



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

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

2020 ANNUAL REPORT





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.



How you want to be treated.



PROVIDENCE HEALTH CARE
Research Institute



THE UNIVERSITY OF BRITISH COLUMBIA

Led by Dr. Don Sin (Director) and Dr. Jordan Guenette (Associate Director)



66 Principal Investigators and
Affiliated Investigators

42 Research Associates and
Postdoctoral Fellows

56 Graduate Students

36 Undergraduate Students

6 Visiting Scientists

55 Support, Operations, and
Administrative Staff



50,000 ft²
laboratory and office space

8 Core Facilities

Cardiovascular Registry
Lung Tissue Registry
Cellular Imaging and Biophysics
Graphics and Imaging
Histology
Molecular Phenotyping
Pre-clinical Models
Digital Slide Scanning



> \$15.5M
in external funding*

\$13.9M
Peer-Reviewed Grants

\$672K
Clinical Trial

\$136K
Contracts and Agreements

\$1.61M
Salary Awards

*April 2020 to March 2021. Details in Appendix A. Total funding held at HLI: \$11.6M

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Dear Friends and Colleagues;

2020 was a challenging year for all of us. We faced the largest worldwide pandemic since the Great Spanish Flu of 1918, which took the lives of 50,000 Canadians. As of June 3, 2021, over 25,000 Canadians and 3.7 million individuals worldwide have lost their lives to COVID-19 and many more have been hospitalized and debilitated by the virus. Despite much progress in the prevention and treatment of COVID-19, we are well into our “3rd COVID surge” with record-setting daily counts of British Columbians infected with the virus. Hospitals (and ICUs) across BC are at their maximal capacity. Many elective surgeries have been cancelled or postponed (indefinitely) to free up additional beds in the hospital, though at the current rate of COVID growth, these beds will soon be filled with COVID patients.

Through this darkness, however, there is a ray of hope. Unprecedented investment in research has led to the development of several highly effective vaccines for COVID-19 in a record-breaking time (~9 months from conception to completion of Phase 3 trials). Countries where mass vaccinations have occurred (e.g. Israel and UK), rates of COVID-19 have plummeted to record lows. To date, approximately 2.26 million British Columbians (as of June 3, 2021) have received at least one dose of the vaccine. This number is expected to exponentially increase over the next few weeks and months. Many public and private facilities are expected to fully open by fall of 2021.

The pandemic has also brought out the very best of the HLI family. To date, there have been no outbreaks of COVID-19 at HLI (thanks to everyone’s cooperation and adherence to guidelines). PIs, staff and trainees have modified their work schedule to fight the pandemic. For many, this has meant working from home, or coming to HLI at off-hours and on strange schedules, mask wearing and social distancing on site, and making Zoom® a daily ritual. Fiscally, HLI is in good shape. The educational and research programs including the Friday seminars and RIP have been well implemented remotely. Our core platforms have been fully operational without any significant impediments or delays (thank you to all our core managers and staff) and our IT support has been exceptional despite the added requests and challenges imposed by the pandemic (thank you to Joe and his dedicated team). Thank you also to the grants team and administrative staff, who have enabled us to take advantage of new funding opportunities for COVID-19 research and ensured our finances, HR and operational issues have been addressed in a timely fashion.

I’m also grateful to UBC Faculty of Medicine, Providence Health Care Research Institute (PHCRI), SFU and the St. Paul’s Foundation for allowing us to recruit exceptional new Faculty members to the Centre including Drs. Zackary Laksman, Ying Wang, Amrit Singh and Graeme Koelwyn and for nominating Dr. Tillie Hackett as a Tier 1 Canada Research Chair (CRC) in Asthma and COPD Pathobiology and Drs. Janice Leung and Graeme Koelwyn as Tier 2 CRCs in Airway Translational Biology and Public Health Omics, respectively. The UBC Faculty of Medicine and PHCRI have provided great leadership and guidance during the pandemic and have allowed the Centre to grow and flourish.

I want to proffer a special thanks to Dr. Bob Schellenberg, who retired on December 31 after 40+ years at UBC/SPH/HLI. Bob is an exceptional clinician, scientist and educator, who inspired a generation of trainees with his immense knowledge, great humility and a wicked sense of humor. He leaves a legacy of teaching, mentoring and patient care for all of us to emulate.



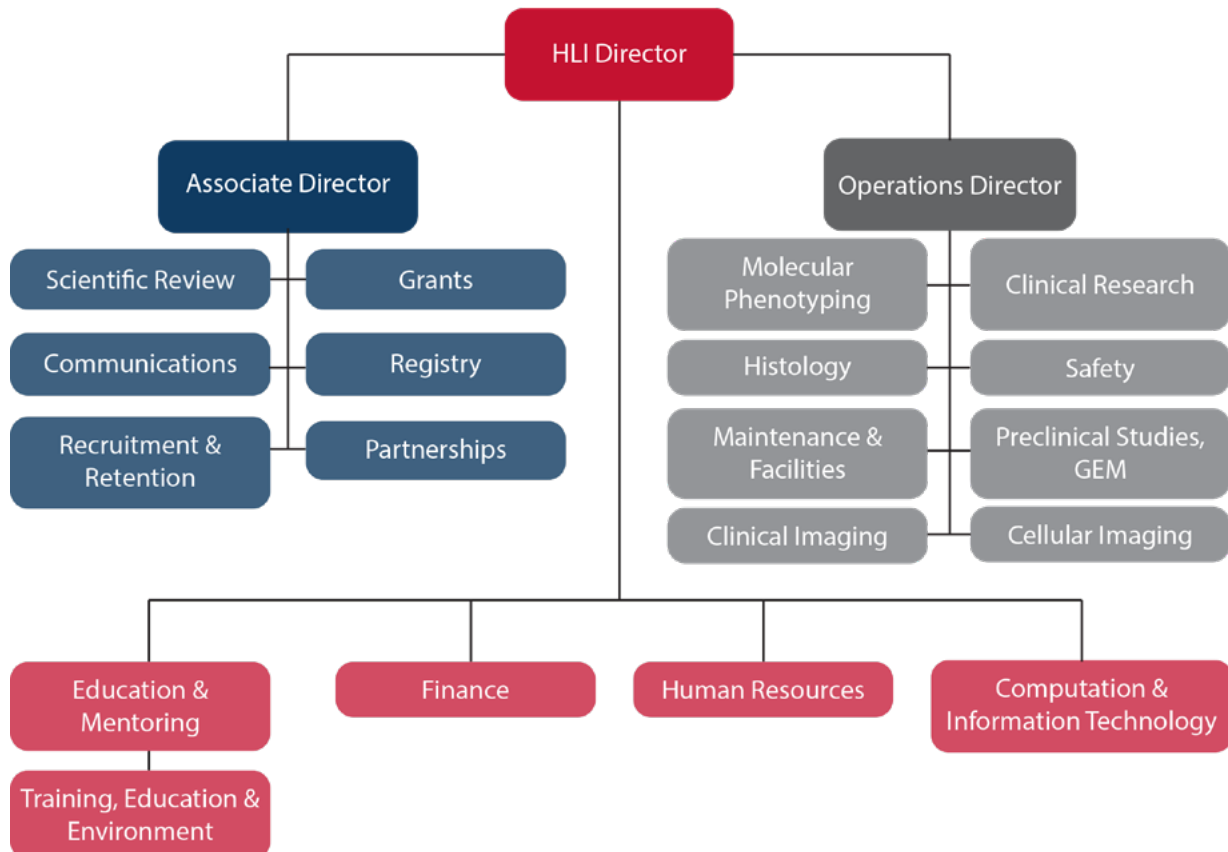
Finally, I wish to thank PHC, our donors, patients, and external partners who have made HLI a very special place to work and whose input and encouragement inspire us on a daily basis to discover, translate and innovate for the ultimate goal of bringing “exceptional care through exceptional science” for our patients with heart and lung diseases.

Thank you and all the best for 2021! The best is yet to come.

A handwritten signature in black ink, appearing to be "D. Sin".

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.





Research Spotlights

Top HLI research stories from 2020





HLI RESEARCHERS JOIN FORCES TO STUDY COVID-19

The global COVID-19 pandemic has affected millions around the world and claimed over 3 million deaths since 2020. Amidst the Provincial lockdown and research curtailment at UBC, many HLI researchers shifted their focus to studying SARS-CoV-2 and COVID-19, as part of the global effort to contain and develop treatments for COVID-19. Some of these publications include:

Repurposing therapeutics for COVID-19

To complement ongoing clinical trials of antivirals, Dr. James Russell assembled a national team to investigate whether losartan, an angiotensin II type 1 receptor blocker (ARB), can effectively target the host response to treat COVID-19. The team received over \$3.5 million from CIHR to conduct an observational study and subsequently, a clinical trial to test the effects of ARBs on COVID-19 outcomes. This study may result in the repurposing of ARBs, which are already clinically approved for the treatment of high blood pressure, heart failure, and diabetes, to decrease the severity of COVID-19 and prevent hospitalizations. Read the full study protocol [here](#).

Identification of ABO plasma protein as a causal risk factor for COVID-19

Using a multi-omics approach, Dr. Don Sin and his team identified plasma ABO protein, which also determines blood types, to be causally related with COVID-19 infection. Increased ABO was associated with not only increased risk of contracting COVID-19, but also increased risk of developing severe disease. Further studies are needed to determine how ABO actually affects COVID-19 pathophysiology. Read the full study [here](#).

Expression of ACE-2 in the airways of smokers and COPD patients

ACE-2 is the entry receptor for SARS-CoV-2, the virus responsible for COVID-19. Using bronchoscopy samples, Drs. Janice Leung, Tillie Hackett, Delbert Dorscheid, Don Sin, and their groups discovered an increase in ACE-2 expression in the airways of smokers and COPD (chronic obstructive pulmonary disease) patients. These results suggest that active cigarette smoking and COPD may increase the risk of severe COVID-19 infection, highlighting the importance of smoking cessation and closer monitoring of these at-risk sub-populations. Read the full study [here](#).

Understanding persistent breathlessness in COVID-19 survivors

Led by Dr. Jordan Guenette, the team found that survivors with varying initial COVID-19 severity displayed signs of dyspnea (breathlessness) 30-90 days after symptom onset. This presents as reduced exercise performance and impaired gas exchange at the physiological level. These findings will inform future therapeutic interventions and rehabilitation programs to hopefully improve lung function following COVID-19 recovery. Read the full study [here](#).



HLI RESEARCHERS JOIN FORCES TO STUDY COVID-19



Following up with COVID-19 patients

Patients who are discharged from the hospital following COVID-19 infection continue to experience symptoms and impairments in their daily lives. To better understand this phenomenon, Drs. Ryerson, Carlsten and their team established the Post-COVID-19 Respiratory Clinic to provide follow-up for these patients. During clinic visits, patients completed surveys and questionnaires on their symptoms. The team found that 76% of patients who were hospitalized for COVID-19 continue to report symptoms 3 months after hospital discharge, regardless of pre-existing comorbidities. These findings suggest that COVID-19 has longer impacts than the initial acute phase, and can cause a range of long-lasting impairments that need to be addressed for patients to fully recover from the disease. Read the full study [here](#).

In another study, Drs. Chris Carlsten and Chris Ryerson measured the clinical, radiological, and pulmonary function abnormalities that persist in COVID-19 patients 12 weeks after symptom onset. Over half of these patients had persistent abnormalities, and patients who spent more time on oxygen supplementation were also more likely to have chronic abnormalities. These studies not only stress the importance of preventing COVID-19 infection, but also provide evidence for further investigations into the chronic nature of COVID-19. Read the full study [here](#).



LUNG HEALTH

***“Bayis Ilh Tus – a strong breath”:* Studying COPD in First Nations Communities**

Respiratory diseases tend to be more common in First Nations communities, but the prevalence of chronic obstructive pulmonary disease (COPD) in these settings remains unknown. Cigarette smoking, one of the major risk factors for COPD, was introduced to these communities post-colonization, and is now more common within the Indigenous population than in the general population. Other risk factors that affect First Nations people’s lung health include the poor air quality in residential schools (the last children to attend these schools in 1996 are now adults), disparities in access to health care services, and living environments with elevated levels of environment pollutants, such as from wood burning and forest fires in Northern BC.

In partnership with Carrier Sekani Family Services, Dr. Pat Camp will use a random-sampling approach to estimate the prevalence of COPD in First Nations communities. The team will collect information on smoking history and other past and current risk factors. This information will be shared with the study participants and their health care providers to facilitate patient care. This study will also lead to increased awareness of COPD and support the planning and delivery of health services and prevent strategies in First Nations communities. Read the full study protocol [here](#).

Small Airways Disease in Idiopathic Pulmonary Fibrosis

Idiopathic pulmonary fibrosis (IPF) is a type of lung disease where fibrosis, or scarring is observed in the lungs, leading to decreased lung function. Previous studies have suggested that the airways are not damaged in IPF. Using a high-resolution imaging approach, Dr. James Hogg and a team of researchers re-examined this theory in a cohort of lungs that were donated by severe IPF patients who underwent transplantation. The team found significant evidence of small airways disease, with a loss of terminal bronchioles even in regions of minimal fibrosis. These findings demonstrate the importance of the small airways in IPF and suggest that small airways could be a potential therapeutic target in the treatment and prevention of IPF. Read the full study [here](#).

Generating a new antibody for targeted immunotherapy

Podocalyxin (Podxl) is a protein that is upregulated in tumours, and promotes tumour growth and metastasis. Although Podxl could be an effective therapeutic target for cancer therapy, its expression in the kidneys and blood vessels means that inhibiting Podxl non-specifically could have unintentional side effects. To overcome this challenge, Dr. Kelly McNagny and his group developed a new antibody that can specifically recognize Podxl expressed in tumours. This antibody, PODO447, was able to recognize a variety of tumours, including many life-threatening ovarian tumours. This study is an important first step towards developing anti-Podxl treatments for cancer therapy. Read the full study [here](#).

A new strategy to improving sepsis survival

Sepsis is caused by the body's overwhelming response to infection, leading to damage to organ systems and potentially death. During sepsis, plasma levels of HDL-cholesterol drop dramatically, partly because of increased CETP (cholesteryl ester transfer protein) activity. Dr. Liam Brunham and his laboratory, including first author Mark Trinder, a MD/PhD student, found that inhibiting CETP not only preserved HDL levels during sepsis, but also improve outcomes and increased survival.

Using a mouse model of experimental sepsis, the group found that mice treated with anacetrapib (a CETP inhibitor) increased survival compared to the placebo group. Further, using data from the UK Biobank, decreased CETP function was found to be associated with significantly decreased sepsis mortality. These results suggest that CETP may be an effective therapeutic target for sepsis treatment, and future studies will determine whether anacetrapib or other CETP inhibitors can be used to treat patients with sepsis. Read the full study [here](#).



**DEVELOPING NEW THERAPIES
FOR CANCER AND SEPSIS**



INVESTIGATING UNDERLYING DISEASE MECHANISMS

Granzyme B as a therapeutic target for autoimmune blistering diseases

Pemphigoid diseases (PDs) are a group of severe autoimmune skin blistering diseases that are currently treated with topical or oral corticosteroids. However, these treatments are non-specific and often lead to severe and potentially fatal adverse reactions.

In an effort to discover new therapeutic targets, Dr. David Granville and his study team investigated the role of granzyme B, a protease secreted by immune cells, in the pathogenesis of PDs. Using mouse models, the team found that genetically knocking out granzyme B or administering granzyme B inhibitors significantly reduced skin blistering. Granzyme B levels are normally increased in these blisters, and this study shows that inhibiting granzyme B may be a viable strategy to treating PDs. Read the full study [here](#).

Uncovering new mechanisms in Coxsackievirus infection

Coxsackievirus B3 (CVB3) is a common virus that can trigger a range of diseases from neurological disorders to myocarditis. Autophagy is generally considered to be an anti-viral mechanism within the host, as it can selectively destroy viral particles. However, there is emerging evidence that viruses can actually take advantage of the autophagy process to facilitate infection. Using gene editing and cultured cells, Dr. Honglin Luo and her team found that CVB3 can trigger the autophagy process through a non-canonical pathway that is not normally used by the host. These results reveal a new pathway for initiating autophagy, apart from the traditional starvation-induced autophagy pathways. Read the full study [here](#).

38 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
Tillie Hackett
James Hogg
Andrew Krahn
Zachary Laksman
Scott Lear
Jonathon Leipsic
Janice Leung

Honglin Luo
Paul Man
Bruce McManus
Kelly McNagny
Raymond Ng
Peter Paré
Brad Quon
James Russell
Chris Ryerson
Andrew Sandford
Robert Schellenberg
Chun Seow
Don Sin
Wan-Cheng Tan
Andrew Thamboo
Scott Tebbutt
Stephan van Eeden
Keith Walley
Decheng Yang

28 AFFILIATED INVESTIGATORS

Jamil Bashir
Philipp Blanke
Sammy Chan
Karen Cheung
Ed Conway
Harvey Coxson
Raouf Dridi
Mark FitzGerald
Jiri Frohlich
Andrew Ignaszewski
Kevin Keen
Ismail Laher
Samuel Lichtenstein
John Mancini

Yannick Molgat-Seon
Ed Moore
Ma'en Obeidat
Simon Pimstone
Jonathan Rayment
Fabio Rossi
Mohsen Sadatsafavi
Michael Seidman
Bill Sheel
Peter Skaarsgard
Stacey Skoretz
Pearce Wilcox
Jian Ye
Xuekui Zhang



Dr. Michael Allard

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

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

UBC Department of Medicine

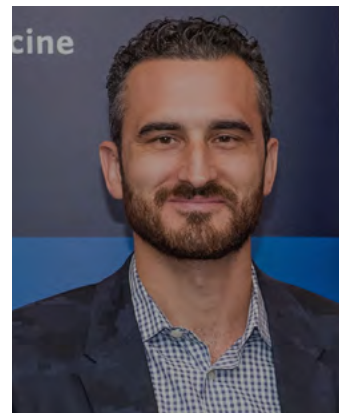
Dr. Boyd’s clinical research program is focused on defining and reversing the elements of the host response that causes sudden organ failure during severe infection. In collaboration with Dr. Robert Hancock, he recently identified a 31 gene endotoxin tolerance profile which predicts subsequent organ 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

UBC Department of Medicine | CRC Tier 2 | MSFHR Scholar

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
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
UBC Department of Medicine | CRC 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 on genetic, cellular, functional, and epidemiologic levels.



Dr. Denise Daley
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
UBC Department of Pathology and Laboratory Medicine | MSFHR Scholar

Dr. DeMarco is a Clinical Chemist at St. Paul's Hospital and her research focus is on impacting patient care through developing and translating new and/or improved biofluid tests for peptide and protein biomarkers into routine care. This includes developing biofluid diagnostic tests for Alzheimer's disease and related forms of dementia. Dr. DeMarco participates in guideline development for clinical laboratory standards for mass spectrometry assays, serves on the board of editors for the leading journal in laboratory medicine, and has leadership roles in professional organizations such as the American Association for Clinical Chemistry, Mass Spectrometry: Applications to the Clinical Lab and the BC Association of Clinical Scientists.





Dr. Delbert Dorscheid

UBC Department of Medicine | MSFHR 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.

Dr. Gordon Francis

UBC Department of Medicine | MSFHR 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

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, atherosclerosis, 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

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. Tillie-Louise Hackett

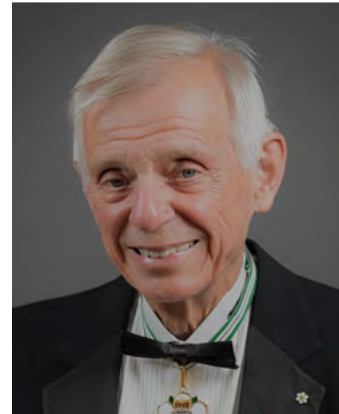
UBC Department of Anesthesiology, Pharmacology, and Therapeutics | CIHR New Investigator

Dr. Hackett’s research is focused on understanding the disruption of normal repair processes within the epithelial-mesenchymal trophic unit of the lung and how this propagates inflammation and tissue remodeling in patients with obstructive lung disease. Her lab uses Computed Tomography imaging to isolate cells from donor lungs. The goal of this research program is to further understand the airway microenvironment to determine therapeutic targets in order to prevent the initiation and perpetuation of pathological processes which contribute to obstructive airway diseases like asthma and chronic obstructive pulmonary disease.

Dr. James Hogg

UBC Department of Pathology and Laboratory 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. Andrew Krahn

UBC Department of Medicine | Sauder Family and HSF Chair

Dr. Krahn has research 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

UBC Department of Medicine | MSFHR 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 medicines to it, and study the cause of the disease and the effect of treatment.





Dr. Scott Lear

SFU Faculty of Health Sciences | Pfizer/HSF Chair in Cardiovascular Prevention Research

Dr. Lear’s research spans the breadth of prevention of cardiovascular disease at a population level to the management of cardiovascular disease at an individual level (www.CoHeaRT.ca). This includes the identification of environmental characteristics that may act as facilitators and barriers of healthy lifestyle habits, investigation to identify the role of ethnic background in risk for obesity, diabetes and cardiovascular disease and how technology can help improve health care access and delivery. He is an engaged scientific communicator through his blog (www.DrScottLear.com) and various commentaries.

Dr. Jonathon Leipsic

UBC Department of Radiology | CRC 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 these 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

UBC Department of Medicine | MSFHR Health Professional Investigator | CIHR-AstraZeneca Early Career 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

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 (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 (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
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. Raymond Ng
UBC Department of Computer Sciences | CRC Tier 1

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.





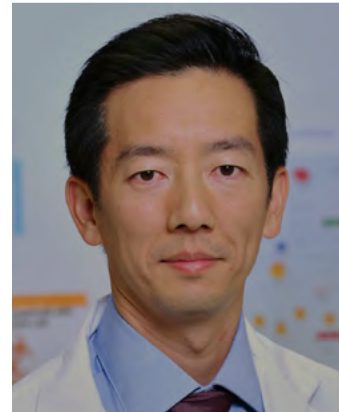
Dr. Peter Paré (Emeritus)
UBC Department of Medicine

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'én Obeidat, he studied the genetic control of gene expression in the lung and blood of COPD patients.

Dr. Bradley Quon

UBC Department of Medicine | MSFHR 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
UBC Department of Medicine

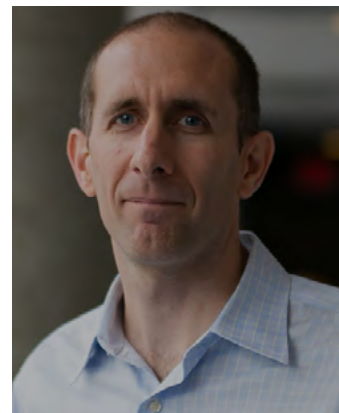
Dr. Russell has published over 285 articles and 45 book chapters; he serves on the editorial boards of 5 journals. He also wrote the septic shock chapter for the prestigious Goldman's Cecil Medicine. Dr. Russell has three major current themes of research: 1) randomized controlled trials in patients with 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

UBC Department of Medicine | MSFHR 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
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. Robert Schellenberg
UBC Department of Medicine



Dr. Robert Schellenberg is an Internist and Allergist / Immunologist at St. Paul's Hospital. He received his MD from the U. of Manitoba and did post-doctoral training at the Health Sciences Centre in Winnipeg and at the Johns Hopkins School of Medicine in Baltimore. The focus of his research is on asthma and allergic inflammation with primary interests in the mechanisms of excessive airway narrowing of asthmatic tissues and the modulation of chemotaxis and apoptosis (programmed cell death) of basophils and eosinophils. His investigations of human airways has brought attention to the importance of changes in extracellular matrix elements as the cause of excessive smooth muscle shortening in asthma.



Dr. Chun Seow
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
UBC Department of Medicine | CRC 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
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
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
UBC Department of Surgery | MSFHR 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 Respiriologists, 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
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
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. Decheng Yang

UBC Department of Pathology and Laboratory Medicine

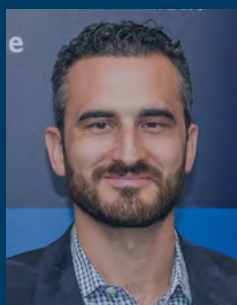
Dr. Yang's research is focused on the pathogenesis of coxsackievirus B3 (CVB3)-induced myocarditis. Ongoing research projects include: 1) Molecular mechanisms of CVB3 replication, specifically focusing on the role of cellular 5'TOP, 2) The role of m6A methylation in viral replication efficiency and pathogenesis, 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.



FACULTY AWARDS



Dr. Andrew Krahn
UBC Killam Research Prize



Dr. Liam Brunham
American Society for Clinical Investigation Young Physician Scientist Award;
Canadian Cardiovascular Society Young Investigator Award



Dr. Bradley Quon
Cystic Fibrosis Foundation Clinical Research Award



Dr. Delbert Dorscheid
AllerGen Michelle Harkness Mentorship Award



Dr. Don Sin
Tier 1 Canada Research Chair in COPD (Renewal)



Dr. Jonathon Leipsic
UBC FoM Distinguished Achievement (Senior Faculty)



Dr. Keith Walley
Bill and Marilyn Webber Lifetime Achievement Award



Dr. Jamil Bashir
Surgery, UBC



Dr. Philipp Blanke
Radiology, UBC



Dr. Sammy Chan
Medicine, UBC



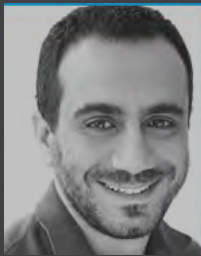
Dr. Karen Cheung
Biomedical Engineering,
UBC



Dr. Ed Conway
Medicine, UBC



Dr. Harvey Coxson
Boehringer Ingelheim



Dr. Raouf Dridi
Quantum Computing



Dr. Mark FitzGerald
Medicine, UBC



Dr. Jiri Frohlich
Pathology, UBC



Dr. Andrew Ignaszewski
Medicine, UBC



Dr. Kevin Keen
Mathematics, UNBC



Dr. Ismail Laher
Anesthesiology, UBC



Dr. Samuel Lichtenstein
Surgery, UBC



Dr. John Mancini
Medicine, UBC



Dr. Yannick Molgat-Seon
U. Winnipeg



Dr. Ed Moore
Physiology, UBC



Dr. Ma'en Obeidat
Novartis



Dr. Simon Pimstone
Medicine, UBC

AFFILIATED INVESTIGATORS



Dr. Jonathan Rayment
Pediatrics, UBC



Dr. Fabio Rossi
Biomedical Engineering,
UBC



Dr. Mohsen Sadatsafavi
Pharmaceutical Sciences,
UBC



Dr. Michael Seidman
UHN



Dr. Bill Sheel
Kinesiology, UBC



Dr. Peter Skaarsgard
Surgery, UBC



Dr. Stacey Skoretz
Audiology, UBC



Dr. Pearce Wilcox
Medicine, UBC



Dr. Jian Ye
Surgery, UBC



Dr. Xuekui Zhang
Mathematics, UVic



PI GRANTS
Awarded in 2020

CIHR COVID-19 Grants

Dr. Jim Russell

Host Response Mediators in Coronavirus Infection
ARBs CORONA II

Canada Foundation for Innovation

Dr. Mari DeMarco

The ABCD Consortium: Accelerating Blood and Cardiopulmonary
COVID-19 Diagnostics

CIHR Project Grant

Dr. Decheng Yang

Role of transcription factor NFAT5 in viral myocarditis: a novel
strategy for therapy

Drs. Liam Brunham & John Boyd

CETP inhibition as a novel treatment to remove pathogen lipids
and improve survival in sepsis

Dr. Honglin Luo

Enterovirus subversion of the autophagy pathway

Dr. Kelly McNagny

Maternal exposures during pregnancy as drivers of susceptibility
to allergic asthma and Th2 inflammation

CIHR Team Grant: Cannabis Research in Priority Areas

Drs. Janice Leung and Don Sin

Canadian Users of Cannabis Smoke Study (CANUCKs): Impact on
Lung Health via Clinical, Imaging, and Biologic Measures

CIHR Catalyst Grant: Health Effects of Vaping

Dr. Don Sin

Effects of ecigarettes on lung health: the VAPE study

Dr. Del Dorscheid

VAPING: the unknown perils of inhalation and epithelial injury

Dr. Chris Carlsten

Lung Health Benefits of E-cigarette Cessation

BC Lung Grant-in-Aid

Dr. David Granville

Defining novel roles for granzyme K in allergic airway inflammation

Dr. Honglin Luo

Novel oncolytic virus for lung cancer treatment

Genome BC

Drs. Chris Ryerson and Scott Tebbutt

Blood single-cell RNA sequencing of fibrotic interstitial lung
disease subtypes

Dr. Don Sin

Endo-phenotyping of human alveolar macrophages from
bronchoalveolar lavage

Canadian Lung Association - Breathing As One

Dr. Pat Camp

COPD Alert! Telehealth System



PI GRANTS
Awarded in 2020

Stem Cell Network - Accelerating Clinical Translation

Dr. Zachary Laksman

Stem cell disease modeling and high throughput screening for personalized therapy of atrial fibrillation

Canadian Donation and Transplantation Research Program

Dr. Bruce McManus

Identification of novel cell-specific immunosuppressive therapies from high resolution single-cell RNA sequencing

Dr. Scott Tebbutt

Investigating regulatory T cell gene signature in blood during acute cardiac transplant rejection

Cancer Research Society Operating Grant

Dr. Honglin Luo

Novel oncolytic virus for lung cancer treatment

Dr. David Granville

Granzyme B: A novel target for the treatment of radiodermatitis

LEO Foundation Open Competition Grant

Dr. David Granville

Granzyme B: A novel therapeutic target in cutaneous leishmaniasis

Boehringer-Ingelheim

Dr. Chris Ryerson

Canadian Registry for Pulmonary Fibrosis: CARE-PF

Scleroderma Association of BC

Dr. Chris Ryerson

SABC Research Program

Cystic Fibrosis Foundation

Dr. Brad Quon

C-reactive protein and calprotectin to diagnose CF pulmonary exacerbations

Jain Foundation

Dr. Pascal Bernatchez

Cholesterol in Muscular Dystrophies

UBC Faculty of Medicine Strategic Investment Fund

Drs. Chris Carlsten and Chris Ryerson

COVID-19 interdisciplinary clinical care network and research platform

UBC Research Facility Support Grants

Drs. Honglin Luo and Scott Tebbutt

Core Service Facilities at the James Hogg Research Centre

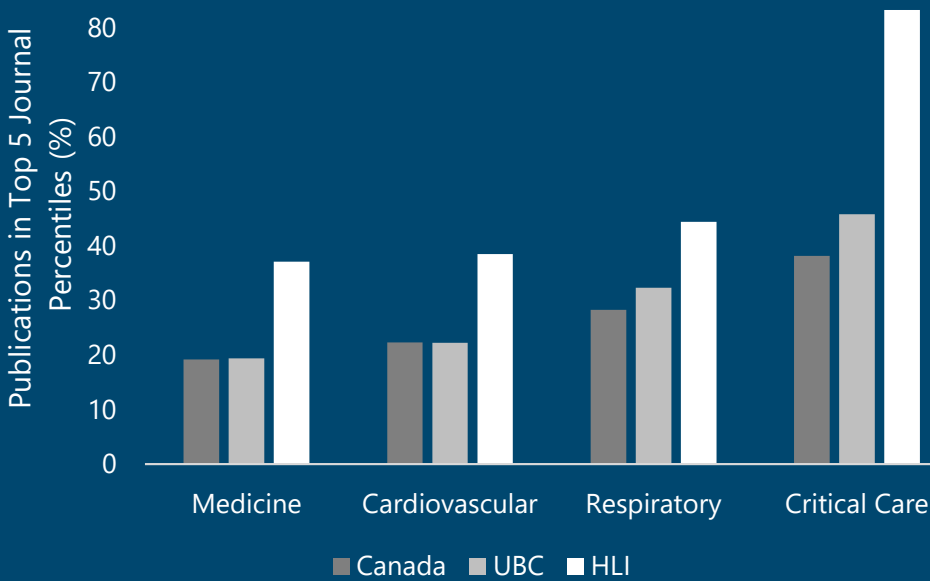
Dr. Don Sin

Biobanking and Tissue Registries at the UBC Centre for Heart Lung Innovation



In 2020, HLI Principal Investigators published **379** Peer-reviewed journal articles, together receiving **2,158** Citations

HLI researchers published more frequently in top journals compared to UBC and Canadian researchers, and are cited **2.75** times more than the average paper in the field.*



High-impact publications in

- New England Journal of Medicine
- Journal of the American Medical Association
- Lancet Respiratory Medicine
- European Respiratory Journal
- Nature Communications
- European Heart Journal
- Circulation
- Journal of Allergy and Clinical Immunology
- American Journal of Respiratory and Critical Care Medicine

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



Knowledge Mobilization

HLI RESEARCHERS IN THE NEWS





COVID-19 IN THE COMMUNITY

Image from Canadian Press - Jonathan Hayward

ICU doctors comment on COVID-19 pandemic

As COVID-19 cases started to affect Canadians, there were many uncertainties regarding the progression and severity of the disease. Dr. John Boyd, HLI PI and an intensivist at St. Paul's Hospital, was interviewed by [CTV Toronto](#) in the spring of 2020. In general, COVID-19 causes symptoms that are typical for infections - fever and respiratory symptoms - but when patients start to experience difficulties breathing, it's time to head to the hospital for more intensive care such as ventilator support. Shortness of breath is an indication that the lungs are swelling and stiffening, making it difficult for patients to get enough oxygen. Compared to other infections, severe COVID-19 takes longer for recovery, making it challenging to maintain hospital capacity when cases surge.

By the fall of 2020, the understanding of COVID-19 and how to best treat patients had substantially improved, and the death rate for severe COVID-19 has decreased. In an article published by [The Daily Scan](#), Dr. Delbert Dorscheid discusses how COVID-19 causes severe inflammation throughout the body, which leads to small clots that cause multi-organ failure and strokes. Patients are also not getting enough oxygen, so the first line of treatment is often a combination of steroids to combat infection, anti-coagulants, and oxygen.

Physicians observe dramatic decreases in patients seeking care during the pandemic

Near the start of the COVID-19 pandemic, as BC canceled elective surgeries and advised everyone to stay home as much as possible, physicians noticed a dramatic decrease in patients seeking care. This was especially concerning for patients with serious heart problems.

In an interview with [CTV News](#), Dr. Andrew Krahn, HLI PI and president of the Canadian Cardiovascular Society, voiced concerns about this trend that was being observed across Canada. At the time, there was a 50-60% decrease in patients visiting the hospital and clinics for cardiac issues, likely because patients are avoiding healthcare facilities over fears of contracting COVID-19 or being turned away. Physicians tell patients that hospitals are safe during the pandemic, and encourage patients to seek care to avoid serious consequences.



INITIATING COVID-19 STUDIES

Developing new tests for COVID-19

COVID-19 causes a range of symptoms in patients, from very mild or no symptoms to life-threatening complications. To better identify which patients are at risk of developing severe illness, Dr. Mari Demarco, HLI PI and a clinical chemist at St. Paul's Hospital received funding to develop a new blood test. In an article of [The Daily Scan](#), Dr. DeMarco explains how this test detects antibodies in the blood to monitor 'high-risk' patients and guide patient care.

COVID-19 testing has always been an important part in managing the pandemic. In particular, rapid testing could be useful for screening air travel passengers and other settings to identify asymptomatic carriers of COVID-19. In collaboration with YVR, WestJet, and other Providence Health Care researchers, Dr. Don Sin and the team initiated a pilot study for WestJet passengers. Using a rapid antigen test that only takes 15-20 minutes, the team is screening all eligible passengers to understand the feasibility of this test and whether asymptomatic carriers are contributing to transmission of the disease. Read more about this study in [Global News](#), [CTV News](#), [CBC News](#), [UBC News](#), and [The Daily Scan](#).

COVID-19 "Long-haulers"

Led by Drs. Chris Ryerson and Chris Carlsten, researchers at HLI found that over 75% of hospitalized COVID-19 patients continue to report symptoms months after their acute illness resolves. These long-hauler symptoms include shortness of breath, difficulties breathing, and a general decrease in their quality of life. In an interview with [CBC News](#), the researchers discuss their recent findings and urge physicians to take 'long-hauler' COVID-19 patients more seriously, as their symptoms are often doubted and dismissed.

St. Paul's Foundation: Funding the Fight

Since the start of the pandemic, St. Paul's Foundation and its donors have been critical to supporting COVID-19 research efforts, especially in the establishment of the COVID-19 Response Fund. This funding has supported:

- Developing rapid COVID-19 testing (Sin)
- Repurposing drugs for COVID-19 treatment (Russell)

Learn more about these studies in this [Vancouver Sun](#) article.

“No Butts About It”

Stopping smoking at any age can lead to immediate health effects. In an article on [The Daily Scan](#), Dr. Delbert Dorscheid discusses what happens when someone stops smoking. After quitting, individuals may experience coughing, which seems counter-intuitive, but is actually the body's way of eliminating the excess mucous and other toxins from the lungs. Blood pressure and cardiovascular health also improves, lung function starts to return to normal, and breathing becomes easier. However, nicotine is one of the most addictive substances, making it potentially more difficult to quit than street drugs. Although it could take years for the full benefits to kick in, quitting smoking is hugely beneficial for health and Dr. Dorscheid urges all smokers to consider quitting, even if it takes multiple tries.

Inherited high cholesterol: is 25 the new 40?

High cholesterol levels are linked to atherosclerosis and can lead to heart attacks and stroke. In an article on [The Daily Scan](#), Dr. Liam Brunham discusses the importance of cholesterol screening on younger people. This would allow for earlier treatment to lower cholesterol levels and prevent future development of cardiovascular diseases.

BC Lung Virtual Patient Forum

On November 18, 2020, World COPD Day, Drs. Don Sin, Janice Leung, and Wan Tan shared their insights and expertise on COPD with a large audience of patients and caregivers. Presentations included a discussion of how COPD has evolved from the past and insights into the future, as well as the relationship between COPD and COVID-19. The exact presentation content can be found on the [BC Lung website](#).

**PUBLIC ADVOCACY:
HEART AND LUNG HEALTH**





EDUCATION

Training the next generation of scientists



The HLI prides itself on its success in attracting international trainees and research personnel from all over the world. In the past 5 years, the HLI has hosted trainees and research personnel from **39 countries** and **6 continents**.



UBC Faculty of Medicine Career Week

MAY 4-8, 2020

HLI hosted the first ever FoM Virtual Career Week

CAREER PANELS

Careers in Industry Research & Development
Academic Research and Teaching
Non-traditional Careers

WORKSHOPS

Building a Network and a LinkedIn Profile
#SciComm: More Than Just a Hashtag

ORGANIZERS

HLI Trainee Association
FoM Graduate and Postdoctoral Education
Providence Health Care Research Institute
BC Children's Hospital Research Institute
Centre for Blood Research
Vancouver Coastal Hospital Research Institute
BC Cancer GrasPods

130+

Unique participants per session

1,048

Total participants (not unique) over the week

10+

UBC and non-UBC units reached

85%

Average rating from participants



SUMMER STUDENTS HLI RESEARCH DAY

Image from 2019 Research Day

Throughout the year, numerous undergraduate students are trained at the HLI through co-operative education programs, directed studies programs or various employment opportunities. Our busiest time of year is May to August when undergraduate students participate in our Summer Student Research Program (HLI-SSRP). Students are mentored by a professor and an immediate supervisor, and gain hands-on basic science laboratory experience while working on a research project. Not only does each student learn, in detail, one or two technologies per four-month or eight-month fellowship, but, more importantly for this formative period of development, students learn the critical logic of complementary technologies and when to employ them to experimental advantage.

In 2020, the HLI hosted **33 summer students** through our Summer Student Research Program, and their experience culminated in the HLI Research Day, a combination of previous years' Summer Student Research Day and Trainee Research Day.

Hosted by the Trainee Association, HLI Research Day was held virtually through Zoom and Twitter on August 21, 2020. Awards were presented for the following presentations:

Oral Presentations: Mark Trinder, Tony Guo, Julia Zhang

1-Minute Thesis: Emmanuel Osei, Lauren Choi, Jinelle Panton, Carleena Ortega

Twitter "Poster" Competition: Daniel He, Min Ryu, Ana Hernandez

Peter D. Paré Scholarships: Aileen Hsieh, Tony Guo



The Centre for Heart Lung Innovation holds two weekly seminars, the Research in Progress Seminar Series and the HLI Friday Seminar Series, both of which run from September through June each year. In March 2020, all seminars were temporarily paused and shifted to a virtual format.

The HLI Friday Seminar Series features invited experts in specific fields from all over the world to give talks which encourage education and collaboration. Detailed information about the 2019 HLI Friday Seminars can be found in [Appendix C](#). The Research in Progress seminar series gives graduate students and post-doctoral fellows at the HLI the opportunity to present their ongoing research to other HLI researchers. 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 program. Detailed information about the 2019 Research in Progress Seminars can be found in [Appendix D](#).

Established in 2018, the **HLI Trainee Association's** mission is to enhance the academic experience of HLI trainees by promoting a training environment enriched with collaboration, education, professional growth, and career success. In 2020, the Association was chaired by Daniel He and Carleena Ortega, overseen by Dr. Scott Tebbutt, HLI's Educational Director, and includes all graduate students and postdoctoral trainees at the HLI. In 2020, the Trainee Association hosted multiple events, including the [FoM Career Week](#), Trivia Night, Paint Night, and many more.





Trainee Scholarships & Fellowships

Awarded in 2020

Sana Aghakeshmiri (Yang)

NSERC USRA

Katrina Besler (Francis)

Vanier Canada Graduate Scholarship

Abhinav Kumar Checkervarty (Tebbutt)

Mitacs Accelerate

Dr. Rachel Eddy (Sin, Leipsic)

MSFHR Research Trainee

Lauren Forgrave (DeMarco)

CIHR Doctoral Award

Dr. Alex Franciosi (Quon)

MSFHR Research Trainee

Dr. Ana Hernandez (Leung, Sin)

Mitacs Accelerate

Dr. Sho Hiroyasu (Granville)

CIHR Fellowship

Rylan McCallum (Brunham)

NSERC USRA

Dr. Stephen Milne (Sin)

Mitacs Accelerate

Reid Mitchell (Guenette)

BC Lung Respiratory Rehabilitation Fellowship

Jinelle Panton (Tebbutt)

Mitacs Accelerate

Debora Petry-Moecke (Camp)

BC Respiratory Rehabilitation Fellowship

UBC International Tuition Award

UBC Faculty of Medicine Graduate Award

Andrew Ramsook (Guenette)

NSERC Michael Smith Foreign Study Supplements Program

Katlyn Richardson (Granville)

CIHR Doctoral Award



Trainee Scholarships & Fellowships

Awarded in 2020

Elodie Sauge (Bernatchez)

Mitacs Accelerate

Srijan Subedi (Dorscheid)

FoM Summer Student Research Program Award

Dr. Anthony Tam (Sin)

Mitacs Accelerate

Arash Tehrani (Bernatchez)

UBC Graduate Scholarship Award

Justin Turner (Camp)

BC Lung Respiratory Rehabilitation Fellowship

UBC Aboriginal Graduate Scholarship

IKB BC Scholarship Society Indigenous Doctoral Student Award

UBC Faculty of Medicine Graduate Award

Elizabeth Henry Scholarship for Communities & Environmental Health

UBC Rehabilitation Sciences Alumni Margaret Hood Scholarship in

Occupational Therapy

Indspire Building Brighter Futures Indigenous Student Bursary

Dr. Mai Tsutsui (Sin)

Uehara Memorial Foundation Research Fellowship

Mitacs Accelerate

Kauna Usman (Hackett)

Mitacs Accelerate

Dr. Dragos Vasilescu (Hogg)

Parker B Francis Fellowship

Jing Wen (Sin)

Mitacs Accelerate

Dr. Zoe White (Bernatchez)

Mitacs Accelerate

Dr. Alyson Wong (Ryerson)

MSFHR Research Trainee

Tim Xue (Luo)

CIHR Doctoral Award



Other Trainee and Staff Awards

Awarded in 2020

Dr. Steve Booth (Hackett)

ATS Best Science and Innovation Abstract Award

Dr. Paul Hanson (McManus)

Histochemical Society Travel Award

Daniel He (Tebbutt, Ryerson)

Faculty of Medicine Research Day - 3-Minute Thesis Award

Dr. Stephen Milne (Sin)

BC Lung Grant-in-Aid

ATS Abstract Scholarship

CTS Poster Competition Award

Carleena Ortega (Francis)

UBC Experimental Medicine MSc GPA Award

Dr. Emmanuel Osei (Hackett)

ATS Abstract Scholarship

Department of APT Best Paper of the Year Award

Dr. Stuart J. Hirst Award

Best APT 1-minute Thesis Presentation Award

Katlyn Richardson (Granville)

VCHRI Rising Star Award

UBC President's Academic Excellence Initiative PhD Award

Simran Samra (Tebbutt)

UBC Experimental Medicine MSc GPA Award



HLI OPERATIONS



Throughout the pandemic, the staff of the Molecular Phenotyping Core (pictured on the right) were in the lab on a regular basis supporting equipment that was being used for COVID-19 research as well as other research endeavours. We were also involved in facilitating transfer of a very large Biobank to HLI. We received over 1,000 freezer boxes containing up to 100 fluid biospecimens per box. We were also fortunate to receive CFI funds to be able to update some of our aged equipment such as replacing our Applied Biosystems ViiA 7 with the QuantStudio 6 Pro Real-Time PCR instrument.

MPCL staff contributed significantly to the following paper published in Biomedicines:

Akata K, Yamasaki K, Leitao Filho FS, Yang CX, Takiguchi H, Sahin B, Whalen BA, Yang CWT, Leung JM, Sin DD, van Eeden SF. Abundance of Non-Polarized Lung Macrophages with Poor Phagocytic Function in Chronic Obstructive Pulmonary Disease (COPD). *Biomedicines*. 2020 Oct 8;8 (10):398. doi: 10.3390/biomedicines8100398. PMID: 33050042; PMCID: PMC7650830.

MOLECULAR PHENOTYPING



Basak Sahin (left) and Beth Whalen (right)

TISSUE CULTURE CORE



HLI'S Tissue Culture facilities include primary and secondary culture rooms along with containment level two virus rooms for use by all HLI members. All facilities are inspected, biosafety cabinets are annually certified and incubators monitored. All is overseen by a tissue culture manager.

In March 2020, daily research activities in our tissue culture (TC) core facility operations needed to pivot to avoid losing critical biological materials.

The TC group was able to prioritize and maintain frozen cell stocks and provide support to essential COVID related TC work so projects could continue. Arrangements were made to ensure a steady supply of liquid nitrogen was available to maintain cryopreserved stocks during the shut down period.

With the help of our HLI maintenance team, the TC core supported projects with a steady stream of supplies of essentials such as ethanol, bleach and carbon dioxide. These efforts were successful in providing ongoing support for research groups conducting cell biobanking and to complete time sensitive projects for students aiming to graduate in the summer of 2020 as well as publication deadlines to be met.

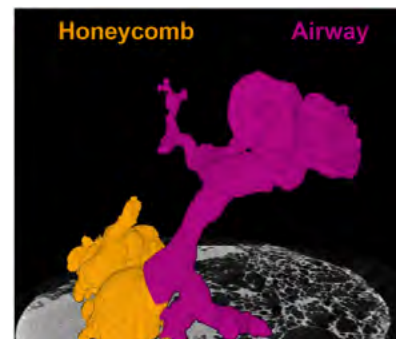


CELLULAR IMAGING AND BIOPHYSICS CORE

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. Feature instruments include the Zeiss LSM 880 confocal microscope with super-resolution and multiphoton capabilities, and the Nikon XTH 225-ST high-resolution microCT scanner. While the onset of the COVID-19 pandemic slowed on-site activities at the CIB in 2020, it was nonetheless a productive year for the CIB team, with several major projects producing significant research results.

Research Highlights:

- Led by Dr. Vasilescu, the CIB has undertaken a major study of the parenchymal structures of lung tissues in idiopathic pulmonary fibrosis. This study required several hundred hours of microCT scanning time to scan over 200 frozen tissue samples. This study aims to understand the underlying pathologies of interstitial lung disease and relate them to radiological and clinical diagnostic criteria. This study has already resulted in several notable publications in [Lancet Respiratory Medicine](#) and the [American Journal of Pathology](#).
- The CIB is always aiming to publish new imaging methods and protocols. These methods generally become part of manuscripts and are included in online supplements. A new [study](#) that described the implementation of an unbiased assessment of the human lung, showed that there are significant anatomical differences between females and males which could explain why females are more susceptible to some lung diseases such as COPD.
- The CIB has continued our ongoing collaborations with the cardiology group of Dr. John Webb, using microCT imaging to help elucidate the performance and failure modes of transcatheter heart valves and formation of calcium deposits on valve leaflets. The [studies](#) have helped inform clinical best practice for redeployment and replacement of transcatheter valves in patients.
- Dr. Barlow has also conducted technical research of high-resolution microscopy, demonstrating a method for combining multiphoton and super-resolution microscopy to greatly improve the performance of the Centre's LSM 880 microscope system. This work was published in [PLoS One](#).
- Imaging work from the CIB has been featured in a number of other studies throughout the HLI, including research on COPD, asthma, and atherosclerosis. The CIB has also recently completed a microCT scanning project of lung tissues from COVID-19 patients (unpublished).





**photo taken pre-pandemic*

PRECLINICAL SERVICES

GEM Facility staff were considered essential workers during the pandemic and through daily rotation and teamwork, maintained all projects and research colonies with no losses.

This was a fantastic accomplishment for the team and one to be proud of.

In 2020, we contributed to a number of research projects involving research projects working on Amyotrophic lateral sclerosis (ALS) Disease, Marfan's Syndrome, Muscular Dystrophy, Cardiovascular Disease, Chronic Obstructive Pulmonary Disease, Emphysema ensuring animal welfare was maintained.

The Histology Core was kept busy during the pandemic with ongoing projects and the purchase of a new Tissue Micro Array known as a TMA. Thanks to a COVID-19 related CFI, this new addition represents a significant move towards the ability to provide an economical and consistent level of quality in immunohistochemistry. As many as a few hundred samples can be fit onto a single slide and all can be stained simultaneously. Paraffin blocks can be sectioned and stained homogeneously.

The other exciting new technology we have is an upgrade to our existing BondRx which provides an easy way for labs to fully automate tests and accelerate their research programs. This upgrade also allows us to perform in situ hybridization (ISH). Leica Biosystems has also partnered with other companies which will allow us to expand with additional multiplexing options.

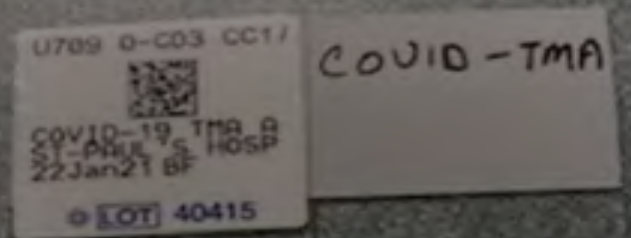
Traditional immunohistochemistry (IHC) preserves spatial context but is limited to 2 to 3 biomarkers per sample. Next-generation sequencing (NGS) enables the analysis of multiple biomarkers but the spatial context of the tissue is lost. Spatial biology (multiplex IHC) addresses these limitations by enabling the analysis of multiple biomarkers in a tissue section while preserving their spatial context.

Chromogenic Multiplex IHC Staining for Rapid Biomarker Tissue Profiling, uses cocktails of antibodies. Simple, fast, simultaneous staining using cocktails of 3–4 antibodies. You can order a Range of pre-optimized panels for key biomarkers or create your own custom panel.

The Histology Core looks forward to further expansion of their technical capabilities and equipment catalogue in 2021.



HISTOLOGY CORE





CARDIOVASCULAR TISSUE REGISTRY

In the past year, the Cardiovascular Registry (CVR) in the Centre for Heart Lung Innovation continued operations and scientific development in all aspects of biobanking, developing COVID-19-based research directions, establishing new, world-class collaborations and strengthening existing ones. The COVID-19 pandemic did not hinder the CVR from producing important and advanced work but has actually become a driving force for research conducted over the past year. The CVR team has continued to biobank surgical and autopsied cardiac tissue from St. Paul's Hospital, including explanted hearts, valve replacement tissues, ventricular assist devices, prosthetics, and more, adding to our repository of over 100,000 specimens to further cardiovascular research.

Additionally, to study the effects of COVID-19 on the heart, collaborations were forged with the University of Nebraska Medical Centre (UNMC), where we developed a project using COVID-19-positive autopsy tissue from UNMC to delineate the mechanisms of cardiac injury. We further employed novel techniques of digital spatial profiling in association with Nanostring Technologies and are in the end stages of our research regarding the spatial transcriptomics of SARS-CoV-2 infection of the heart compared to other cardiotropic viruses. Our findings have been documented in manuscripts submitted for publication and presented at multiple renowned conferences across North America, such as the National Heart Lung and Blood Institute (NHLBI) and Histochemical Society workshops. In addition to our close connection with the UNMC, over the past year, we have expanded our network to collaborate with world-renowned leaders in fields including virology and cardiovascular disease at the University of California San Francisco and Gladstone Institute, Nanyang Technological University, University Health Network in Toronto, and the University of Arizona whilst continuing to support and improve our current local partnerships within the HLI and UBC, Canada-wide collaborations with McMaster University and international collaborations with Columbia University, Charité in Berlin, Cincinnati Children's Hospital and the University of Hawaii, among others.

The CVR has also received support, funding, and awards to recognize cutting-edge research and its gifted team members. Our co-op students have won the Pathology Summer Studentship, the Faculty of Medicine Summer Student Research Program Award, the American Society of Investigative Pathology Summer Student Award, and received Biotalent support.

Overall, the CVR has had a productive year and is looking forward to building on that progress in 2021.



JAMES HOGG LUNG REGISTRY

Despite the challenges of the global COVID-19 pandemic, 2020 has been a productive year for the HLI James Hogg Lung Registry (JHLR). Lung tissue specimens and associated data from the lung registry supported 11 publications and 8 projects from both Investigators at the HLI and external institutions including researchers at the University of North Carolina, the University of California at San Francisco, Institute of Pharmacy – Berlin, Fred Hutch Cancer Research Centre – Seattle, University of Tasmania, University of Alberta, and The University of Manitoba.

In particular, the JHLR contributed significantly to this recent publication in the Canadian Journal of Respiratory, Critical Care, and Sleep Medicine, which highlights the biobanking techniques, new imaging methodologies and respiratory research that has been supported by the lung registry for the last 40 years.

D. P. Sutherland, D. M. Vasilescu, E. T. Osei, N. E. Coxson, C. X. Yang, S. Booth, H. O. Coxson, W. M. Elliot, P. D. Paré, J. C. Hogg & T. L. Hackett (2021) A Canadian lung tissue biobank with associated clinical data supporting respiratory research for four decades. Canadian Journal of Respiratory, Critical Care, and Sleep Medicine, DOI: 10.1080/24745332.2021.1878007

In 2020, the JHLR Biobank Information Management System (BIMS) was further expanded following the completed digitization of all lung function tests and blood work. Over 2021, we will be digitizing patient questionnaire information and radiology reports.

Over 2020 the JHRC continued to grow. We have initiated a collaboration with Dr. Chuck Wen in Thoracic Surgery at Fraser Health Surrey Memorial Hospital, to be an additional collection site for the lung registry. Currently, the ethics and Material Transfer Agreements are in the last stages of approval with Fraser Health. The goal for this collaboration is to supply lung tissue for single, cell research. The JLHR is also currently supporting the Sin lab in collaboration with IKOMED Technologies Inc. with a preclinical evaluation of a porcine Emphysema model. Since 2019, the JHLR also hosts a number of blood-derived DNA and RNA cohorts including:

- 1) Severe Asthma Registry – Dr. Dorscheid (BALF, blood)
- 2) Canadian Asthma Primary Prevention Study (DNA, serum, plasma) – Drs. Sandford, Daley & Pare
- 3) Study of Asthma, Genes and Environment (DNA) - Drs. Sandford, Daley & Pare
- 4) Lung Health Study (DNA) - Drs. Sandford, Daley & Pare
- 5) Cystic Fibrosis Modifier Gene Study (DNA) - Drs. Sandford, Daley & Pare
- 6) Obstructive Sleep Apnea Study (DNA, serum, plasma) - Drs. Sandford & Ayas

JHLR PUBLICATIONS IN 2020



Xu F et al. The transition from normal lung anatomy to minimal and established fibrosis in idiopathic pulmonary fibrosis (IPF). *EBioMedicine*.

Sutherland DP et al. Canadian lung tissue biobank with associated clinical data supporting respiratory research for four decades. *Canadian Journal of Respiratory, Critical Care, and Sleep Medicine*.

Eapen MS et al. Dysregulation of endocytic machinery and ACE2 in small airways of smokers and COPD patients can augment their susceptibility to SARS-CoV-2 (COVID-19) infections. *Am J Physiol Lung Cell Mol Physiol*.

Vameghestahbanati M et al. Central Airway Tree Dysanapsis Extends to the Peripheral Airways. *Am J Respir Crit Care Med*.

Tanabe N et al. Pathological Comparisons of Paraseptal and Centrilobular Emphysema in Chronic Obstructive Pulmonary Disease. *Am J Respir Crit Care Med*.

Vasilescu DM et al. Comprehensive stereological assessment of the human lung using multiresolution computed tomography. *J Appl Physiol*.

Mostaço-Guidolin LB et al. Pulmonary vascular remodeling is an early feature of fatal and non-fatal asthma. *Am J Respir Cell Mol Biol*.

Vasilescu DM et al. Loss of Alveolar Attachments as a Pathomechanistic Link between Small Airway Disease and Emphysema. *Am J Respir Crit Care Med*.

Verleden SE et al. Small airways pathology in idiopathic pulmonary fibrosis: a retrospective cohort study. *Lancet Respiratory Medicine*.

Kirby M et al. Computed Tomography Total Airway Count Is Associated with the Number of Micro-Computed Tomography Terminal Bronchioles. *Am J Respir Crit Care Med*.

Leung JM et al. ACE-2 expression in the small airway epithelia of smokers and COPD patients: implications for COVID-19. *Eur Respir J*.

Last year was an extremely busy year compounded by COVID. We added privileged remote access (PRA), allowing remote access for data analysis, acquisition and other machines. It allowed easy remote access for staff and users, while auditing tasks and helping to prevent ransom-ware and similar attacks.

IT Staff were present at work throughout the year wearing PPE and maintaining physical distancing rules while helping to keep the centre running and answering all service request. Additional registries and databases were added throughout the year working with remote users. Supply channel issues also hindered purchasing of equipment.

We added large screen displays to three meeting rooms, large compute nodes with 1.5 Terabytes of RAM and storage capacity expansion to a capacity of 2 Petabytes.



INFORMATION TECHNOLOGY

HEALTH AND SAFETY



HLI Safety Committee co-chairs Gurpreet Singera (left) and Ivan Leversage (right)

The COVID-19 pandemic presented a unique challenge for the HLI Safety Committee. With campus shutdowns and hospital access restrictions beginning in March 2020, our priority shifted to ensuring the health and safety of those who were continuing essential work in the labs. Staffing was reduced to essential workers and those conducting urgent COVID-19 studies.

With the help of SPH physical plant, the safety committee installed many additional hand sanitizer units by office spaces, lab areas and at each entrance door at HLI. Surface sanitization was an important step to curb the spread of COVID-19 in work areas, meeting rooms, lunchrooms, photocopier areas, so sanitization stations in common areas were created. These included 70% ethanol spray bottles to sanitize areas before and after use and disinfectant wipes. Committee members continue to monitor sanitization stations and replenish when depleted.

Meetings and orientations shifted to being conducted virtually. Room occupancy limits were set to maximize physical distancing of occupants. In instances where physical distancing was not possible, PPE and medical masks were used. As HLI donated supplies to SPH in early days of the pandemic, we in turn called upon SPH to assist HLI members when PPE shortages occurred later in the year.

Mandatory COVID-19 safety training for all was provided. A COVID-19 Safety Plan document and video was created by the Operations team and posted on the HLI intranet. Daily self assessment health checks continue to be conducted as per WorkSafeBC requirements. The committee also disseminated fast changing vaccination availability information to all HLI members.

During the COVID-19 pandemic, several HLI Principal Investigators initiated COVID-19 research studies and with that came the need to increase our bio-banking capacity to store samples. This, along with our continued expansion with other research programs, necessitated the design and construction of an additional freezer storage room. With great support and effort from PHCRI and St Paul's Hospital, this additional space was completed in record time. This room has the capacity to store 10 ultra-low freezers (equates to storage space for 576,000 samples)

We also learned that the Pfizer and Moderna vaccines would require both low and ultra- low storage conditions. With our vast experience with bio-banking, HLI was proud to offer vaccine storage space and monitoring services.

The Facilities team continued to work closely with Operations to provide timely and accurate information for the design of the future CRSC. Planning for the new St. Paul's will be instrumental in ensuring our future lab space will be able to meet research demands well into the future.



FACILITIES AND MAINTENANCE

PARTNERSHIPS AND ACKNOWLEDGEMENTS

The HLI is grateful to our funding partners: Canada Foundation for Innovation, British Columbia Knowledge Development Fund, Providence Health Care, PHCRI, University of British Columbia, Heart and Stroke Foundation of BC and Yukon, BC Lung Association, the St. Paul's Hospital Foundation and many vendors and industrial collaborators, for their crucial support of our ongoing programs.

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)
Genentech Inc.
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 Foundation for Health Research
National Institutes of Health
National Research Council
Natural Sciences and Engineering Research Council of Canada (NSERC)
Novartis Pharmaceuticals Canada Inc.
Octapharma Canada Inc.
Pfizer Canada Inc.
Pharmaxis Ltd.
ProMetic Life Sciences Inc.
PROOF Centre of Excellence
Providence Health Care Research Institute (PHCRI)
Province of British Columbia
Respivert Ltd.
RxSource Corp.
sanofi-aventis Canada Inc.
St. Paul's Hospital Foundation
The Lung Association
Trius Therapeutics Inc.
UBC Department of Medicine
UBC Department of Physical Therapy
University of Calgary
Vertex Pharmaceuticals Inc.
viDA Therapeutics Inc.

We are grateful to the following individuals for their assistance in the creation of this report: Vivienne Chan, Claire Smits, Chris Robinson, Gwen Sin, Bryan Wong, Ivan Leversage, Dr. Don Sin and all the HLI Principal investigators.

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.



St. Paul's Foundation
178 – 1081 Burrard Street
Vancouver, BC V6Z 1Y6
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info@startanevolution.ubc.ca
<https://startanevolution.ubc.ca/category/projects-by-faculty/faculty-of-medicine>

Appendix A

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

April 2020 - March 2021

Bernatchez, Pascal

- Activating the antiatherosclerotic properties of endothelial function: from cells to humans. Grant. Heart and Stroke Foundation of Canada, \$91,500.
- Optimization of angiotensin II receptor type 1 blockers (ARBs) in chronic obstructive pulmonary disease (COPD). Grant. Innovation, Science and Economic Development of Canada, Providence Health, Province of BC, total \$133,333.34.

Boyd, John

- Organ donation after cardiac death: optimizing the donor heart. Grant. Canadian Institutes of Health Research, \$100,980.

Brunham, Liam

- Targeted next generation sequencing to improve the diagnosis and treatment of familial hypercholesterolemia in British Columbia. Grant. Providence Health Care Research Institute, \$10,509.60.
- CFI Infrastructure Operating Fund. Grant. Canada Foundation for Innovation, \$20,110.
- Investigating pharmacogenetic mechanisms of doxorubicin-induced human pluripotent stem cell-derived cardiomyocytes. Grant. Canadian Institutes of Health Research, \$128,407.
- 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). Clinical Trial. The Medicines Co., \$12,529.58.
- Multi-center cross-sectional epidemiological study to characterize the prevalence and distribution of lipoprotein(a) levels among patients with established cardiovascular disease. Clinical Trial. Novartis, \$27,980.
- Pipeline towards stem cell driven personalized medicine for atrial fibrillation. Grant. Stem Cell Network, \$21,400.
- CETP inhibition as a novel treatment to remove pathogen lipids and improve survival in sepsis. Grant. Canadian Institutes of Health Research, \$135,166.
- Familial hypercholesterolemia in Canada: Precision and personalized approaches to increase identification and improve clinical outcomes. Grant. Canadian Institutes of Health Research, \$124,000.
- Cardiovascular genetics: phenotypes, genotypes, and cellular mechanisms. Salary Award. Michael Smith Foundation for Health Research, \$90,000.
- Precision Cardiovascular Disease Prevention. Salary Award. Canada Research Chair, \$100,000.

Camp, Pat

- “Niw’h 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. Grant. Canadian Institutes of Health Research, \$177,405.
- Bayis Il 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. Grant. Canadian Institutes of Health Research, \$174,871.
- Wildfire smoke and emergency planning for First Nations people living with lung disease in remote and rural British Columbia. Grant. Canadian Institutes of Health Research, \$181,158.
- COPD Alert! Telehealth System. Grant. The Lung Association, \$10,000.

Carlsten, Christopher

- A blood test to diagnose western red-cedar asthma. Grant. Innovation, Science and Economic Development Canada and PROOF Centre of Excellence. Total \$15,000.
- Epigenetic health benefits of budesonide. Grant. Genome British Columbia, \$444,730. Funding held at VCHRI.
- Does Traffic-Related Air Pollution Reduce the Effectiveness of Corticosteroids in Asthma. Grant. Canadian Institutes of Health Research, \$168,300. Funding held at VCHRI.
- Analysis of multiomic Data to Accelerate Personalized health interventions against inhaled Toxicants (ADAPT). Grant. Canadian Institutes of Health Research, \$62,466.67. Funding held at VCHRI.

Appendix A

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

April 2020 - March 2021

- Does air pollution reduce inhaled corticosteroid effectiveness through modulating epigenetics? Grant. BC Lung Association, \$25,000. Funding held at VCHRI.
- Nasal Epithelium Interventions for Traffic-Related Air Pollution (NEIT). Clinical Trial. GlaxoSmithKline, \$78,099.33. Funding held at VCHRI.
- Lung health benefits of e-cigarette cessation. Grant. Canadian Institutes of Health Research, \$99,000. Funding held at VCHRI.
- COVID-19 infection in British Columbia: A prospective patient registry for respiratory outcomes. Grant. VCHRI, \$20,000. Funding held at VCHRI.
- Respiratory outcomes following COVID-19 infection in British Columbia. Grant. Michael Smith Foundation for Health Research, \$220,000. Funding held at VCHRI.
- Workplace diesel exhaust exposure: Defining a biosignature to support prevention. Grant. Worker's Compensation Board of Manitoba, \$66,133.33. Funding held at VCHRI.
- Relationship between external and internal microbiomes in normal and compromised airways. Grant. Genome British Columbia, \$122,886.50. Funding held at VCHRI.
- Vaping and Youth: Pathways to care and prevention. Grant. VPSA Engagement, \$20,000. Funding held at VCHRI.
- Occupational and Environmental Lung Disease. Salary Award. Canada Research Chair, \$100,000. Funding held at VCHRI.

DeMarco, Mari

- Advancing healthcare diagnostics for neurodegenerative disorders. Salary Award. Michael Smith Foundation for Health Research, \$90,000.
- IMPACT-AD (Translating research into practice: Investigating the impact of Alzheimer's disease diagnostics in Canada. Grant. Brain Canada, \$246,486.33.
- Quantitative isotype profiling and dynamics of SARS-CoV-2 infections: Next-generation serology. Grant. Michael Smith Foundation for Health Research, \$124,000. Funding held at Dept. of Pathology.
- The ABCD Consortium ("Accelerating Blood and Cardiopulmonary COVID-19 Diagnostics"). Grant. Canada Foundation for Innovation, \$502,600. Funding held at Dept. of Pathology.

Dorscheid, Delbert

- Sponsorship for Severe Asthma Clinic at PHC. Grant. Novartis, \$707.73
- A 2-treatment period, randomized, placebo-controlled, multicenter parallel-group study to assess the safety of QAW039 when added to existing asthma therapy in GINA steps 3, 4 and 5 patients with uncontrolled asthma. Clinical Trial. Novartis, \$6,490.
- A Feasibility Study: A Safety Evaluation of the Gala Airway Treatment System on Patients with Chronic Bronchitis in Canada. Clinical Trial. Gala Therapeutics Inc, \$34,732.50.
- 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. Clinical Trial. AstraZeneca Canada, \$9,569.07.
- 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. Clinical Trial. AstraZeneca Canada, \$4,802.
- 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. Clinical Trial. Sanofi-Aventis Canada, \$1,926.
- IgE-mediated inflammation generated by the airway epithelium is antigen independent - a cause of a novel asthma phenotype. Salary Award. Michael Smith Foundation for Health Research, \$90,000.

Francis, Gordon

- The unrecognized importance of smooth muscle foam cells in atherosclerosis development and treatment. Grant. Canadian Institutes of Health Research, \$200,928.
- An Open-Label Extension Study of Volanesorsen Administered Subcutaneously to Patients with Familial Chylomicronemia Syndrome (FCS). Clinical Trial. Ionis Pharmaceuticals Inc, \$16,868.95.

Appendix A

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

April 2020 - March 2021

- Relative deficiency of lysosomal acid lipase in arterial smooth muscle cells as a novel target for atherosclerosis treatment and prevention. Grant. Canadian Institutes of Health Research, \$102,510.
- Non-HDL-cholesterol, macrophage, and lipid-lowering drug influences on smooth muscle foam cell formation and fate in atherosclerosis. Grant. Heart and Stroke Foundation of Canada, \$91,020.
- The role of smooth muscle cell metabolism of amyloid beta in cerebral amyloid angiopathy. Grant. Alzheimer Society of Canada, \$75,000.
- Redefining atherosclerosis: Characterizing and targeting smooth muscle cell foam cells for the treatment and prevention of coronary heart disease and stroke. Salary Award. Michael Smith Foundation for Health Research, \$90,000.

Granville, David

- Granzyme B: A novel therapeutic target in cutaneous leishmaniasis. Grant. LEO Foundation, \$133,333.33. Funding held at VCHRI.
- Deriving a clinic-ready formulation of antibiotic sulfaphenazole for the treatment of pressure injuries. Grant. International Collaboration on Repair Discoveries, \$7,500. Funding held at VCHRI.
- Defining novel roles for granzyme K in allergic airway inflammation. Grant. BC Lung Association, \$25,000. Funding held at VCHRI.
- Granzyme B: A Novel Target for the Treatment of Radiodermatitis. Agreement. Cancer Research Society, \$60,000. Funding held at VCHRI.
- Targeting granzyme B with a novel inhibitor for the treatment of radiodermatitis. Grant. MITACS, \$93,333. Funding held at VCHRI.
- Profiling granzymes in inflammatory neuromuscular diseases. Grant. Muscular Dystrophy of Canada, \$50,000. Funding held at VCHRI.
- A Novel Therapeutic for Inflammatory Skin Diseases. Grant. Michael Smith Foundation for Health Research, \$75,000. Funding held at VCHRI.
- Granzymes in Tissue Injury, Inflammation and Repair. Grant. Canadian Institutes for Health Research, \$257,924. Funding held at VCHRI.
- Discovery to Commercialization (D2C) Training Program. Grant. University of British Columbia, \$20,740.50. Funding held at VCHRI.

Guenette, Jordan

- Research Start-up Funds from PHCRI, UBC Dept of Physical Therapy and JHRC. Grant. Providence Health Care Research Institute, \$1,500.
- Sex-differences in respiratory sensation and muscle function during conditions of physiological stress. Grant. Natural Sciences and Engineering Research Council of Canada, \$94,520.
- Investigating the role of skeletal muscle dysfunction on dyspnoea and exercise intolerance in interstitial lung disease. Grant. BC Lung Association, \$25,000.
- The effects of 60% oxygen during exercise training in patients with fibrotic interstitial lung disease. Grant. Michael Smith Foundation for Health Research, \$41,500.

Hackett, Tillie-Louise

- CFI Infrastructure Operating Fund. Grant. Canada Foundation for Innovation, \$9,375.
- The Role of Small Airways Disease Heterogeneity in Asthma. Grant. Canadian Institutes of Health Research, \$149,155.
- Airway-On-A-Chip: Development and in vitro validation of a microfluidic cell culture model for chronic obstructive pulmonary disease (COPD). Grant. Innovation, Science and Economic Development Canada, Providence Health Care Research Institute, and Province of British Columbia, \$36,666.66.
- Assessing small airway disease heterogeneity in asthma to determine novel therapeutic targets. Grant. Michael Smith Foundation for Health Research, \$9,000.

Hogg, James

- Novel quantitative emphysema subtypes in MESA and SPIROMICS. Agreement. National Institutes of Health Research, \$3,699.20.

Appendix A

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

April 2020 - March 2021

- Comprehensive multi-resolution investigation of IPF pathology. Grant. Francis Family, \$90,000.
- Analysis of airway pathology in idiopathic pulmonary fibrosis using a combination of computed tomography, micro-computed tomography, histology and gene expression. Grant. BC Lung Association, \$25,000.

Krahn, Andrew

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

Laksman, Zachary

- Research and administrative costs account. Grant. St. Paul's Foundation, \$849.25.
- Pipeline towards stem cell driven personalized medicine for atrial fibrillation. Grant. Stem Cell Network Inc, \$62,400.
- Mapping the phosphoproteome in persistent atrial fibrillation. Grant. UBC Division of Cardiology Academic Practice Plan (CAPP), \$15,000.
- Morphological profiling in human stem cell-derived cardiomyocytes. Grant. Innovation, Science and Economic Development Canada, \$3,000.
- Developing personalized anti-arrhythmic drug therapy for atrial fibrillation. Salary Award. Michael Smith Foundation for Health Research, \$90,000.

Leipsic, Jonathon

- Structural valve degeneration in bioprosthetic heart valves. Grant. Michael Smith Foundation for Health Research, \$3,500.
- Structural valve degeneration in bioprosthetic heart valves. Grant. Canadian Institutes of Health Research, \$45,000.
- Advanced Cardiopulmonary Imaging. Salary Award. Canada Research Chair, \$100,000.

Leung, Janice

- Epigenetic and transcriptomic disturbances in HIV-associated COPD. Grant. Canadian Institutes of Health Research, \$25,098.
- Sphingolipids in HIV-associated chronic obstructive pulmonary disease. Agreement. National Institutes of Health, \$613,311.
- Primed for damage: Interactions between human immunodeficiency virus and the small airway epithelium. Grant. BC Lung Association, \$25,000.
- Canadian users of cannabis smoke study (CANUCKs): Impact on lung health via clinical, imaging, and biologic measures. Grant. Canadian Institutes of Health Research, \$299,905.
- Understanding the aging HIV lung from dysbiosis to cell injury. Salary Award. Michael Smith Foundation for Health Research, \$90,000.

Luo, Honglin

- Understanding the interplay between coxsackieviruses and the host ubiquitin-proteasome system. Grant. Natural Sciences and Engineering Research Council of Canada, \$51,040.
- Enteroviral control of autophagy: Relevance to heart failure. Grant. Heart and Stroke Foundation of Canada, \$60,600.
- Engineering coxsackievirus B3 for KRAS-driven lung cancer therapy. Grant. Providence Health Care Research Institute, \$26,500.
- Role of enteroviral infection in amyotrophic lateral sclerosis. Grant. Canadian Institutes of Health Research, \$177,909.
- Enteroviral infection in the development of Amyotrophic Lateral Sclerosis. Grant. Canadian Institutes of Health Research, \$35,000.
- Novel oncolytic virus for lung cancer treatment. Agreement. Cancer Research Society, \$60,000.
- Enterovirus subversion of the autophagy pathway. Canadian Institutes of Health Research, \$73,440.

McManus, Bruce

- Development and validation of blood-based biomarkers for improved heart failure management.

Appendix A

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

April 2020 - March 2021

Grant. Michael Smith Foundation for Health Research, \$17,291.67.

- HEARTBiT: A novel multi-marker blood test for management of acute cardiac allograft rejection. Grant. Canadian Institutes of Health Research, \$481,529.
- Personalizing myocarditis diagnostics through novel biomarkers. Grant. Michael Smith Foundation for Health Research, \$41,500.

McNagny, Kelly

- Maternal exposures during pregnancy as drivers of susceptibility to allergic asthma and Th2 inflammation. Grant. Canadian Institutes of Health Research, \$237,150. Funding held at Biomedical Research Centre.
- Modulation of Innate Immune Responses as a Therapy for Muscular Dystrophy. Grant. Canadian Institutes of Health Research, \$191,250. Funding held at Biomedical Research Centre.
- Investigating mechanisms of disease and identifying diagnostic biomarkers in focal segmental glomerulosclerosis (FSGS) and nephrotic syndromes. Grant. UBC, \$75,000. Funding held at Biomedical Research Centre
- Innate Lymphoid cells and RAR-related orphan receptor alpha (RORa) as therapeutic targets for gastrointestinal fibrosis and Crohn's disease. Grant. Canadian Institutes of Health Research, \$152,900. Funding held at Biomedical Research Centre.

Quon, Bradley

- CFI Infrastructure Operating Fund. Grant. Canadian Foundation for Innovation, \$5,849.
- A Phase 3, Open-label, Rollover Study to Evaluate the Safety and Efficacy of Long-term Treatment With VX-661 in Combination With Ivacaftor in Subjects Aged 12 Years and Older With Cystic Fibrosis, Homozygous or Heterozygous for the F508del-C. Clinical Trial. Vertex Pharmaceuticals (Canada) Inc, \$7,680.
- A Multi-Center, Randomized, Placebo-Controlled, Phase 1, Two-Part Study Designed to Assess the Safety, Tolerability, Pharmacokinetics, Food Effect, and Drug-Drug Interactions of PTI-801 in Healthy Volunteers, and Safety, Tolerability, and Pharmacokinetics of PTI-801 in Subjects with Cystic Fibrosis. Clinical Trial. Proteostasis Therapeutics Inc, \$5,988.63.
- A Multicenter, Randomized, Double-Blind, Placebo-Controlled Phase 2 Trial to Evaluate Efficacy and Safety of Lenabasum in Cystic Fibrosis. Clinical Trial. Corbus Pharmaceuticals, \$14,071.89.
- A Phase 1 Study to Evaluate the Safety, Tolerability, and Pharmacokinetics of PTI-808 in Healthy Adult Subjects and in Adults with Cystic Fibrosis. Clinical Trial. Proteostasis Therapeutics Inc, \$47,477.20.
- 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. Clinical Trial. Vertex Pharmaceuticals (Canada) Inc, \$11,471.
- A double-blind, randomized, placebo-controlled, phase II study of the efficacy and safety of LAU-7B in the treatment of cystic fibrosis in adults. Clinical Trial. Laurent Pharmaceuticals, \$30,736.79.
- Identification of blood-based biomarkers predictive of pulmonary exacerbations in cystic fibrosis. Grant. Innovation, Science and Economic Development Canada, PROOF Centre of Excellence, and Province of British Columbia, total \$30,000.
- A randomised, double-blind, placebo-controlled and parallel group trial to evaluate efficacy and safety of twice daily inhaled doses of BI 1265162 delivered by Respimat[®] inhaler as add-on therapy to standard of care over 4 weeks in patients. Clinical Trial. Boehringer Ingelheim (Canada) Ltd, \$21,469.75.
- 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). Clinical Trial. Vertex Pharmaceuticals (Canada) Inc, \$20,130.
- A phase 3, randomized, double-blind, controlled study evaluating the efficacy and safety of VX-445 combination therapy in subjects with cystic fibrosis who are heterozygous for the F508del mutation and a gating or residual function mutation. Clinical Trial. Vertex Pharmaceuticals (Canada) Inc, \$25,396.
- Refining the approach to cystic fibrosis pulmonary exacerbations - modeling data to improve

Appendix A

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

April 2020 - March 2021

assessment and predict etiology. Grant. Michael Smith Foundation for Health Research, \$28,875.

- Multi-OMIC biomarkers to predict neonatal vaccine response. Grant. Innovation, Science and Economic Development Canada and PROOF Centre of Excellence, \$15,000.
- The development of novel blood protein biomarkers to enable precision care in cystic fibrosis. Salary Award. Michael Smith Foundation for Health Research, \$90,000.

Russell, James

- Host response mediators in coronavirus (COVID-19) infection. Grant. Canadian Institutes of Health Research, \$49,932.
- Host response mediators in coronavirus (COVID-19) infection: Is there a protective effect of ARBs on outcomes of coronavirus infection? (ARBs CORONA II). Grant. Canadian Institutes of Health Research, \$3,456,541.

Ryerson, Chris

- The Canadian Cohort for Pulmonary Fibrosis. Clinical Trial. Boehringer Ingelheim (Canada) Ltd, \$206,550.
- Multicenter, international, doubleblind, two-arm, randomized, placebo controlled phase II trial of pirfenidone in patients with unclassifiable progressive fibrosing ILD. Clinical Trial. Hoffmann-La Roche Ltd, \$2,402.
- A Randomized, Double-Blind, Placebo-Controlled Phase 2 Study of Safety, Tolerability and Efficacy of Pirfenidone in Patients with Rheumatoid Arthritis Interstitial Lung Disease. Contract. Brigham and Women's Hospital Inc, \$2,764.75.
- 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. Clinical Trial. Galapagos NV, \$61,443.72.
- Randomized, double-blind, placebo-controlled, dose-ranging, efficacy and safety study with inhaled RVT-1601 for the treatment of persistent cough in patients with idiopathic pulmonary fibrosis (IPF): SCENIC Trial. Clinical Trial. Respivant Sciences, GmbH, \$16,890.
- Connecting clinical research and economic evaluation by mapping lung function to EQ-SD-5L in patients with interstitial lung disease. Grant. Michael Smith Foundation for Health Research, \$14,437.50.
- Genetic variant associations with radiology, histology and outcomes in interstitial lung disease. Grant. Canadian Pulmonary Fibrosis Foundation, \$90,000.
- Clinical, biological, and prognostic impact of supplemental oxygen in fibrotic interstitial lung disease. Salary Award. Michael Smith Foundation for Health Research, \$90,000.

Sandford, Andrew

- Epigenetic markers in the prediction of long-term adverse complications in patients with sleep apnea. Grant. BC Lung Association, \$25,000.
- Molecular signatures and predictive biomarkers for phenotyping allergic rhinitis responses. Grant. Innovation, Science and Economic Development Canada, PROOF Centre of Excellence, and Province of BC, total \$15,000.

Seow, Chun

- Mechanisms underlying the bronchodilatory effect of deep inspiration in health and asthma: from airway smooth muscle to the whole lung. Grant. Canadian Institutes of Health Research, \$146,148.
- Molecular mechanisms for length adaptation in smooth muscle cells. Grant. Natural Sciences and Engineering Research Council of Canada, \$55,680.

Sin, Don

- Using multi-omics to discover novel biomarkers and therapeutic targets for chronic obstructive pulmonary disease. Grant. Canadian Institutes of Health Research, \$109,980.
- A Prospective Safety and Feasibility Study of the RejuvenAir System Metered Cryospray Therapy for Chronic Bronchitis Patients. Clinical Trial. CSA Medical Inc, \$6,934.98.
- Platform development to assay immune cell chemotaxis in chronic obstructive pulmonary

Appendix A

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

April 2020 - March 2021

- disease (COPD). Grant. Innovation, Science and Economic Development Canada, Providence Health Care Research Institute and Province of British Columbia, total \$50,000.
- Biomarker tests to diagnose and prognose acute exacerbations of chronic obstructive pulmonary disease. Grant. Michael Smith Foundation for Health Research, \$150,000.
- Effects of inhaled corticosteroids on airway bacterial microbiome and host responses in patients with COPD. Grant. The Lung Association, \$25,000.
- A novel treatment for emphysema by radiofrequency in rodents and large animals. Grant. IKOMED Technologies Inc, Innovation, Science and Economic Development Canada, Province of British Columbia, \$36,666.67.
- Ventilation heterogeneity in asthma, COPD, and asthma-COPD overlap: Oscillometry and pulmonary MRI. Grant. Michael Smith Foundation for Health Research, \$3,354.17.
- Application of multi-omics and pharmacological studies to discover potential new therapeutics for COVID-19. Grant. NanoMedicines Innovation Network (NMIN) - Networks of Centres of Excellence, Innovation, Science and Economic Development Canada, PROOF Centre of Excellence, and Province of British Columbia, total \$40,000.
- An approach to screening for SARS-CoV2 at YVR. Grant. YVR/WestJet, \$392,000.
- Enabling Precision Health in COPD. Grant. Canada Foundation for Innovation/BCKDF, \$189,045.
- Deep phenotyping in COPD: Defining the distribution of human alveolar macrophages. Grant. BC Lung Association, \$25,000.
- Mechanistic insight and therapeutic intervention against hedgehog signaling-mediated mucous expression in patients with COPD. Grant. BC Lung Association, \$25,000.
- Chronic Obstructive Pulmonary Disease. Salary Award. Canada Research Chair, \$200,000.
- De Lazzari Family Chair, Centre for Heart Lung Innovation. Salary Award. St. Paul's Foundation, \$300,000.

Tebbutt, Scott

- Systems biology to identify biomarkers of neonatal vaccine immunogenicity: Project 1 - InnovativeOMIC integration to predict immunogenicity. Agreement. National Institutes of Health, \$9,066.08.
- Identification of blood-based biomarkers to distinguish subtypes of interstitial lung disease. Grant. Canadian Institutes of Health Research, \$35,000.
- Identification of diagnostic biomarkers to differentiate subtypes of interstitial lung disease. Grant. BC Lung Association, \$25,000.
- HEARTBIT: A novel multi-marker blood test for management of acute cardiac allograft rejection. Grant. Michael Smith Foundation for Health Research. \$41,500.
- Investigating regulatory T-cell gene signature in blood during acute cardiac transplant rejection. Grant. Canadian Donation and Transplantation Research Program, \$30,000.

Thamboo, Andrew

- Understanding a Potentially Common Upper Airway Disorder: Empty Nose Syndrome. Salary Award. Michael Smith Foundation for Health Research, \$90,000.

Walley, Keith

- Translational research to improve sepsis outcomes. Grant. Canadian Institutes of Health Research, \$315,406.
- Improving sepsis outcomes with anti-PCSK9 monoclonal antibody therapy. Grant. Michael Smith Foundation for Health Research. \$12,104.17.

Yang, Decheng

- Mechanisms of selective host gene translation regulation in picornavirus infection. Grant. Natural Sciences and Engineering Research Council of Canada, \$39,440.
- Role of transcription factor NFAT5 in viral myocarditis: a novel strategy for therapy. Grant. Canadian Institutes of Health Research, \$133,476.

Appendix B

Publications by HLI PIs in 2020

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*HLI PIs are in **bold**.

Appendix B

Publications by HLI PIs in 2020

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Appendix B

Publications by HLI PIs in 2020

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Appendix B

Publications by HLI PIs in 2020

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Appendix B

Publications by HLI PIs in 2020

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Appendix C

HLI Friday Seminar Series 2020


- January 17 An invitation to deep learning
Speaker: Dr. Dridi Raouf
Host: Dr. Don Sin
- January 24 Cell surface engineering approaches for the prevention of immune-mediated rejection
Speaker: Dr. Jayachandran Kizhakkedathu
Host: Dr. Pascal Bernatchez
- January 31 Cathepsins as drug targets: from atherosclerosis to osteoporosis
Speaker: Dr. Dieter Brömme
Host: Dr. Pascal Bernatchez
- February 7 Emerging new concepts in COPD
Speaker: Dr. Don Sin
- February 14 Mesenchymal (“stem cells”) progenitors in health and disease
Speaker: Dr. Michael Underhill
Host: Dr. James Hogg
- February 21 Bridging the gap: how to leverage Mitacs for research collaboration support and training opportunities
Speaker: Lily Takeuchi
- February 28 Journey to the centre of the lung: barriers, dogma, and the matrix approach
Speaker: Dr. Darryl Knight
- March 6 Targeting airway smooth muscle contraction for asthma therapy
Speaker: Dr. Ramaswamy Krishnan
Host: Dr. Chun Seow
- May 22* The good, the bad, and the ugly of ACE2 in COVID-19
Speaker: Dr. Don Sin
- June 5 Getting the word out beyond traditional publication
Speaker: Dr. Scott Lear
- June 12 Acute cardiac injury and Renin-Angiotensin-System (RAS) drugs in COVID-19 and control viral infections. Risk? Benefit?
Speaker: Dr. Jim Russell
- July 24 The power and promise of ‘omics based data integration in heart and lung pharmacogenomics
Speaker: Dr. Amrit Singh
Host: Dr. Tillie Hackett

*Seminars were temporarily cancelled in March to May due to the COVID-19 pandemic. Seminars after March 2020 were held virtually on Zoom.

Appendix C

HLI Friday Seminar Series 2020

- July 31 Reimagining graduate education for the 21st century
Speakers: Drs. Susan Porter and Serbulent Turan
Host: Dr. Dragos Vasilescu
- August 25 Novel pathologies in chronic progressive lung diseases
Speaker: Dr. John McDonough
Host: Dr. Tillie Hackett
- September 25 Biomarker discovery in a big data world
Speakers: Dr. Virginia Chen and Casey Shannon
Host: PROOF Centre
- October 2 Recent advances in risk stratification of alpha-1 antitrypsin deficiency genotypes: implications for clinical care
Speaker: Dr. Alessandro Franciosi
Host: Dr. Brad Quon
- October 9 The p-value is dead, long live the p-value! A cautionary tale of statistical inference
Speaker: Dr. John Best
Host: Dr. Mari DeMarco
- October 16 Identifying key molecular drivers from multiple omics data
Speakers: Daniel He and Dr. Amrit Singh
Host: PROOF Centre
- October 23 Imaging biomarker frontiers in fibrotic lung disease
Speaker: Dr. Simon Welsh
Host: Dr. Chris Ryerson
- November 6 Predicting severe COPD exacerbations: developing a population surveillance approach with administrative data
Speakers: Drs. Hamid Tavakoli and Mohsen Sadatsafavi
Host: Dr. Don Sin
- November 13 From studying the development of the cardiac conduction system to developing novel biological pacemaker technologies.
Speaker: Dr. Stephanie Protze
Host: Dr. Zachary Laksman
- November 20 How to successfully develop biomarkers? Key lessons from the PROOF experience
Speaker: Drs. Ji-Young Kim and Zsuzsanna Hollander
Host: PROOF Centre



Appendix C

HLI Friday Seminar Series 2020

- November 27 Regulation of group 2 innate lymphoid cell functions and its impact for pulmonary health
Speaker: Dr. Jorg Fitz
Host: Dr. Kelly McNagny
- December 4 Update on the ARBs CORONA research program - from peptides to proteomics to trials
Speaker: Dr. Jim Russell
- December 11 Histopathologic characterization and digital spatial profiling of COVID-19 associated human cardiac injury
Speaker: Dr. Paul Hanson

Appendix D

HLI Research-in-Progress (RIP) Seminar Series 2020

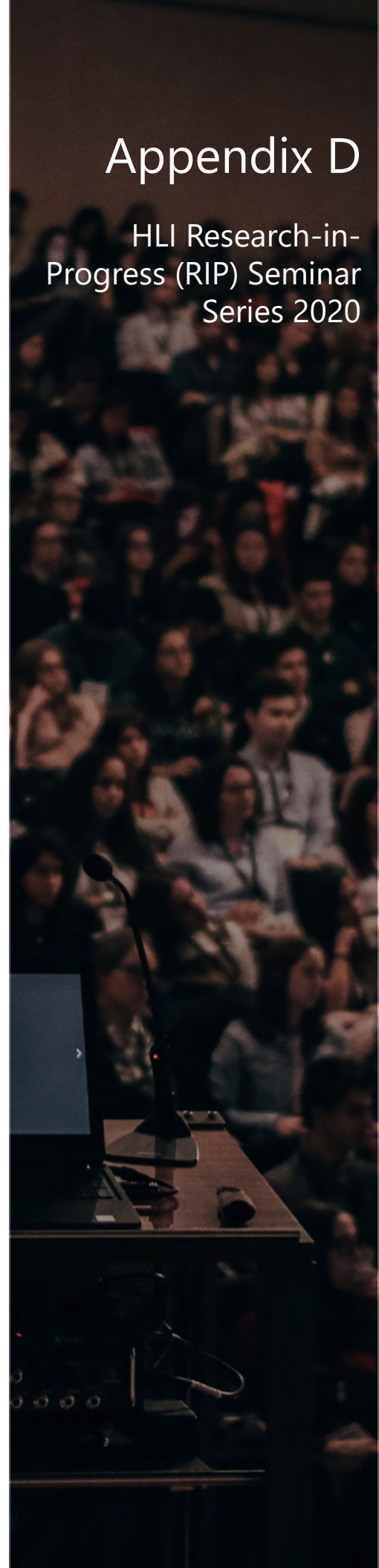
- January 6 Genetic determinants of heart attacks: a focus on blood lipids
Speaker: Mark Trinder
- January 13 Predictive biomarkers for sub-phenotyping allergic rhinitis patients
Speaker: Simran Samra
- January 20 Genetic variations in RARG influences susceptibility to doxorubicin-induced cardiotoxicity in patient-specific iPSC-derived cardiomyocytes
Speaker: Effimia Christidi
- January 27 Inspiratory muscle training (IMT) after extra-pleural pneumonectomy: case study
Speaker: Reid Mitchell
- February 3 CRIPR-Cas9 gene editing reveals FAM13A as a modifier of TGFb1 fibrotic response in airway epithelium
Speaker: Dr. Anthony Tam
- February 10 Exploration of factors that predict progression to non-tuberculosis Mycobacteria active disease in patients with cystic fibrosis
Speaker: Miguel Prieto
- February 24 Predicting new-onset exertional and resting hypoxemia in interstitial lung disease
Speaker: Ferhan Saleem
- March 2 Characteristics and prognostic risk factors of unclassifiable interstitial lung disease
Speaker: Sana Vahidy
- March 9 Granzyme K as a novel player in cardiovascular disease
Speaker: Dr. Matthew Zeglinski
- June 1* Biomarker discovery for frontotemporal dementia
Speaker: Lauren Forgrave
- June 8 Gene expression profiles of interstitial lung disease: a systematic review and meta-analysis
Speaker: Daniel He
- June 15 Cardiovascular risk assessment, early identification and prevention of very premature atherosclerotic cardiovascular disease
Speaker: Diana Vikulova

*Seminars were temporarily cancelled in March to May due to the COVID-19 pandemic. Seminars after March 2020 were held virtually on Zoom.

Appendix D

HLI Research-in-Progress (RIP) Seminar Series 2020

- June 22 Role of RAR γ and its genetic variants S427L in transcriptional response to doxorubicin-induced cardiotoxicity
Speaker: Margaret Huang
- June 29 Optimization of angiotensin II receptor type 1 blockers (ARBs) in chronic lung diseases
Speaker: Elodie Saugé
- July 6 Evaluating the impact of comorbidities in fibrotic interstitial lung disease
Speaker: Effimia Christidi
- September 14 Coronavirus papain-like protease (PLpro) disrupts cellular autophagy through cleavage of ULK1
Speaker: Yasir Mohamud
- September 28 Titin variants and risk of atrial fibrillation
Speaker: Kate Huang
- October 5 Development of oncolytic coxsackievirus B3 for lung cancer therapy
Speaker: Huitao Liu
- October 19 DNA methylation provides insights on the chronic obstructive pulmonary disease lung
Speaker: Ana Hernandez
- October 26 The combination of a cholesterol-rich Western diet and thermoneutrality results in increased muscle wasting in muscular dystrophic mice
Speaker: Graham Donen
- November 2 Epigenetic age prediction algorithm in children
Speaker: Denitsa Vasileva
- November 16 Role of NFAT5 in the pathogenesis of coxsackievirus-induced myocarditis
Speaker: Guangze Zhao
- November 23 Is COPD a risk factor for poor outcome among COVID-19 positive patients? A systematic review
Speaker: Firoozeh V. Gerayeli
- November 30 Development of oncolytic coxsackievirus B3 for breast cancer therapy
Speaker: Amirhossein Bahreyni





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