs. Canadian Lung Association. Grant, $19,848.
- The association of genetic risk factors with morphology and outcomes in interstitial lung disease. Michael Smith Health Research BC. Grant, $28,875.
- Use of peripheral blood single-cell transcriptomic diagnostics in the diagnosis and prognostication of interstitial lung disease. Canadian Pulmonary Fibrosis Foundation. Contract, $60,000.
- CARE-PF2022: Personalized Approaches to Prognostication and Management of Fibrotic Interstitial Lung Disease. Boehringer Ingelheim. Clinical Trial, $383,525.
- Clinical, biological, and prognostic impact of supplemental oxygen in fibrotic interstitial lung disease. Michael Smith Health Research BC. Salary, $90,000. Funding held at the Department of Medicine.
- Blood single-cell RNA profiling of interstitial lung diseases. MITACS. Grant, $30,000. Funding held at the Department of Medicine.

Sellers, Stephanie
- Understanding of BPHV use, define features of BPHV level, and begin to develop new imaging approaches for detecting valve degeneration and identifying therapeutic targets to improve valve durability. Providence Health Care Research Institute. Grant, $16,783.68.
- Valvular heart disease and bioprosthetic heart valves: defining mechanisms of degeneration and therapeutic discovery from bedside to bench. Michael Smith Health Research BC. Salary, $33,750.
- Determining mechanisms of transcatheter valve degeneration. UBC Faculty of Medicine. Grant, $10,000.
- Start-Up Funds. UBC Faculty of Medicine. Grant, $15,000. Funding held at the Department of Medicine.

Seow, Chun
- Molecular mechanisms for length adaptation in smooth muscle cells. Natural Sciences and Engineering Research Council of Canada. Grant, $48,000.
- Mechanisms underlying the bronchodilatory effect of deep inspiration in health and asthma: from ariway smooth muscle to the whole lung. Canadian Institutes of Health Research. Grant, $187,235.

Sin, Don
- Using multi-omics to discover novel biomarkers and therapeutic targets fo chronic obstructive pulmonary disease. Canadian Institutes of Health Research. Grant, $119,202.
- Frequency Treatment for Emphysema Rat Model. IKOMED Technologies. Contract, $67,977.
- TORCH (Towards omics and imaging to revolutionize COPD and asthma health) in Canada. Canada Foundation for Innovation. Grant, $25,311.67.
- Infrastructure Operating Fund. Canada Foundation for Innovation. Grant, $139,000.
- Platform development to assay immune cell chemotaxis in chronic obstructive pulmonary disease (COPD). MITACS. Grant, $31,666.66.
- JHRC Infrastructure Fund. Providence Health Care Research Institute (PHCRI). Clinical Trial, $31,402.91.
- Ventilation heterogeneity in asthma, COPD, and asthma-COPD overlap: Oscillometry and pulmonary MRI. Michael Smith Health Research BC and St. Paul's Foundation. Grant, $59,416.68.

- Endo-phenotyping of human alveolar macrophages from bronchoalveolar lavage (BAL). Genome British Columbia. Contract, $118,000.
- A novel approach to discover therapeutic and biomarker targets and enable precision health in COPD: TORCH (Towards Omics and Imaging to Revolutionize COPD Health). Canadian Institutes of Health Research. Grant, $142,864.
- Cellular phenotyping chronic obstructive pulmonary disease from microbes to epithelial and macrophages. MITACS. Grant, $30,000.
- Markers of the Human Conduction System. University Health Network. Contract, $3,225.
- Blood epigenetic age biomarkers and health outcomes in COPD. Canadian Institutes of Health Research. Grant, $100,000.
- Dissecting heterogeneity in COPD: a functional imaging-guided-omics study. Michael Smith Health Research BC. Grant, $3,833.32.
- A Novel Radiofrequency Treatment for Emphysema in Pig Model. MITACS. Grant, $60,000.
- The Canadian Respiratory Research Network Long COVID-19. Canadian Institutes of Health Research. Clinical Trial, $2,000.
- A data sience approach to identiyf novel COPD phenotypes using pulmonary imaging. Canadian Respiratory Research Network. Grant, $10,000.
- 129Xe magnetic resonance imaging based phenotypes of long COVID: A multi-enter evaluation. Canadian Institutes of Health Research. Grant, $1,500.
- Tier I Chair in Chronic Obstructive Pulmonary Disease. Canada Research Chairs. Salary, $200,000. Funding held at the Department of Medicine.
- A randomized, double-blind, placebo-controlled, parallel-group, Proof-of-Concept (PoC) study to assess the efficacy, safety and tolerability of SAR440340, in patients with moderate-to-severe chronic obstructive pulmonary disease (COPD). Sanofi-Aventis Canada. Clinical Trial, $336. Funding held at the Department of Medicine.

Singh, Amrit
- Development of triple co-culture airway model systems for asthma pathogenesis and evaluation using single cell multiomics. British Columbia Lung Foundation. Grant, $25,000.
- Integrating public and in-house multiomics data to identify drug repurposing candidates for scleroderma. MITACS. Grant, $80,000.
- HLI Start Up Funds. St. Paul's Foundation. Grant, $150,000.
- APT Research Start-Up Funds. UBC Department of Anesthesiology, Pharmacology and Therapeutics. Grant, $50,000. Funding held at the Department of Anesthesiology, Pharmacology and Therapeutics.

Tan-Hogg, Wan
- The Canadian Cohort Obstructive Lung Diseases (CanCOLD). Canadian Institutes of Health Research. Clinical Trial, $2,129.4.
- The Canadian Cohort Obstructive Lung Diseases (CanCOLD). Various Companies. Clinical Trial, $62,387.62.
- COVID-19 and COPD: Important Knowledge Gaps in Subclinical Pulmonary Disease in the Canadian Population. Canadian Institutes of Health Research. Clinical Trial, $11,070.

Tebbutt, Scott
- HEARTBiT: A novel multi-marker blood test for management of acute cardiac allograft rejection. Canadian Institutes of Health Research. Grant, $436,050.
- Understanding molecular responses of bronchial epithelium to plicatic acid exposure. British Columbia Lung Foundation. Grant, $25,000.
- Natural products in bronchial asthma. MITACS. Grant, $30,000.
- Circulating metabolites as non-invasive biomarkers of chronic lung allograft dysfunction in humans. British Columbia Lung Foundation. Grant, $25,000.
- Identifying COVID-19 Molecular Endotypes. Boston Children's Hospital. Contract, $12,000.

Thamboo, Andrew
- Developing a surrogate marker to asthmatic tissue: the nasal cavity. MITACS. Grant, $15,000.

Walley, Keith
- Translational research to improve sepsis outcomes. Canadian Institutes of Health Research. Grant, $74,249.

Wang, Ying
- Targeting efferocytosis to reduce risk of cardiovascular events. Heart and Stroke Foundation of Canada. Salary, $60,000.
- Targeting efferocytosis to reduce risk of cardiovascular events. Canadian Institutes of Health Research. Grant, $163,710.
- Beyond morphology: Convert disease-related gene networks to pixels in digital pathology to solve the puzzle of "vulnerable plaques" that lead to cardiovascular events. New Frontiers in Research Fund. Grant, $87,500.
- Targeting efferocytosis to reduce risk of cardiovascular event. Michael Smith Health Research BC. Salary, $22,500.
- Startup Funding. St. Paul's Foundation. Contract, $19,618.10.
- Spatial characterization of human atherosclerotic disease for therapeutic and biomarker development. Canada Foundation for Innovation, BCKDF, and UBC James Hogg Research Centre. Grant, $250,543.
- Centre for Heart Lung Innovation Heart and Lung Tissue Biobank. UBC VP Research & Innovation. Grant, $49,999.44.

Yang, Decheng
- Mechanisms of selective host gene translation regulation in picornavirus infection. Natural Sciences and Engineering Research Council of Canada. Grant, $34,000.
- Role of transcription factor NFAT5 in viral myocarditis: a novel strategy for therapy. Canadian Institutes of Health Research. Grant, $120,870.

Appendix B

Publications by HLI PIs in 2022

Acaster S, Mukuria C, Rowen D, Brazier JE, Wainwright CE, **Quon BS**, Duckers J, Quittner AL, Lou Y, Sosnay P, McGarry LJ. Development of the CFQ-R-8D: Estimating Utilities From the Cystic Fibrosis Questionnaire-Revised. Value Health. 2022 Dec 09. doi: 10.1016/j.jval.2022.12.002 PMID: 36509366

Afshar R, Askari AS, Sidhu R, Cox S, Sherifali D, **Camp PG**, Tang TS. Out of the mouths of Peer Leaders: Perspectives on how to improve a telephone-based peer support intervention in type 2 diabetes. Diabet Med. 2022 Sep 01;39(9):e14853. doi: 10.1111/dme.14853 PMID: 35437815

Afshar R, Sidhu R, Afshari R, Askari AS, Sherifali D, **Camp PG**, Cox S, Tang TS. Profiling "Success": Demographic and Personality Predictors of Effective Peer Leaders in a Diabetes Self-management Intervention. Can J Diabetes. 2022 Aug 01;46(6):553-560. doi: 10.1016/j.jcjd.2022.01.001 PMID: 35501224

Afshar R, Sidhu R, Askari AS, Sherifali D, **Camp PG**, Cox S, Tang TS. "Tis Better to Give Than to Receive?" Health-related Benefits of Delivering Peer Support in Type 2 Diabetes: An Explanatory Sequential Mixed-methods Study. Can J Diabetes. 2022 Jul 01;46(5):518-525. doi: 10.1016/j.jcjd.2022.02.006 PMID: 35739043

Akata K, **Leung JM**, Yamasaki K, Leitao Filho FS, Yang J, Xi Yang C, Takiguchi H, Shaipanich T, Sahin B, Whalen BA, Yang CWT, **Sin DD**, **van Eeden SF**. Altered Polarization and Impaired Phagocytic Activity of Lung Macrophages in People With Human Immunodeficiency Virus and Chronic Obstructive Pulmonary Disease. J Infect Dis. 2022 Mar 02;225(5):862-867. doi: 10.1093/infdis/jiab506 PMID: 34610114

Akbar N, Braithwaite AT, Corr EM, **Koelwyn GJ**, van Solingen C, Cochain C, Saliba AE, Corbin A, Pezzolla D, Møller Jørgensen M, Bæk R, Edgar L, De Villiers C, Gunadasa-Rohling M, Banerjee A, Paget D, Lee C, Hogg E, Costin A, Dhaliwal R, Johnson E, Krausgruber T, Riepsaame J, Melling GE, Shanmuganathan M, Oxford Acute Myocardial Infarction Study (OxAMI), Bock C, Carter DRF, Channon KM, Riley PR, Udalova IA, Moore KJ, Anthony D, Choudhury RP. Rapid neutrophil mobilisation by VCAM-1+ endothelial extracellular vesicles. Cardiovasc Res. 2022 Feb 04. doi: 10.1093/cvr/cvac012 PMID: 35134856

Akinmolayemi O, Ozdemir D, Pibarot P, Zhao Y, **Leipsic J**, Douglas PS, Jaber WA, Weissman NJ, Blanke P, Hahn RT. Clinical and Echocardiographic Characteristics of Flow-Based Classification Following Balloon-Expandable Transcatheter Heart Valve in PARTNER Trials. JACC Cardiovasc Imaging. 2023 Jan 01;16(1):1-9. doi: 10.1016/j.jcmg.2022.05.010 PMID: 36599555

Akodad M, Blanke P, Chuang MA, Duchscherer J, **Sellers SL**, Chatfield AG, Gulsin GG, Lauck S, **Leipsic JA**, Meier D, Moss RR, Cheung A, Sathananthan J, Wood DA, Ye J, Webb JG. Late Balloon Valvuloplasty for Transcatheter Heart Valve Dysfunction. J Am Coll Cardiol. 2022 Apr 12;79(14):1340-1351. doi: 10.1016/j.jacc.2022.01.041 PMID: 35393014

Akodad M, Blanke P, Nestelberger T, Alosail A, Chatfield AG, Chuang MA, **Leipsic JA**, Tzimas G, Lounes Y, Meier D, Sathananthan J, Wood DA, Webb JG. Hybrid Approach Using the Cusp-Overlap Technique for Transcatheter Aortic Valve Replacement With a Balloon-Expandable Valve. JACC Cardiovasc Interv. 2022 Dec 12;15(23):2387-2395. doi: 10.1016/j.jcin.2022.10.035 PMID: 36402718

Akodad M, Chuang A, Ihdayhid A, Chatfield AG, **Leipsic J**, Cheung A, Wood DA, Della Siega A, Iqbal MB, Webb JG, Sathananthan J. Early Transcatheter Heart Valve Pannus Leading to Coronary Obstruction Managed With Orthotopic Chimney Stenting. CJC Open. 2022 May 01;4(5):509-511. doi: 10.1016/j.cjco.2022.01.008 PMID: 35607485

*HLI PIs are in **bold.**

Akodad M, Kütting M, **Sellers S**, Kirsten A, Marx P, Kim I, Cheung A, **Leipsic J**, Søndergaard L, Toggweiler S, Wood DA, Webb JG, Sathananthan J. Redo Transcatheter Aortic Valve Implantation with the ALLEGRA Transcatheter Heart Valve: Insights from Bench Testing. Cardiovasc Eng Technol. 2022 Dec 01;13(6):930-938. doi: 10.1007/s13239-022-00627-1 PMID: 35505271

Akodad M, Sathananthan J, Tzimas G, Salcudean H, Hensey M, Gulsin GS, Meier D, Anthony Chuang MY, Chatfield AG, Landes U, Blanke P, Sondergaard L, Payne GW, Lutter G, Puehler T, Wood DA, Webb JG, **Leipsic JA**, **Sellers SL**. Multimodality Imaging to Assess Leaflet Height in Mitral Bioprosthetic Valves: Implications for Mitral Valve-in-Valve Procedure. JACC Cardiovasc Imaging. 2022 Sep 01;15(9):1663-1665. doi: 10.1016/j.jcmg.2022.01.010 PMID: 36075626

Akodad M, **Sellers S**, Landes U, Meier D, Tang GHL, Gada H, Rogers T, Caskey M, Rutkin B, Puri R, Rovin J, **Leipsic J**, Sondergaard L, Grubb KJ, Gleason P, Garde K, Tadros H, Teodoru S, Wood DA, Webb JG, Sathananthan J. Balloon-Expandable Valve for Treatment of Evolut Valve Failure: Implications on Neoskirt Height and Leaflet Overhang. JACC Cardiovasc Interv. 2022 Feb 28;15(4):368-377. doi: 10.1016/j.jcin.2021.12.021 PMID: 35210043

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Appendix C

HLI Friday Seminar Series 2022

January 14	The new role of activated platelets in the calcification of aortic valve Speaker: Dr. Rihab Bouchareb Hosts: Drs. Stephanie Sellers & Janar Sathananthan	
January 28	Importance of flow dynamics in the assessment of cardiovascular disease and outcomes Speaker: Dr. Hoda Hatoum Hosts: Drs. Stephanie Sellers & Janar Sathananthan	
February 4	Emerging Role of Oxidized Phosphatidylcholine in Asthma: Bronchoconstriction Inducers and Bronchodilator Inhibitors Speakers: Drs. Andrew Halayko & Jignesh Vaghasiya Host: Dr. Chun Seow	
February 18	Interpretable neural network applications for omics data Speaker: Dr. Amrit Singh	
February 25	HLI 3-Minute Thesis	
March 4	Turning up the HETE on airway smooth muscle: Understanding the role of hydroxyeicosatetraenoic acids in regulating airway smooth muscle contractility Speaker: Dr. Christopher Pascoe	Host: Dr. Chun Seow
March 11	Stromal progenitors as organizers of the inflammatory environment Speaker: Dr. Fabio Rossi	Host: Dr. Don Sin
March 18	Epigenetic age in the assessment of clinical outcomes in Chronic Obstructive Pulmonary Disease Speaker: Dr. Ana Hernandez	Host: Dr. Don Sin
March 25	Smooth muscle foam cells: A unique target to induce atherosclerotic plaque regression Speaker: Dr. Gordon Francis	
April 1	Is stem cell society peaceful? Speaker: Dr. Nika Shakiba	Host: Dr. Leili Rohani
April 8	What has the pandemic taught us about myocarditis? Speaker: Dr. Leslie Cooper	Host: Dr. Gurpreet Singhera
May 6	Cis-regulatory architecture of coronary artery disease Speaker: Dr. Clint Miller	Host: Dr. Ying Wang
May 20	Understanding and mitigating the inflammatory consequences of one-lung ventilation during lung surgery Speaker: Dr. Binlam Kidane	Host: Dr. Chun Seow
May 27	All Roads Lead to AATHEN: the UBC Advanced Angiotensin THerapeutics Network Speaker: Dr. Pascal Bernatchez	

Appendix C

HLI Friday Seminar Series 2022

June 3 Understanding Immune Mechanisms of Disease Tolerance
Speaker: Dr. Ruth Franklin
Host: Dr. Graeme Koelwyn

June 10 Advanced multifunctional fibers for tissue engineering and drug delivery
Speaker: Dr. Mohsen Akbari Host: Dr. Leili Rohani

June 17 Modeling human lung development and disease using pluripotent stem cells
Speaker: Dr. Amy Wong Host: Dr. Brad Quon

September 16 RETHINCking COPD: from Lancet to NEJM
Speaker: Dr. Don Sin

September 23 Navigating through 'omics data: a multivariate perspective
Speaker: Dr. Kim-Anh Le Cao Host: Dr. Amrit Singh

October 7 Challenges and Opportunities for Future Cardiovascular Biobank
Speaker: Dr. Ying Wang & BMCB

October 14 Common and Differential Biomolecular Pathways amongst Primary Interstitial Lung Disease and Interstitial Lung Disease Secondary to Scleroderma or Undifferentiated Connective Tissue Disease
Speaker: Dr. Kevin Keen

October 21 Atrial Fibrosis as a Pathophysiological Nexus Between Fibrillation and Stroke: How Can We Use Computational Modeling to Elucidate Complex Mechanisms
Speaker: Dr. Patrick Boyle Host: Dr. Zachary Laksman

October 28 ZIKA Virus Perturbs Importins During Its Replication
Speaker: Dr. Yanjin Zhang Host: Dr. Decheng Yang

November 4 Using Ancient Biology to Serve Modern Therapeutic Needs: The Mevalonate Pathway and Inhibition of Airway Smooth Muscle Contraction by Statins
Speaker: Dr. Amir Zeki Host: Dr. Chun Seow

November 18 Illuminating the Mechanics of Artificial Versus Physiological Breathing
Speaker: Dr. Mona Eskandari Host: Dr. Chun Seow

November 25 Advances in the diagnosis and classification of pulmonary fibrosis
Speaker: Dr. Chris Ryerson

December 2 Airway mucus plugs as a marker of the Type 2 niche in asthma
Speaker: Dr. Maude Liegeois Host: Dr. Tillie Hackett

December 9 Molecular Tools for Assessing Allograft Health: A 21st Century Approach to Transplant Diagnostics
Speaker: Dr. Paul Hanson Hosts: Dr. Gurpreet Singhera & Amrit Samra

Appendix D

Research-in-Progress Seminar Series 2022

January 10	Exploration of factors that predict progression to non-tuberculous Mycobacteria active disease in patients with cystic fibrosis Speaker: Miguel Preito
January 17	Assessing exposure to indoor air pollutants in First Nations housing Speaker: Ivan Kamurasi
January 24	Interactions between HIV & the Airway Epithelium: Understanding the Relationships of HIV & COPD Speaker: Ravneet Hansi
January 31	Blood Biomarkers to Identify Cystic Fibrosis Pulmonary Exacerbations Speaker: Naomi Potter
February 7	Regulatory T cells and Allergic Rhinitis Phenotypes Speaker: Shanay Niusha
February 14	Stories of resilience from the 2018 wildfire season in Carrier and Sekani First Nations People' territory Speaker: Justin Turner
February 28	The effects of face masks on the neurophysiological mechanisms of exertional dyspnoea in healthy adults Speaker: Olivia Hutchinson
March 14	Effects of dead space loading on respiratory mechanics and exertional dyspnea Speaker: Dr. Reid Mitchell
March 21	Identification of in vivo proteolytic fragments of TDP-43 specific to frontotemporal lobar degeneration with TDP-43 inclusions Speaker: Lauren Forgrave
March 28	Patient-oriented research: Using lived experiences to inform Alzheimer's disease diagnostics, care, and support Speaker: Khushbu Patel
April 4	Scoping Review on Virtual Care for Indigenous Populations Speaker: Debora Petry Moecke
April 11	Characterization of ACE2 and SARS-CoV-2 pseudoviral infection in models of the airway epithelium Speaker: Tony Guo

Appendix D

Research-in-Progress Seminar Series 2022

April 25	Genetic Susceptibility of Pulmonary Exacerbations in Preschoolers with Cystic Fibrosis Speaker: Kang Dong
May 2	Investigation of the role of miR-146a in the regulation of fibrosis in chronic obstructive pulmonary disease Speaker: Kauna Usman
May 16	Increasing circulating Lysosomal Acid Lipase for reduction of atherosclerosis in ApoE-deficient mice using mRNA-containing lipid nanoparticles Speaker: Katrina Besler
May 30	Investigation into the mechanism of doxorubicin-induced cardiotoxicity: roles of genetic variant RARG-S427L Speaker: Margaret Huang
October 3	Characterizing the chronology of vascular damage in a mouse model of pediatric type 1 diabetes Speaker: Chris Yuen
October 17	Indigenous Cardiovascular Health and the Impact of Cholesterol Disorders Speaker: Rylan McCallum
October 24	Development of Oncolytic Coxsackievirus B3 for Breast Cancer Therapy Speaker: Amirhossein Bahreyni
October 31	Flow Cytometry Basics Speaker: Basak Sahin
November 7	Phenotyping airway mucosal abnormalities in individuals with Post-Covid Pulmonary Syndrome: results of a single-cell RNA sequencing study Speaker: Firoozeh Gerayeli
November 14	Investigating heterogeneity of small airways disease in asthma Speaker: Aileen Hsieh
November 21	Plasma lipid abnormalities in muscular dystrophies: a systematic review and meta-analysis Speaker: Zeren Sun
November 28	The Involvement of Fibrocytes in Scleroderma and Idiopathic Pulmonary Fibrosis Speaker: Raveen Badyal
December 5	Phenotyping of Long COVID Airways Speaker: Elizabeth Guinto

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