Centre for Heart Lung Innovation

UBC and St. Paul's Hospital

Basic, clinical, and translational research for heart, lung, and blood vessel diseases

2018 Annual Report

AT A GLANCE

Established in 1977 by Drs. James Hogg and Peter Paré

Director	**Dr. Don Sin**
Associate Director	**Dr. Jordan Guenette**
Principal Investigators	**37**
Early Career Investigators	**3**
Investigators	**17**
Research Associates	**7**
Technicians	**25**
Visiting Scientists	**7**
Post-Doctoral Fellows	**32**
Graduate Students	**47**
Other Students	**64**
Core/Operations Staff	**37**
TOTAL	**276**
Named Research Chairs*	**19**
Funding in FY 2018-19**	**$13.3 Million**
Space	**over 50,000 square feet**
Hosted Biotech / Spin-off companies	**5**

CORE Facilities:

Cardiovascular Registry
Lung Tissue Registry
Cellular Imaging and Biophysics
Imaging Services
Histology
Molecular Phenotyping
Preclinical Services
Clinical Research
Information Technology

Department Affiliations

Anesthesiology, Pharmacology, and Therapeutics
Computer Sciences
Health Sciences
Medical Genetics
Medicine
- Cardiology
- Critical Care Medicine
- Endocrinology
- Infectious Diseases
- Respiratory Medicine

Pathology and Laboratory Medicine
Physical Therapy
Radiology
Surgery

*Details in PI Profiles.
**April 2018 to March 2019. Details in Appendix A.

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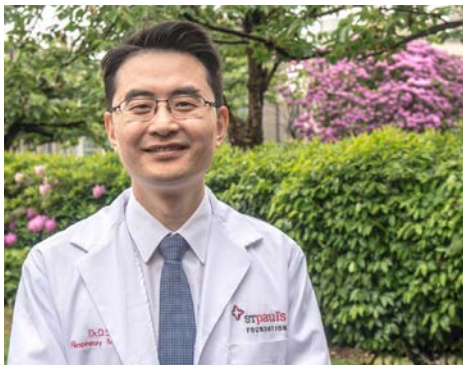
MESSAGE FROM THE DIRECTOR



Dear Colleagues,

2018 was a banner year for investigators, trainees, and all the staff at the Centre for Heart Lung Innovation (HLI). We remained at the forefront of exceptional research in heart and lung diseases, made significant contributions to these areas, and impacted on patient care. Our research has revolutionized management of cardiac valvular diseases, advanced our understanding of COPD by identifying new genetic and pathologic markers of disease, enabled discovery of new blood biomarkers of sepsis, and identified novel sources for atherosclerotic plaque genesis and progression. These are but a few of the many notable achievements by HLI investigators and their teams over the past year.

2018 was also a year of unprecedented success in procuring research funding and awards, totaling over $13 million for the fiscal year of 2018/2019 and publication output, totaling more than 305 publications, including a landmark report on early COPD from HLI Principal Investigator, Dr. Tillie Hackett, in LANCET Respiratory Medicine.

The Centre added a new Principal Investigator, Dr. Kelly McNagny, PhD, a UBC Professor of Medical Genetics. With the new appointment of Education Director Dr. Scott Tebbutt in 2018, the Centre launched the inaugural HLI Trainee Association, a student-led program to enrich the trainee experience. The Centre is committed to training a world-class group of next generation researchers and scientists in heart and lung research.

The Centre's successes are dependent on the critical, continued support of our funding partners and donors. HLI scientists, trainees, and staff express our sincere gratitude to: the Canadian Institutes of Health Research, Natural Sciences and Engineering Councail of Canada, Canada Foundation for Innovation, BC Knowledge Development Fund, Providence Health Care, University of British Columbia, Heart and Stroke Foundation of Canada, Canadian Lung Association, BC Lung Association, St. Paul's Foundation, the National Institutes of Health, Simon Fraser University, vendors, industry collaborators, donors, and most importantly to our patients, who are our partners in research and our inspiration in all that we do.

Regrettably, heart and lung diseases remain the leading causes of morbidity and mortality in BC and throughout Canada. We at HLI are committed in finding new solutions to address this enormous burden through innovation, translation, training and partnerships. With Redevelopment of St. Paul's Hospital and its research infrastructure, this process will be accelerated.

Sincerely,

Don D. Sin, MD

Director and De Lazzari Family Chair, Centre for Heart Lung Innovation

Professor, UBC Department of Medicine

About the Centre for Heart Lung Innovation

The Centre for Heart Lung Innovation (HLI, previously known as the iCapture and 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. The HLI's reporting and management structure is shown in Figure 1.

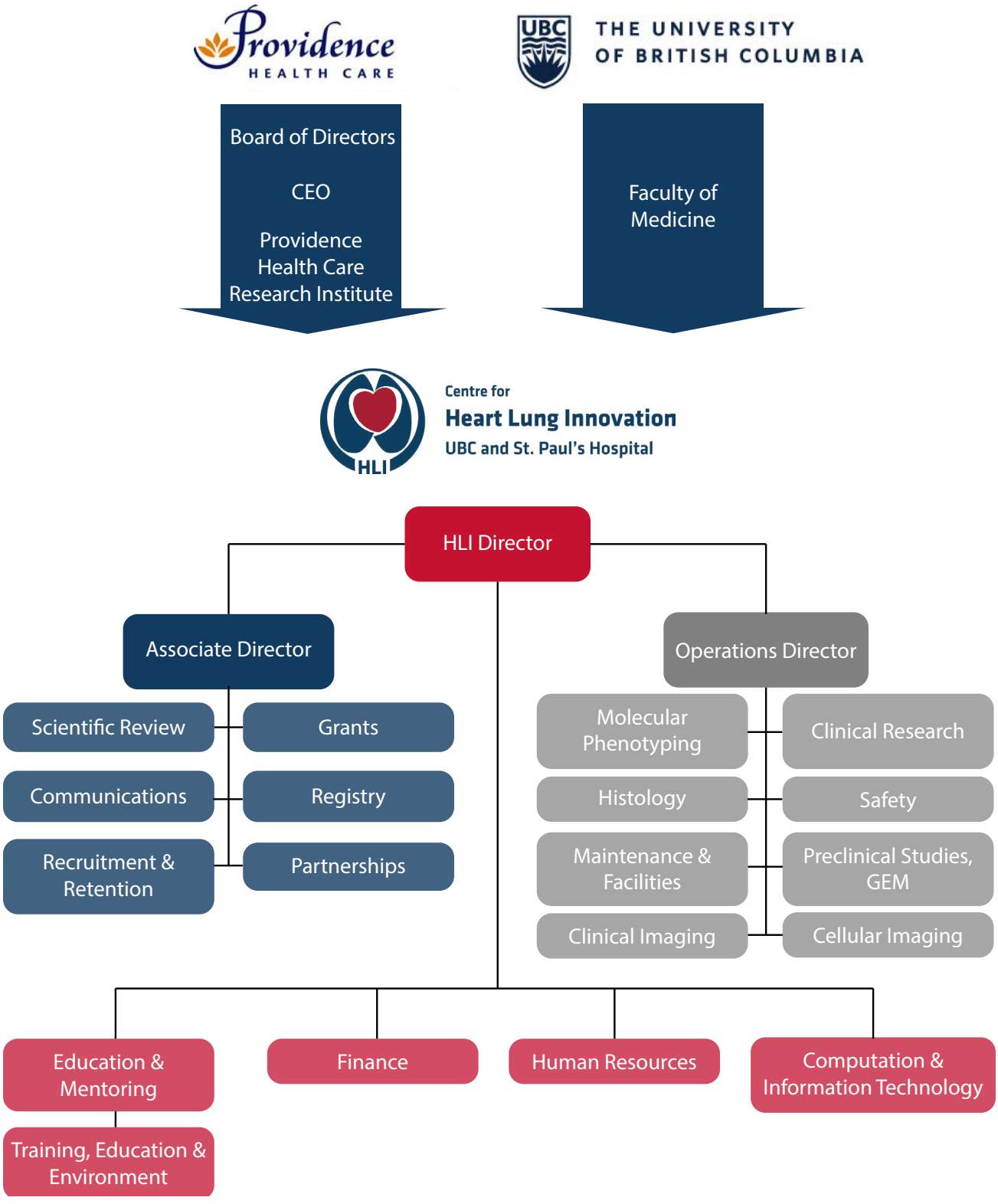


Figure 1. Governance and management structure of the Centre for Heart Lung Innovation in 2018.

RESEARCH SPOTLIGHT

Dr. Tillie Hackett and HLI team make first discovery of the early damage in the small airways of COPD patients

Chronic obstructive pulmonary disease (COPD) is a group of chronic lung diseases characterized by limitations in airflow, and is the leading cause of death and hospital admissions in BC and Canada. Previously, it was believed that only very severe COPD patients exhibited tissue damage within the small airways in the lungs.

> *"These patients often have little to no symptoms, so it was believed their lungs were relatively undamaged."*

In this landmark study, Dr. Tillie Hackett (above right) and her team of researchers discovered that significant tissue damage can be detected in the smallest airways within the lung in patients with mild and moderate COPD. The researchers were able to image airways <0.5 mm in diameter using an innovative, ultra high-resolution, micro computed tomography (CT) imaging instrument at HLI, with specialized software developed by the team. This equipment was purchased through funding from CFI, BCKDF, and St. Paul's Foundation.

> *"Now that we know the severity of the damage, we need to look at earlier intervention to ensure the best outcomes for COPD patients."*

This CIHR-funded study underscores the importance of studying the small airways in early stages of COPD to improve our understanding of the disease and to develop targeted therapies. Currently, COPD patients are not given any medications until more advanced disease develops, and the medications available are only symptom-relieving. This research suggests that COPD patients should be treated at the earliest stages when the disease may be more responsive to therapy. This finding will also revolutionize the way clinical trials for new COPD drugs are conducted. Evaluating new drugs on patients with early disease may yield more successes and accelerate the development of effective COPD therapies.

Co-first authors Dr. Hyun-Kyoung Koo, Dr. Dragoş Vasilescu, and Steve Booth are all HLI trainees.

This study was also featured in UBC News, BC Medical Journal, and the Vancouver Sun, and was selected as a UBC Faculty of Medicine Top 10 Highlight of 2018.

Koo HK, **Vasilescu DM**, **Booth S**, **Hsieh A**, Katsamenis OL, **Fishbane N**, **Elliott WM**, **Kirby M**, Lackie P, Sinclair I, Warner JA, Cooper JD, **Coxson HO, Paré PD**, **Hogg JC**, **Hackett TL**. Small airways disease in mild and moderate chronic obstructive pulmonary disease: a cross-sectional study. Lancet Respir Med. 2018 Aug;6(8):591-602. doi: 10.1016/S2213-2600(18)30196-6. Epub 2018 Jul 4. PubMed PMID: 30072106.

HLI personnel are bolded in the Research Spotlight citations.

Dr. Liam Brunham and HLI investigators uncover links between lipoproteins and sepsis

Sepsis is described as the body's overactive response to infection that results in injury of its own tissues and organs, which can lead to septic shock, organ failure, and death. Sepsis leads to 6 million deaths globally each year. It is known that levels of a molecule called high-density lipoprotein cholesterol (HDL-C) are lowered during sepsis, and this decrease is associated with worse survival.

In this study involving 200 patients, Dr. Liam Brunham (left) and his team discovered that the cholesteryl ester transfer protein (CETP) gene plays a key role in the drop in HDL-C levels in sepsis. Excitingly, there are already drugs designed against CETP for treating cardiovascular disease. Although these drugs did not have significant benefits for cardiovascular disease, further research will show if these drugs can be repurposed to improve survival rates for sepsis patients.

First author Mark Trinder is a HLI MD/PhD student and a Vanier Canada Graduate Scholar.

Trinder M, **Genga KR**, **Kong HJ**, Blauw LL, **Lo C**, **Li X**, **Cirstea M**, Wang Y, Rensen PCN, **Russell JA**, **Walley KR**, **Boyd JH**, **Brunham LR**. Cholesteryl Ester Transfer Protein Influences High-Density Lipoprotein Levels and Survival in Sepsis. Am J Respir Crit Care Med. 2019 Apr 1;199(7):854-862. doi: 10.1164/rccm.201806-1157OC. PubMed PMID: 30321485.

Dr. Scott Tebbutt develops a new blood test to identify patients at risk of an allergic asthma response

Allergic asthma is the most common type of asthma. Some allergic asthma patients experience an allergen-induced late-phase asthmatic response (LAR), which is characterized by airway contraction, airway inflammation, mucus hypersecretion, airway remodeling, and more severe symptoms than the initial reaction. It is a challenge for physicians to correctly identify which patients will develop these late phase responses to provide proper management and treatment.

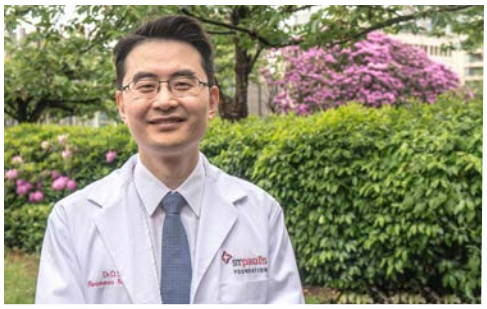
Using the CFI, BCKDF, and St. Paul's Hospital Foundation funded new Nanostring Elements platform, a state-of-the-art instrument that simultaneously measures a panel of DNA and RNA molecules, Dr. Tebbutt (left) and his team have developed and validated a blood test that can accurately predict whether a patient will undergo a LAR. The Trinity biomarker panel simultaneously measures 14 RNA transcripts found in the blood to discriminate between responses from different allergic asthma patients.

The Trinity biomarker panel resulting from this study will help stratify heterogeneous patient groups, select therapies, reduce overtreatment, identify new drug targets, improve the efficacy of clinical trials, and accelerate the availability of novel medications for allergic asthma patients.

First author Amrit Singh is a former HLI graduate student and a recipient of the Canadian Institutes of Health Research Doctoral Award–Frederick Banting and Charles Best Canada Graduate Scholarship.

Singh A, Shannon CP, **Kim YW**, **Yang CX**, Balshaw R, Cohen Freue GV, Gauvreau GM, FitzGerald JM, Boulet LP, O'Byrne PM, **Tebbutt SJ**. Novel Blood-based Transcriptional Biomarker Panels Predict the Late-Phase Asthmatic Response. Am J Respir Crit Care Med. 2018 Feb 15;197(4):450-462. doi: 10.1164/rccm.201701-0110OC. PubMed PMID: 29087730.

Dr. Don Sin and HLI researchers find correlations between the sputum microbiome and mortality rates in COPD patients



Chronic obstructive pulmonary disease is a group of chronic lung diseases characterized by poor airflow with prognoses that vary dramatically from mild symptoms to death. A challenge for effective COPD management is for clinicians to accurately stratify patients according to risk of disease progression.

The microbiome refers to the collection of microorganisms (such as bacteria, virus, fungus, etc) in an ecosystem. In this study funded by Genome Canada, Genome BC, and St. Paul's Hospital Foundation, sputum, which consists of saliva and mucus, was collected from 102 COPD patients, and the researchers discovered a correlation between the composition of the patient sputum microbiome and 1-year mortality in COPD patients who were hospitalized due to an acute event. Dr. Sin (above) and his team found that patients who did not survive one year after discharge had less diverse sputum bacterial populations. The researchers also discovered that the patients had worse survival if they had the bacteria Staphylococcus or did not have Veillonella bacteria in their sputum.

This work suggests that COPD patient sputum may be used to identify specific at-risk patients for closer monitoring following discharge from the hospital.

First author Fernando Sergio Leitao Filho is a HLI postdoctoral fellow and a recipient of the Canadian Institutes of Health Research ICS Travel Award and American Thoracic Society Abstract Scholarship.

Leitao Filho FS, **Alotaibi NM**, **Ngan D**, **Tam S**, **Yang J**, **Hollander Z**, **Chen V**, FitzGerald JM, Nislow C, **Leung JM**, **Man SFP**, **Sin DD**. Sputum Microbiome is Associated with 1-Year Mortality Following COPD Hospitalizations. Am J Respir Crit Care Med. 2018 Oct 30;. doi: 10.1164/rccm.201806-1135OC. [Epub ahead of print] PubMed PMID: 30376356.

Dr. Chris Carlsten analyzes protein changes in the lungs after allergen and diesel exhaust co-exposures

Diesel exhaust is a significant, global health problem, but how human health is affected by diesel exhaust is poorly understood. Dr. Carlsten (left) and his team were interested in examining how exposures to diesel exhaust, an allergen, or both would affect the health of the lungs. Specifically, they studied the proteins produced by the lungs of human volunteers using a mass spectrometer, an instrument that can accurately identify specific proteins.

The research team found that there were 79 proteins that changed by more than 4-fold when the volunteers were exposed to diesel exhaust and an allergen, compared to allergen exposure alone. Further proteomic analyses of these 79 proteins suggest that diesel exhaust and allergen co-exposure increased the inflammatory and oxidative stress responses in the lungs.

This study elucidates new biological mechanisms in the lungs that result from the presence of two common air pollutants that are relevant worldwide.

Mookherjee N, Piyadasa H, **Ryu MH**, **Rider CF**, Ezzati P, Spicer V, **Carlsten C**. Inhaled diesel exhaust alters the allergen-induced bronchial secretome in humans. Eur Respir J. 2018 Jan;51(1). doi: 10.1183/13993003.01385-2017. Print 2018 Jan. PubMed PMID: 29371381.

Dr. Jordan Guenette pioneers the use of supplemental oxygen for pulmonary rehabilitation patients

Interstitial lung disease causes irreversible scarring of the lungs that eventually affects breathing function and oxygen intake. Dyspnoea, or shortness of breath, is a debilitating symptom affecting patients with chronic lung disease, including interstitial lung disease. For idiopathic pulmonary fibrosis, the most common interstitial lung disease, the average survival from time of diagnosis is only 2 to 3 years.

Dr. Jordan Guenette (left) and his team of researchers recently published significant findings investigating the mechanisms that cause shortness of breath and strategies to relieve this symptom. They discovered that breathing in higher levels of oxygen dramatically improved the shortness of breath of lung disease patients. One patient was able to exercise on an exercise bicycle for 7 minutes breathing room air (21% oxygen) but this increased to 43 minutes when breathing in 60% oxygen.

"We were able to take those results and secure over $2.1 million to take this intervention across the country."

In the same study, the team also uncovered new details regarding how the nervous system contributes to shortness of breath in lung disease. This work has launched a new clinical trial at 8 centres across Canada. By improving the capacity of lung disease patients to stay active, this research will positively impact patient quality of life.

First author Michele Schaeffer is a HLI postdoctoral fellow and a recipient of UBC's 4-Year Doctoral Fellowship and the BC Lung Association Respiratory Rehabilitation Fellowship.

Schaeffer MR, **Ryerson CJ**, **Ramsook AH**, **Molgat-Seon Y**, **Wilkie SS**, **Dhillon SS**, **Mitchell RA**, Sheel AW, Khalil N, **Camp PG**, **Guenette JA**. Neurophysiological mechanisms of exertional dyspnoea in fibrotic interstitial lung disease. Eur Respir J. 2018 Jan;51(1). doi: 10.1183/13993003.01726-2017. Print 2018 Jan. PubMed PMID: 29348183.

This study was also highlighted in a feature video produced by the BC Lung Association and an article in the Providence Health Care's The Daily Scan.

Dr. Honglin Luo examines the mechanisms of viral heart infections

Coxsackievirus B3 is a major etiological factor for myocarditis (infection of the heart) and virus-induced heart failure, for which effective therapy is lacking. There is increasing evidence that aberrant accumulation of protein aggregates and damaged organelles contribute to heart failure; however, the underlying molecular mechanism remains poorly characterized.

Dr. Luo (left) and her team studied how coxsackievirus B3 disrupts a cellular degradation pathway (called autophagy), leading to impaired protein homeostasis. They discovered that coxsackievirus B3 directly targets sequestosome 1 and CALCOCO2, two autophagy adaptor proteins that normally act to eliminate protein aggregates and damaged organelles. These two proteins differentially regulate viral replication before succumbing to degradation by viral proteases. This study provides novel mechanistic insights between virus infections and impaired protein homeostasis as a consequence of disrupted autophagy.

By improving our understanding of viral infection mechanisms, Dr. Luo and her group of researchers can strategize future therapeutic targets for treating coxsackievirus B3 infections.

First author Yasir Mohamud is an HLI PhD student and a recipient of the UBC 4-Year PhD Fellowship and ALS-Canada/ Brain-Canada Doctoral Fellowship

Mohamud Y, **Qu J**, **Xue YC**, **Liu H**, **Deng H**, **Luo H**. CALCOCO2/NDP52 and SQSTM1/p62 differentially regulate coxsackievirus B3 propagation. Cell Death Differ. 2018 Aug 28;. doi: 10.1038/s41418-018-0185-5. [Epub ahead of print] PubMed PMID: 30154446.

Dr. Del Dorscheid elucidates a pathway integral to airway repair in asthma

Asthma is a chronic airway inflammatory disease characterized by attacks of breathlessness and wheezing which occur with varied severity and frequency. The epithelium is the outer layer of cells in the breathing tubes that is exposed to various agents in the environment, and needs to constantly maintain and repair itself in response to stimuli and insults. Asthma patients generally have defective mechanisms in airway epithelium repair.

One research focus of Dr. Del Dorscheid (right) and his team is to understand how a molecule called IL13 repairs and maintains the airway epithelium "wall" against the environment. In this work, Dr. Dorscheid's team discovered that a protein receptor, IL13Rα2, which responds to the IL13 molecule, is a key player in resolving injuries to the airway epithelium. Importantly, they also discovered that asthmatic lung airways have dramatically less IL13Rα2.

Together, this study points to the IL13/IL13Rα2 pathway as an important node to consider for the design of asthma therapies.

First author Jasmine Yang is a HLI PhD student.

This study was featured in Science and the City.

Yang SJ, **Allahverdian S**, **Saunders ADR**, **Liu E**, **Dorscheid DR**. IL-13 signaling through IL-13 receptor α2 mediates airway epithelial wound repair. FASEB J. 2019 Mar;33(3):3746-3757. doi: 10.1096/fj.201801285R. Epub 2018 Nov 27. PubMed PMID: 30481486.

Dr. Gordon Francis discovers a key protein responsible for promoting cholesterol removal in atherosclerosis

Atherosclerosis is a major cause of heart disease, which is a leading cause of death in Canada and worldwide. Reverse cholesterol transport is a multi-step process that results in the removal of excess cholesterol from the body, and higher levels of transport are important for preventing and reversing the development and progression of atherosclerosis.

In a recent study funded by CIHR and the Heart and Stroke Foundation of Canada, Dr. Gordon Francis (left) and his research group discovered that a protein called lysosomal acid lipase (LAL) plays an important role in promoting reverse cholesterol transport. Importantly, supplementing the LAL-deficient models with extra LAL resulted in rescued reverse cholesterol transport.

This suggests that treatment with LAL could potentially be used to reduce the increased risk of atherosclerosis in LAL-deficient individuals.

Co-first authors Drs. Kristin Bowden and Joshua Dubland are former HLI PhD students.

Bowden KL, **Dubland JA**, **Chan T**, Xu YH, Grabowski GA, Du H, **Francis GA**. LAL (Lysosomal Acid Lipase) Promotes Reverse Cholesterol Transport In Vitro and In Vivo. Arterioscler Thromb Vasc Biol. 2018 May;38(5):1191-1201. doi: 10.1161/ATVBAHA.117.310507. Epub 2018 Mar 29. PubMed PMID: 29599133; PubMed Central PMCID: PMC5920716.

Dr. Bradley Quon identifies a blood protein that predicts treatment response in cystic fibrosis patients

Cystic fibrosis (CF) is a genetic disorder affecting respiratory, digestive, and reproductive health. In particular, CF patients develop abnormally thick mucus linings in the lungs that can result in infections that lead to death. CF patients often experience pulmonary exacerbations, which are more severe episodes requiring additional medical treatment, and in many cases, hospitalizations.

Dr. Quon (right)'s laboratory group aimed to design a blood test to predict early in the treatment course whether a patient will respond to pulmonary exacerbation treatment. The blood test can potentially inform CF clinicians to modify treatment plan in a timely manner. Dr. Quon and his team employed multiple reaction monitoring mass spectrometry (MRM-MS) to analyze proteins in the blood of CF patients, and discovered that an increase in blood fibrinogen levels early in the treatment predicted improvement in lung function and other symptoms at the end of treatment. This is the first study to identify fibrinogen as an early predictive blood-based protein biomarker of treatment response in CF patients.

First author Dr. James Roberts is a Resident Physician at St. Paul's Hospital and a HLI Research Assistant.

Roberts JM, Dai DLY, **Hollander Z**, **Ng RT**, **Tebbutt SJ**, Wilcox PG, **Sin DD**, **Quon BS**. Multiple reaction monitoring mass spectrometry to identify novel plasma protein biomarkers of treatment response in cystic fibrosis pulmonary exacerbations. J Cyst Fibros. 2018 May;17(3):333-340. doi: 10.1016/j.jcf.2017.10.013. Epub 2017 Nov 22. PubMed PMID: 29174082.

HLI Principal Investigator Dr. Peter Paré

HLI INVESTIGATORS

HLI Investigators

37 PRINCIPAL INVESTIGATORS

Michael Allard
Pascal Bernatchez
John Boyd
Liam Brunham
Pat Camp
Chris Carlsten
Harvey Coxson
Denise Daley
Mari DeMarco
Del Dorscheid
Gordon Francis
David Granville
Jordan Guenette
Tillie Hackett
James Hogg
Andrew Krahn
Scott Lear
Jonathon Leipsic
Janice Leung
Honglin Luo
Paul Man
Bruce McManus
Kelly McNagny
Raymond Ng
Ma'en Obeidat
Peter Paré
Brad Quon
James Russell
Chris Ryerson
Andrew Sandford
Chun Seow
Don Sin
Wan Tan-Hogg
Scott Tebbutt
Stephan van Eeden
Keith Walley
Decheng Yang

3 EARLY CAREER INVESTIGATORS

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Michael Seidman
Andrew Thamboo

17 INVESTIGATORS

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Sammy Chan
Ed Conway
Mark Fitzgerald
Jiri Frohlich
Andy Ignazewski
Ismail Laher
Samuel Lichtenstein
John Mancini
Ed Moore
Simon Pimstone
Fabio Rossi
Robert Schellenberg
Peter Skarsgard
Stacy Skoretz
Pearce Wilcox
Jian Ye

NEW PRINCIPAL INVESTIGATOR

Kelly McNagny, PhD

Professor | Department of Medical Genetics
University of British Columbia

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.

PRINCIPAL AND EARLY CAREER INVESTIGATOR PROFILES

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.

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 their 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.

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 cause sudden organ failure during severe infection. In collaboration with Dr. Robert Hancock, he 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 is collaborating with Drs. Keith Walley and James Russell to develop an anti-PCSK9 therapy as a novel treatment for sepsis.

Liam Brunham
UBC Department of Medicine
Canada Research Chair Tier 2

Dr. Brunham's research focuses on understanding how changes in specific genes contribute to differences in drug response as well as to alterations in plasma lipid levels and their relationship to metabolic and cardiovascular disease. His laboratory uses cutting-edge approaches in human genetics, including genome-wide association studies and next-generation sequencing to investigate the role of genetic variation in these phenotypes. In December 2015, Dr. Brunham started a collaboration with Dr. Simon Pimstone to launch the SAVE BC study, aiming to identify risk factors and develop new approaches for diagnosis and treatment of BC families affected by early-onset atherosclerotic heart disease.

Pat Camp
UBC Department of Physical Therapy

Dr. Camp's research interests focus 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 in remote and rural First Nations communities in BC, 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.

Christopher Carlsten
UBC Department of Medicine
Canada Research Chair Tier 2

Dr. Carlsten's clinical and research interests centre around 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.

Harvey Coxson
UBC Department of Radiology

Dr. Coxson specializes in quantitative imaging of the lung, particularly computed tomography, with correlations to quantitative pathology and pulmonary function. Dr. Coxson's laboratory is the core imaging site for the Canadian Cohort of Obstructive Lung Disease (CanCOLD) study, a population based study of COPD, and was the core imaging analysis site for the international COPD study ECLIPSE. Dr. Coxson also works with investigators across Canada as part of the Thoracic Imaging Network of Canada and the Canadian Respiratory Research Network.

Denise Daley
UBC Department of Medicine
Canada Research Chair Tier 2

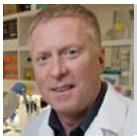
Dr. Daley is utilizing cutting-edge statistical, epigenetic, and bioinformatics techniques to obtain a better understanding of how inherited genetic variants and environmental exposures interact to modify the risk for developing disease. Her lab has completed several genome-wide association and sequencing 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 who are at the greatest risk and develop biomarkers and public health interventions.

Mari DeMarco
UBC Department of Pathology and Laboratory Medicine

With a strong interest in bridging basic biomedical science, analytical chemistry, and laboratory medicine, Dr. DeMarco's research group specializes in new methodological approaches for identification and quantitation of protein biomarkers of health and disease. A particular focus is advancing clinical diagnostics for neurodegenerative disorders, such as Alzheimer's disease and frontotemporal dementia. This work to translate new biomedical discoveries into patient care is accomplished in collaboration with clinicians and scientists at HLI, the UBC Centre for Brain Health and the provincial Clinic for Alzheimer's Disease and Related Disorders.

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.



Gordon Francis
UBC Department of Medicine

Dr. Francis's research involves understanding the mechanisms of accumulation of cholesterol in arteries in atherosclerosis, and how to remove this cholesterol to prevent coronary heart disease and stroke. Current major projects in his lab include: (1) understanding the role of cholesterol derived from lysosomes in regulating gene expression required for cholesterol removal from cells, and whether accumulation of excess cholesterol in lysosomes is a feature of atherosclerosis; and (2) understanding the reason arterial smooth muscle cells appear to accumulate more cholesterol than arterial macrophages. 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.

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.

Jordan Guenette
UBC Department of Physical Therapy
MSFHR Scholar

The primary aim of Dr. Guenette's research program is to better understand the physiological factors that limit exercise tolerance across the spectrum of health and chronic lung disease. His lab uses a number of novel measurement techniques to simultaneously assess the respiratory, cardiovascular, muscular, and neuro-physiological responses to exercise. His current project aims to identify the causes of shortness of breath in patients with interstitial lung disease (ILD) and chronic obstructive pulmonary disease (COPD). Ultimately, this research will lead to the development of more effective treatments to better manage breathlessness and improve exercise tolerance and quality of life for individuals with chronic respiratory diseases.

Tillie Hackett
UBC Department of Anesthesiology, Pharmacology and Therapeutics
CIHR New Investigator and MSFHR Scholar

Dr. Hackett's research program is focused on understanding the disruption of normal repair processes within the epithelial-mesenchymal trophic unit (EMTU) of the lung and how this propagates inflammation and tissue remodeling in patients with obstructive lung disease. Her laboratory uses an innovative and targeted approach to isolate cells from donor lungs guided by computed tomography imaging. 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 COPD.

James Hogg
UBC Department of Pathology and Laboratory Medicine
Order of Canada and Order of BC

Dr. Hogg has been on the staff of the University of British Columbia at St. Paul's Hospital since 1977 and is currently an Emeritus Professor of Pathology at UBC. 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. Very 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 is currently studying the lung microbiome in COPD and examining the host response to this microbiome in human lung.

Andrew Krahn
UBC Department of Medicine
Sauder Family and HSF Chair

Dr. Krahn is a Professor and Head of the Division of Cardiology at the University of British Columbia. Dr. Krahn has authored 386 peer reviewed publications, and his research is funded by the Heart and Stroke Foundation and the Canadian Institute of Health Research. Current research interests include investigation of genetic causes of arrhythmias, causes of loss of consciousness and implantable arrhythmia devices. Dr. Krahn is the founder of the Hearts in Rhythm Organization (HiRO), 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. He is the Sauder Family Chair and UBC Chief of Cardiology, and the Paul Brunes Chair in Heart Rhythm Disorders. He is the President of the Canadian Cardiovascular Society and second Vice President of the Heart Rhythm Society.

Zachary Laksman
UBC Division of Cardiology
MSFHR Health Professsional-Investigator

Dr. Laksman's reserach focus is on the genetic basis for diseases of the heart muscle, heart rhythm, and 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.

Scott Lear
Simon Fraser University Faculty of Health Sciences

Dr. Lear's research focuses on effective prevention and management policies and programs for cardiovascular and other chronic diseases. His research uses a population and health services approach to prevent and manage disease (www.CoHeaRT.ca). This work includes investigating how the "built" environment in which we live acts as either a barrier or facilitator of healthy behaviours. His Multi-cultural Community Health Assessment Trial (M-CHAT) is an ongoing investigation to identify the role of ethnic background in risk for obesity, diabetes, and cardiovascular disease. For people with disease, Dr. Lear looks at how technology can support patients in managing their chronic diseases under the umbrella of the British Columbia Alliance for Telehealth Policy and Research (www.BCATPR.ca).

Jonathon Leipsic
UBC Department of Radiology
Canada Research Chair 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 more broadly in the realm of coronary artery atherosclerosis, prognosis, and the interplay between ischemic heart and chronic obstructive pulmonary disease. Some of his work has informed and modified clinical practice on a global scale. 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 COPD exacerbations.

Janice Leung
UBC Department of Medicine
MSFHR Health Professional-Investigator and CIHR-AstraZeneca Early Career Investigator

Dr. Leung is studying the clinical outcomes, manifestations, and underlying mechanisms of HIV-associated COPD. 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.

Honglin Luo
UBC Department of Pathology and Laboratory Medicine

The focus of Dr. Luo's research is to define the molecular and pathogenic determinants of virus-host interactions in enterovirus-induced cardiac and neurodegenerative diseases. Ongoing research projects include: (1) Understanding molecular mechanisms of impaired cardiac function in enteroviral myocarditis. This research focuses on the protein quality control system, which includes molecular chaperones and protein degradation pathways with the long-term goal of designing effective molecular therapies for this disease; (2) Determining the possible role of enteroviral infection in the development of amyotrophic lateral sclerosis (ALS); and (3) Developing coxsackievirus B3 (CVB3) as an oncolytic virus for lung cancer treatment. Using cell and mouse models, Dr. Luo's group recently found that CVB3 is an extremely potent anti-tumor virus, destroying various types of lung cancer cells with limited effects on normal cells. The present research aims to genetically engineer CVB3 to further enhance its safety and anti-tumor potency for the treatment of lung cancer.

Bruce McManus
UBC Department of Pathology and Laboratory Medicine
Order of Canada and Order of BC

Dr. McManus is the CEO of the Centre of Excellence for Prevention of Organ Failure (PROOF) and the Co-Director of the Institute for Heart + Lung Health. His research program is focused on the mechanisms, consequences, detection, and prevention of injury and aberrant repair involved in inflammatory diseases of the heart and blood vessels. Dr. McManus works in a cross-disciplinary fashion on translational research questions for which answers are critically enabled by computational sciences, including molecular biomarker discovery and validation, information acquisition, annotation, use, and registry development to support heart and lung research. A major focus continues to be the multi-centre clinical validation of the HEARTBiT rejection-exclusion assay. This past year, Dr. McManus received the Margolese National Heart Disorders Prize and was appointed to the Order of Canada.

S.F. Paul Man
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.

Raymond Ng
UBC Department of Computer Sciences

Dr. Ng's research focuses on data mining, which can be broadly viewed as large scale data analysis. With the advancement of computer technologies and biotechnologies, data are collected and accumulated at a phenomenal rate, but our ability to collect data far exceeds the ability to analyze them. The general focus of Dr. Ng's research is to develop tools that can help domain experts analyze their data in ways that are feasible, efficient to deal with the volume of the data, and statistically sound. One focus is to perform gene expression profiling for various heart and blood vessel diseases. A specific goal is to identify genes and pathways that are critical to the development, and hence cure, of those diseases.

Ma'en Obeidat
UBC Department of Medicine
MSFHR Scholar

Dr. Obeidat's research aims at translating multi-omics data for respiratory diseases into biologically actionable knowledge for drug and biomarker discoveries. His group uses cutting edge approaches in human genetics, multi-omics, and integrative omics from multiple cell types and tissues to map causal genes and proteins underlying the risk for respiratory diseases which can be developed into therapeutic and/or biomarker solutions. To date, he has identified over 100 novel genetic loci associated with airway obstruction, and his work has resulted in 60 publications. Dr. Obeidat received fellowship awards from CIHR, Michael Smith Foundation for Health Research and the US-based Parker B. Francis Foundation. He has also been awarded research funding from CIHR, the BC Lung Association, and the Canadian Lung Association.

Peter Paré
UBC Department of Medicine
Professor Emeritus

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

Bradley Quon
UBC Department of Medicine
MSFHR Scholar

Dr. Quon is a clinician-scientist with a primary clinical and research interest in cystic fibrosis (CF). His research focuses on bridging discoveries in the basic laboratory into the clinic to improve patient outcomes. 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 transfromed patient care. He is also the Medical Director of the newly formed CF Canada Clinical Trial Network (CF CanACT).

James Russell
UBC Department of Medicine

Dr. Russell has published over 275 peer-reviewed articles and editorials as well as 45 book chapters; he serves on the editorial boards of five journals. Key examples this past year were a proof of principle trial of selepressin, a novel selective V1a agonist, in septic shock. He also showed that diabetic septic shock patients have similar immune and lipid responses and outcomes as non-diabetic septic patients. 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 and (2) the genomics and pharmacogenomics of septic shock. He is now developing a new theme (3) to define 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. Dr. Russell has worked closely with Drs. Walley and Boyd to discover that inhibition of the enzyme PCSK9 could improve the outcome of sepsis.

Christopher Ryerson
UBC Department of Medicine
MSFHR Scholar

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 marginal benefits and major toxicities of existing ILD pharmacotherapies, thus having the potential to significantly improve the lives of ILD patients.

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 COPD 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.

Michael Seidman
UBC Department of Pathology and Laboratory Medicine

Dr. Seidman conducts primarily collaborative research studies, and is also working on several projects of his own design aimed at improving diagnostics in cardiovascular pathology. His areas of focus are cardiovascular pathology, research histopathology, and cardiovascular genetics. His recent discoveries include the identification of biomarkers for myocarditis.

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.

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.

Wan 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).

Scott Tebbutt
UBC Department of Medicine

Dr. Tebbutt's research program is focused on systems biology and the use of multi-omics (genomics, transcriptomics, proteomics, metabolomics, etc.) 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 spores of the fungus Aspergillus fumigatus with 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 Chief Scientific Officer of the Prevention of Organ Failure (PROOF) Centre of Excellence, a not-for-profit organization dedicated to moving research findings into health care, and focused on non-invasive biomarkers that can diagnose and/or predict organ failure (heart, lung and kidney).

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 a team of respirologists, he has a lab associated with Centre for Heart Lung Innovation. Dr. Thamboo has an interest in areas of unified airway hypothesis, upper airway physiology, office based rhinology, and outcomes research. He is a recent recipient of the Michael Smith Foundation Health Investigator Award.

Stephan van Eeden
UBC Department of Medicine
CIHR/GSK Professorship in 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, leading to downstream adverse cardiovascular health effects. Dr. van Eeden also showed that statins, a medication commonly used to treat patients with increased blood lipid/cholesterol, significantly attenuated these adverse effects of air pollutants. These adverse effects are particularly important for subjects with underlying lung diseases such as COPD, where air pollution cause exacerbations of the disease. He currently works on understanding the molecular mechanisms underlying these exacerbations and exploring novel methods for early identification and treatment of these exacerbations.

Decheng Yang
UBC Department of Pathology and Laboratory Medicine

The first area of Dr. Yang's research is the molecular biology and pathogenesis of coxsackievirus, an RNA virus known to cause myocarditis. Dr. Yang is studying the mechanisms of host-pathogen interactions, viral translation initiation, and cardiovirulence with the aim to develop novel antiviral therapies to treat coxsackievirus-induced myocarditis. The second area of Dr. Yang's research is the study of host gene responses to viral infection. He and his team have previously identified genes, as well as microRNAs, involved in myocarditis induction. His specific focus is the roles of these selected genes and microRNAs in signal transduction pathways and epigenetic modifications leading to cardiomyocyte apoptosis or cardiac hypertrophy. These studies have great potential to discover new targets for gene therapy and molecular markers for diagnosis of viral myocarditis and other related infectious diseases.

Keith Walley
UBC Department of Medicine

Dr. Walley translates basic discoveries into clinical practice in the ICU. 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. 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.

RECOGNIZING RESEARCH EXCELLENCE

Dr. Bruce McManus is appointed to the Order of Canada and receives the 2018 Margolese National Heart Disorders Prize

Dr. McManus was one of 105 new appointments to the Order of Canada, one of Canada's highest civilian honours that recognizes outstanding achievement, dedication to the community, and service to the nation. In 2018, Dr. McManus also received the Margolese National Heart Disorders Prize. He was recognized for his translational research that has led to advancements in the diagnosis and treatment of cardiovascular disease and organ failure in Canada.

Dr. Andrew Krahn receives the 2018 Margolese National Heart Disorders Prize

The Margolese National Heart Disorders Prize is awarded annually to a Canadian physician or scientist who makes outstanding contributions to the treatment, amelioration, or cure of heart disorders. Dr. Krahn was awarded this prize in recognition of his work on detecting and managing heart rhythm disorders.

Dr. Liam Brunham is awarded a Canada Research Chair

The Canada Research Chairs Program awards funding to attract and retain the world's most accomplished and promising minds to achieve research excellance in their respective fields. Dr. Liam Brunham, an Assistant Professor in the Division of General Internal Medicine, leads a research group focused on the genetics of cardiovascular disease and phamacogenetics. in 2018, Dr. Brunham was awarded a Canada Research Chair (Tier 2) in Precision Cardiovascular Disease Prevention.

Dr. Jordan Guenette receives a New Investigator Award

Dr. Guenette's research program is focused on understanding the physiological factors that limit exercise tolerance in healthy individuals and in patients with chronic lung disease. The Canadian Society for Exercise Physiology New Investigator Award is presented annually to an individual with an excellent reputation throughout Canada and international recognition. As part of the award, Dr. Guenette also presented at the CSEP AGM and was invited to write a review for *Applied Physiology, Nutrition and Metabolism*.

Dr. Honglin Luo receives an Innovation and Translational Research Award

The Innovation and Translational Research Award from Vancouver Coastal Health Research Institute and Providence Health Care Research Institute is used to fund innovative research that will have an impact on patient care at VCH and PHC. This award will allow Dr. Luo to further develop her research program, which involves engineering a virus for treating lung cancer.

Dr. Ma'en Obeidat receives a MSFHR Scholar Award

The Michael Smith Foundation for Health Research (MSFHR) Scholar Award is given to early-career researchers to support the establishment of an independent research career and to expand their potential to make significant contributions to their field. Dr. Obeidat's research focuses on using integrative genomics to identify novel therapeutics and biomarkers for COPD.

Dr. Del Dorscheid receives a MSFHR Health Professional Investigator Award

Dr. Dorscheid is a clinician scientist whose research focuses on the molecular mechanisms of asthma. He received a HP-I award from the Michael Smith Foundation for Health Research, which will support his research in this area.

Dr. Tillie Hackett receives a Distinguished Achievement Award

In recognition of outstanding basic science research and scholarly contributions in the areas of health and life sciences, Dr. Hackett received a Distinguished Achievement Award from the University of British Columbia Faculty of Medicine.

Dr. Chris Ryerson receives a Distinguished Achievement Award

In recognition of outstanding clinical research and scholarly contributions in the areas of health and life sciences, Dr. Ryerson received a Distinguished Achievement Award from the University of British Columbia Faculty of Medicine.

Dr. Janice Leung receives a Clinical Faculty Award

In recognition of excellence in teaching by clinical faculty, Dr. Leung was awarded a Clinical Faculty Award from the University of British Columbia Faculty of Medicine.

Peer Reviewed Publications

The Centre for Heart Lung Innovation's investigators and students authored **305** publications in 2018.

In the category of Medicine, **20.5%** of publications from the Centre for Heart Lung Innovation (HLI) were in the top 5% of most cited papers. Based on the field weighted citation impact, publications by HLI researchers were cited **3.3 times** more than the average paper in a corresponding field. (Figure 2). HLI's field weighted citation impact was higher than that of UBC and other top research institutions around the world.

HLI researchers published more frequently in top 5% of most cited journals in the disciplines of medicine (**26.1%**), respiratory (**38.3%**), cardiovascular (**21.2%**), and critical care (**45.9%**) than researchers at UBC or in Canada (Figure 3). In 2018, HLI generated over 300 publications for the second year in a row (Figure 4).

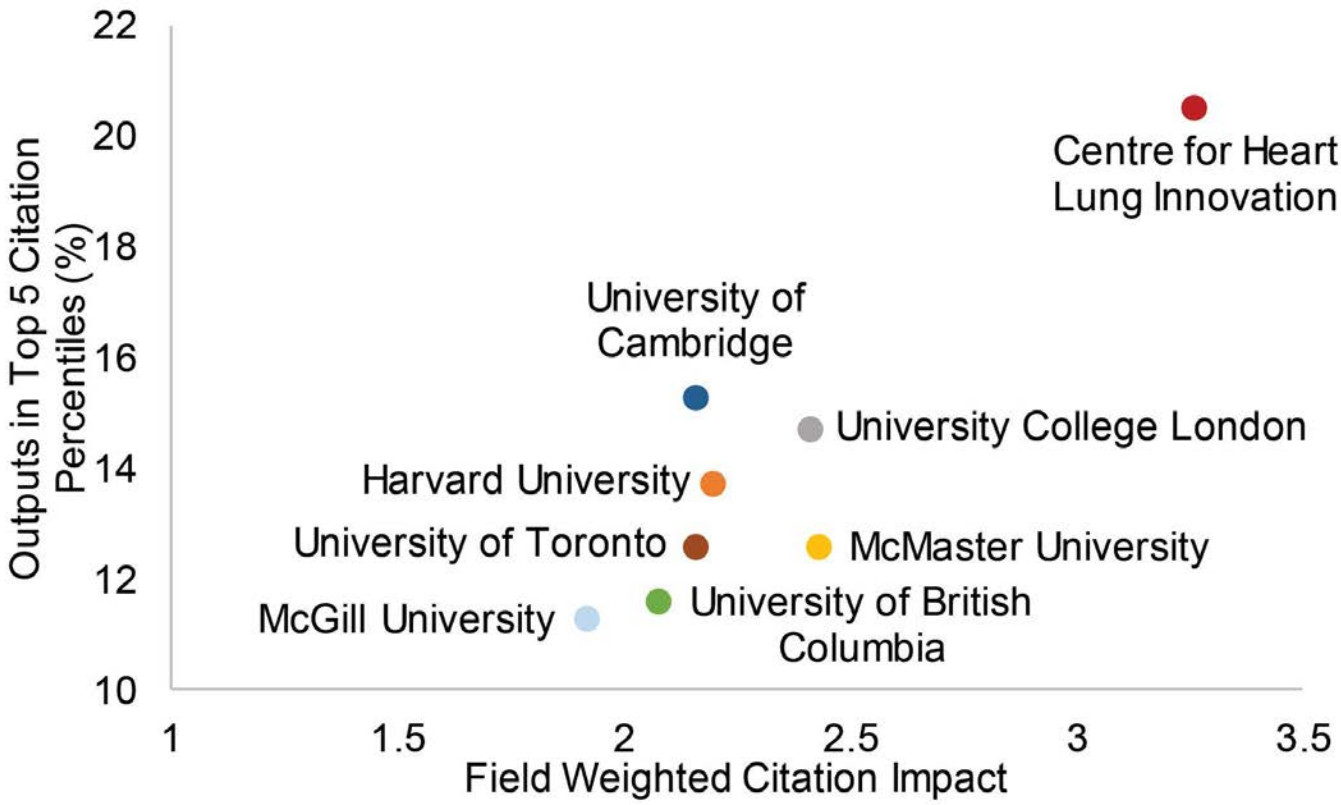


Figure 2. Percentage of top-cited publications and field weighted citation impact in the field of Medicine for the Centre for Heart Lung Innovation and other top research institutions in 2018. The field weighted citation impact is a ratio of the number of citations compared to the number of expected citations for outputs of similar age, subject, and publication type. Data was obtained from SciVal.

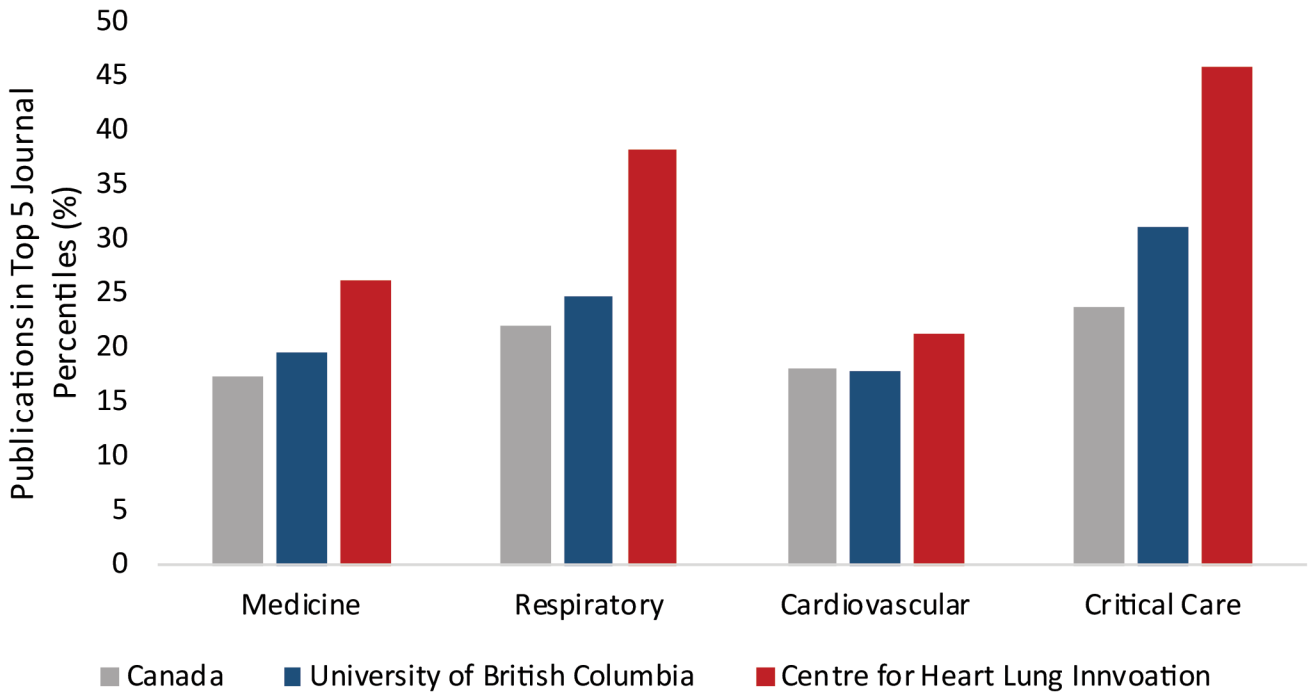


Figure 3. In 2018, HLI investigators published more often in the top 5% of most cited journals than researchers at UBC or in Canada. The full list of all HLI publications in journals with impact factors > 10 follows. Data was obtained from SciVal.

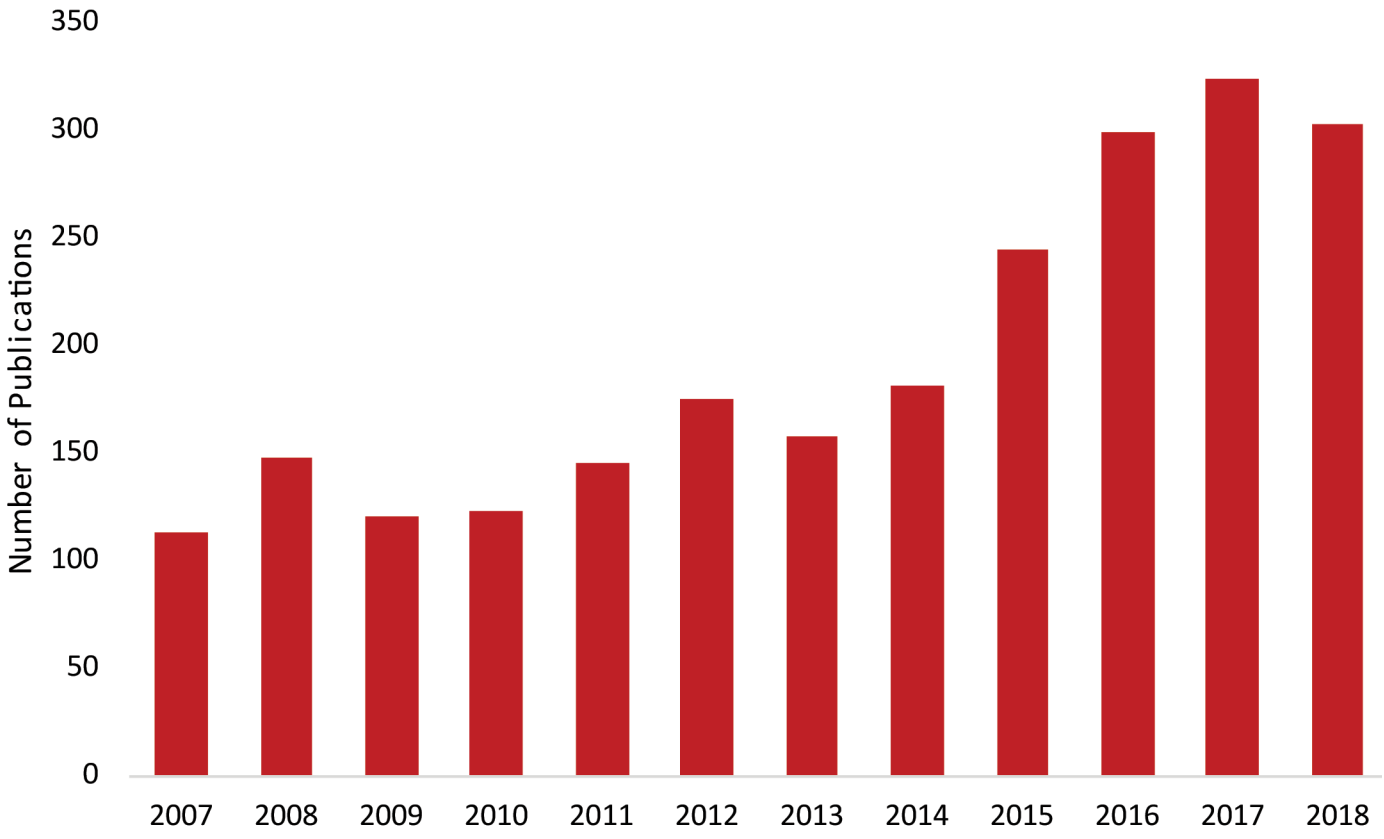


Figure 4. Publications authored by the Centre for Heart Lung Innovation Principal Investigators - a 12-year trend. A full list of the 2018 HLI Principal Investigator publications can be found in Appendix B.

HIGH IMPACT PAPERS BY HLI INVESTIGATORS IN 2018

Lancet

Impact Factor: 53.254

Journal Category:
Medicine, General and Internal

Rank Within Category:
2/155

Dehghan M, Mente A, Rangarajan S, Sheridan P, Mohan V, Iqbal R, Gupta R, **Lear S**, Wentzel-Viljoen E, Avezum A, Lopez-Jaramillo P, Mony P, Varma RP, Kumar R, Chifamba J, Alhabib KF, Mohammadifard N, Oguz A, Lanas F, Rozanska D, Bostrom KB, Yusoff K, Tsolkile LP, Dans A, Yusufali A, Orlandini A, Poirier P, Khatib R, Hu B, Wei L, Yin L, Deeraili A, Yeates K, Yusuf R, Ismail N, Mozaffarian D, Teo K, Anand SS, Yusuf S; Prospective Urban Rural Epidemiology (PURE) study investigators. Association of dairy intake with cardiovascular disease and mortality in 21 countries from five continents (PURE): a prospective cohort study. Lancet. 2018 Nov 24;392(10161):2288-2297. doi: 10.1016/S0140-6736(18)31812-9. Epub 2018 Sep 11. PubMed PMID: 30217460.

Mente A, O'Donnell M, Rangarajan S, McQueen M, Dagenais G, Wielgosz A, **Lear S**, Ah STL, Wei L, Diaz R, Avezum A, Lopez-Jaramillo P, Lanas F, Mony P, Szuba A, Iqbal R, Yusuf R, Mohammadifard N, Khatib R, Yusoff K, Ismail N, Gulec S, Rosengren A, Yusufali A, Kruger L, Tsolekile LP, Chifamba J, Dans A, Alhabib KF, Yeates K, Teo K, Yusuf S. Urinary sodium excretion, blood pressure, cardiovascular disease, and mortality: a community-level prospective epidemiological cohort study. Lancet. 2018 Aug 11;392(10146):496-506. doi: 10.1016/S0140-6736(18)31376-X. Epub 2018 Aug 9. PubMed PMID: 30129465.

Nature Genetics

Impact Factor: 27.125

Journal Category:
Genetics & Heredity

Rank Within Category:
2/171

Demenais F, Margaritte-Jeannin P, Barnes KC, Cookson WOC, Altmüller J, Ang W, Barr RG, Beaty TH, Becker AB, Beilby J, Bisgaard H, Bjornsdottir US, Bleecker E, Bønnelykke K, Boomsma DI, Bouzigon E, Brightling CE, Brossard M, Brusselle GG, Burchard E, Burkart KM, Bush A, Chan-Yeung M, Chung KF, Couto Alves A, Curtin JA, Custovic A, **Daley D**, de Jongste JC, Del-Rio-Navarro BE, Donohue KM, Duijts L, Eng C, Eriksson JG, Farrall M, Fedorova Y, Feenstra B, Ferreira MA; Australian Asthma Genetics Consortium (AAGC) collaborators, Freidin MB, Gajdos Z, Gauderman J, Gehring U, Geller F, Genuneit J, Gharib SA, Gilliland F, Granell R, Graves PE, Gudbjartsson DF, Haahtela T, Heckbert SR, Heederik D, Heinrich J, Heliövaara M, Henderson J, Himes BE, Hirose H, Hirschhorn JN, Hofman A, Holt P, Hottenga J, Hudson TJ, Hui J, Imboden M, Ivanov V, Jaddoe VWV, James A, Janson C, Jarvelin MR, Jarvis D, Jones G, Jonsdottir I, Jousilahti P, Kabesch M, Kähönen M, Kantor DB, Karunas AS, Khusnutdinova E, Koppelman GH, Kozyrskyj AL, Kreiner E, Kubo M, Kumar R, Kumar A, Kuokkanen M, Lahousse L, Laitinen T, Laprise C, Lathrop M, Lau S, Lee YA, Lehtimäki T, Letort S, Levin AM, Li G, Liang L, Loehr LR, London SJ, Loth DW, Manichaikul A, Marenholz I, Martinez FJ, Matheson MC, Mathias RA, Matsumoto K, Mbarek H, McArdle WL, Melbye M, Melén E, Meyers D, Michel S, Mohamdi H, Musk AW, Myers RA, Nieuwenhuis MAE, Noguchi E, O'Connor GT, Ogorodova LM, Palmer CD, Palotie A, Park JE, Pennell CE, Pershagen G, Polonikov A, Postma DS, Probst-Hensch N, Puzyrev VP, Raby BA, Raitakari OT, Ramasamy A, Rich SS, Robertson CF, Romieu I, Salam MT, Salomaa V, Schlünssen V, Scott R, Selivanova PA, Sigsgaard T, Simpson A, Siroux V, Smith LJ, Solodilova M, Standl M, Stefansson K, Strachan DP, Stricker BH, Takahashi A, Thompson PJ, Thorleifsson G, Thorsteinsdottir U, Tiesler CMT, Torgerson DG, Tsunoda T, Uitterlinden AG, van der Valk RJP, Vaysse A, Vedantam S, von Berg A, von Mutius E, Vonk JM, Waage J, Wareham NJ, Weiss ST, White WB, Wickman M, Widén E, Willemsen G, Williams LK, Wouters IM, Yang JJ, Zhao JH, Moffatt MF, Ober C, Nicolae DL. Multiancestry association study identifies new asthma risk loci that colocalize with immune-cell enhancer marks. Nat Genet. 2018 Jan;50(1):42-53. doi: 10.1038/s41588-017-0014-7. Epub 2017 Dec 22. PubMed PMID: 29273806; PubMed Central PMCID: PMC5901974.

BMJ-British Medical Journal

Impact Factor: 23.562

Journal Category: Medicine, General & Internal

Rank Within Category: 4/155

Eyawo O, Hull MW, Salters K, Samji H, Cescon A, Sereda P, Lima VD, Nosyk B, Whitehurst DGT, **Lear SA**, Montaner JSG, Hogg RS; Comparative Outcomes And Service Utilization Trends (COAST) Study. Cohort profile: the Comparative Outcomes And Service Utilization Trends (COAST) Study among people living with and without HIV in British Columbia, Canada. BMJ Open. 2018 Jan 13;8(1):e019115. doi: 10.1136/bmjopen-2017-019115. PubMed PMID: 29331972; PubMed Central PMCID: PMC5781099.

Lear SA. Patients in research: one step in a long path. BMJ. 2018 Oct 24;363:k4386. doi: 10.1136/bmj.k4386. PubMed PMID: 30355642.

European Heart Journal

Impact Factor: 23.425

Journal Category: Cardiac & Cardiovascular Systems

Rank Within Category: 1/128

Baruteau AE, Kyndt F, Behr ER, Vink AS, Lachaud M, Joong A, Schott JJ, Horie M, Denjoy I, Crotti L, Shimizu W, Bos JM, Stephenson EA, Wong L, Abrams DJ, Davis AM, Winbo A, Dubin AM, Sanatani S, Liberman L, Kaski JP, Rudic B, Kwok SY, Rieubland C, Tfelt-Hansen J, Van Hare GF, Guyomarc'h-Delasalle B, Blom NA, Wijeyeratne YD, Gourraud JB, Le Marec H, Ozawa J, Fressart V, Lupoglazoff JM, Dagradi F, Spazzolini C, Aiba T, Tester DJ, Zahavich LA, Beauséjour-Ladouceur V, Jadhav M, Skinner JR, Franciosi S, **Krahn AD**, Abdelsayed M, Ruben PC, Yung TC, Ackerman MJ, Wilde AA, Schwartz PJ, Probst V. SCN5A mutations in 442 neonates and children: genotype-phenotype correlation and identification of higher-risk subgroups. Eur Heart J. 2018 Aug 14;39(31):2879-2887. doi: 10.1093/eurheartj/ehy412. PubMed PMID: 30059973.

Cheung CC, **Krahn AD**. The importance of a comprehensive evaluation of survivors of cardiac arrest. Eur Heart J. 2018 Jun 1;39(21):1988-1991. doi: 10.1093/eurheartj/ehy160. PubMed PMID: 29584853.

Ruiz CE, Hahn RT, Berrebi A, Borer JS, Cutlip DE, Fontana G, Gerosa G, Ibrahim R, Jelnin V, Jilaihawi H, Jolicoeur EM, Kliger C, Kronzon I, **Leipsic J**, Maisano F, Millan X, Nataf P, O'Gara PT, Pibarot P, Ramee SR, Rihal CS, Rodes-Cabau J, Sorajja P, Suri R, Swain JA, Turi ZG, Tuzcu EM, Weissman NJ, Zamorano JL, Serruys PW, Leon MB; of the Paravalvular Leak Academic Research Consortium. Clinical Trial Principles and Endpoint Definitions for Paravalvular Leaks in Surgical Prosthesis: An Expert Statement. Eur Heart J. 2017 Apr 18. doi: 10.1093/eurheartj/ehx211. [Epub ahead of print]

Wang C, Bangdiwala SI, Rangarajan S, **Lear SA**, AlHabib KF, Mohan V, Teo K, Poirier P, Tse LA, Liu Z, Rosengren A, Kumar R, Lopez-Jaramillo P, Yusoff K, Monsef N, Krishnapillai V, Ismail N, Seron P, Dans AL, Kruger L, Yeates K, Leach L, Yusuf R, Orlandini A, Wolyniec M, Bahonar A, Mohan I, Khatib R, Temizhan A, Li W, Yusuf S. Association of estimated sleep duration and naps with mortality and cardiovascular events: a study of 116 632 people from 21 countries. Eur Heart J. 2018 Dec 5. doi: 10.1093/eurheartj/ehy695. [Epub ahead of print] PubMed PMID: 30517670.

Lancet: Respiratory Medicine

Impact Factor: 21.466

Journal Category:	Rank Within Category:
Critical Care Medicine	1/33
Respiratory System	1/60

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Journal of the American College of Cardiology

Impact Factor: 16.834

Journal Category:	Rank Within Category:
Cardiac & Cardiovascular Systems	3/128

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Lancet: Diabetes & Endocrinology

Impact Factor: 19.313

Journal Category:	Rank Within Category:
Endocrinology & Metabolism	3/142

Chow CK, Ramasundarahettige C, Hu W, AlHabib KF, Avezum A Jr, Cheng X, Chifamba J, Dagenais G, Dans A, Egbujie BA, Gupta R, Iqbal R, Ismail N, Keskinler MV, Khatib R, Kruger L, Kumar R, Lanas F, **Lear S**, Lopez-Jaramillo P, McKee M, Mohammadifard N, Mohan V, Mony P, Orlandini A, Rosengren A, Vijayakumar K, Wei L, Yeates K, Yusoff K, Yusuf R, Yusufali A, Zatonska K, Zhou Y, Islam S, Corsi D, Rangarajan S, Teo K, Gerstein HC, Yusuf S; PURE investigators. Availability and affordability of essential medicines for diabetes across high-income, middle-income, and low-income countries: a prospective epidemiological study. Lancet Diabetes Endocrinol. 2018 Oct;6(10):798-808. doi: 10.1016/S2213-8587(18)30233-X. Epub 2018 Aug 28. PubMed PMID: 30170949.

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Impact Factor: 18.881

Journal Category:	Rank Within Category:
Cardiac & Cardiovascular Systems	2/128
Peripheral Vascular Disease	1/65

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Impact Factor: 18.075

Journal Category:	Rank Within Category:
Public, Environmental & Occupational Health	1/181

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American Journal of Respiratory and Critical Care Medicine

Impact Factor: 15.239

Journal Category:	Rank Within Category:
Critical Care Medicine	2/33
Respiratory System	2/60

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Intensive Care Medicine

Impact Factor: 15.008

Journal Category:	**Rank Within Category:**
Critical Care Medicine	3/33

Annane D, Ouanes-Besbes L, de Backer D, DU B, Gordon AC, Hernández G, Olsen KM, Osborn TM, Peake S, **Russell JA**, Cavazzoni SZ. A global perspective on vasoactive agents in shock. Intensive Care Med. 2018 Jun;44(6):833-846. doi: 10.1007/s00134-018-5242-5. Epub 2018 Jun 4. Review. PubMed PMID: 29868972.

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The Journal of Allergy and Clinical Immunology

Impact Factor: 13.258

Journal Category:	Rank Within Category:
Allergy	1/27
Immunology	6/155

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Nature Communications

Impact Factor: 12.353

Journal Category: Multidisciplinary Sciences

Rank Within Category: 3/64

Ji X, Bossé Y, Landi MT, Gui J, Xiao X, Qian D, Joubert P, Lamontagne M, Li Y, Gorlov I, de Biasi M, Han Y, Gorlova O, Hung RJ, Wu X, McKay J, Zong X, Carreras-Torres R, Christiani DC, Caporaso N, Johansson M, Liu G, Bojesen SE, Le Marchand L, Albanes D, Bickeböller H, Aldrich MC, Bush WS, Tardon A, Rennert G, Chen C, Teare MD, Field JK, Kiemeney LA, Lazarus P, Haugen A, Lam S, Schabath MB, Andrew AS, Shen H, Hong YC, Yuan JM, Bertazzi PA, Pesatori AC, Ye Y, Diao N, Su L, Zhang R, Brhane Y, Leighl N, Johansen JS, Mellemgaard A, Saliba W, Haiman C, Wilkens L, Fernandez-Somoano A, Fernandez-Tardon G, van der Heijden EHFM, Kim JH, Dai J, Hu Z, Davies MPA, Marcus MW, Brunnström H, Manjer J, Melander O, Muller DC, Overvad K, Trichopoulou A, Tumino R, Doherty J, Goodman GE, Cox A, Taylor F, Woll P, Brüske I, Manz J, Muley T, Risch A, Rosenberger A, Grankvist K, Johansson M, Shepherd F, Tsao MS, Arnold SM, Haura EB, Bolca C, Holcatova I, Janout V, Kontic M, Lissowska J, Mukeria A, Ognjanovic S, Orlowski TM, Scelo G, Swiatkowska B, Zaridze D, Bakke P, Skaug V, Zienolddiny S, Duell EJ, Butler LM, Koh WP, Gao YT, Houlston R, McLaughlin J, Stevens V, Nickle DC, **Obeidat M**, Timens W, Zhu B, Song L, Artigas MS, Tobin MD, Wain LV, Gu F, Byun J, Kamal A, Zhu D, Tyndale RF, Wei WQ, Chanock S, Brennan P, Amos CI. Identification of susceptibility pathways for the role of chromosome 15q25.1 in modifying lung cancer risk. Nat Commun. 2018 Aug 13;9(1):3221. doi: 10.1038/s41467-018-05074-y. PubMed PMID: 30104567; PubMed Central PMCID: PMC6089967.

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European Respiratory Journal

Impact Factor: 12.244

Journal Category: Respiratory System

Rank Within Category: 3/60

Khalil N, Manganas H, **Ryerson CJ**, Shapera S, Cantin AM, Hernandez P, Turcotte EE, Parker JM, Moran JE, Albert GR, Sawtell R, Hagerimana A, Laurin P, Gagnon L, Cesari F, Kolb M. Phase 2 clinical trial of PBI-4050 in patients with idiopathic pulmonary fibrosis. Eur Respir J. 2018 Dec 21. pii: 1800663. doi: 10.1183/13993003.00663-2018. [Epub ahead of print] PubMed PMID: 30578394.

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Autophagy

Impact Factor: 11.100

Journal Category:	**Rank Within Category:**
Cell Biology	13/190

Corona AK, Mohamud Y, Jackson WT, **Luo H**. Oh, SNAP! How enteroviruses redirect autophagic traffic away from degradation. Autophagy. 2018;14(8):1469-1471. doi: 10.1080/15548627.2018.1480849. Epub 2018 Jul 21. PubMed PMID: 30032704; PubMed Central PMCID: PMC6103677.

JACC: Cardiovascular Imaging

Impact Factor: 10.247

Journal Category:	**Rank Within Category:**
Cardiac & Cardiovascular Systems	7/128
Radiology, Nuclear Medicine & Medical Imaging	1/129

Kim U, **Leipsic JA**, Sellers SL, Shao M, Blanke P, Hadamitzky M, Kim YJ, Conte E, Andreini D, Pontone G, Budoff MJ, Gottlieb I, Lee BK, Chun EJ, Cademartiri F, Maffei E, Marques H, Shin S, Choi JH, Virmani R, Samady H, Stone PH, Berman DS, Narula J, Shaw LJ, Bax JJ, Min JK, Chang HJ. Natural History of Diabetic Coronary Atherosclerosis by Quantitative Measurement of Serial Coronary Computed Tomographic Angiography: Results of the PARADIGM Study. JACC Cardiovasc Imaging. 2018 Oct;11(10):1461-1471. doi: 10.1016/j.jcmg.2018.04.009. Epub 2018 May 16. PubMed PMID: 29778853.

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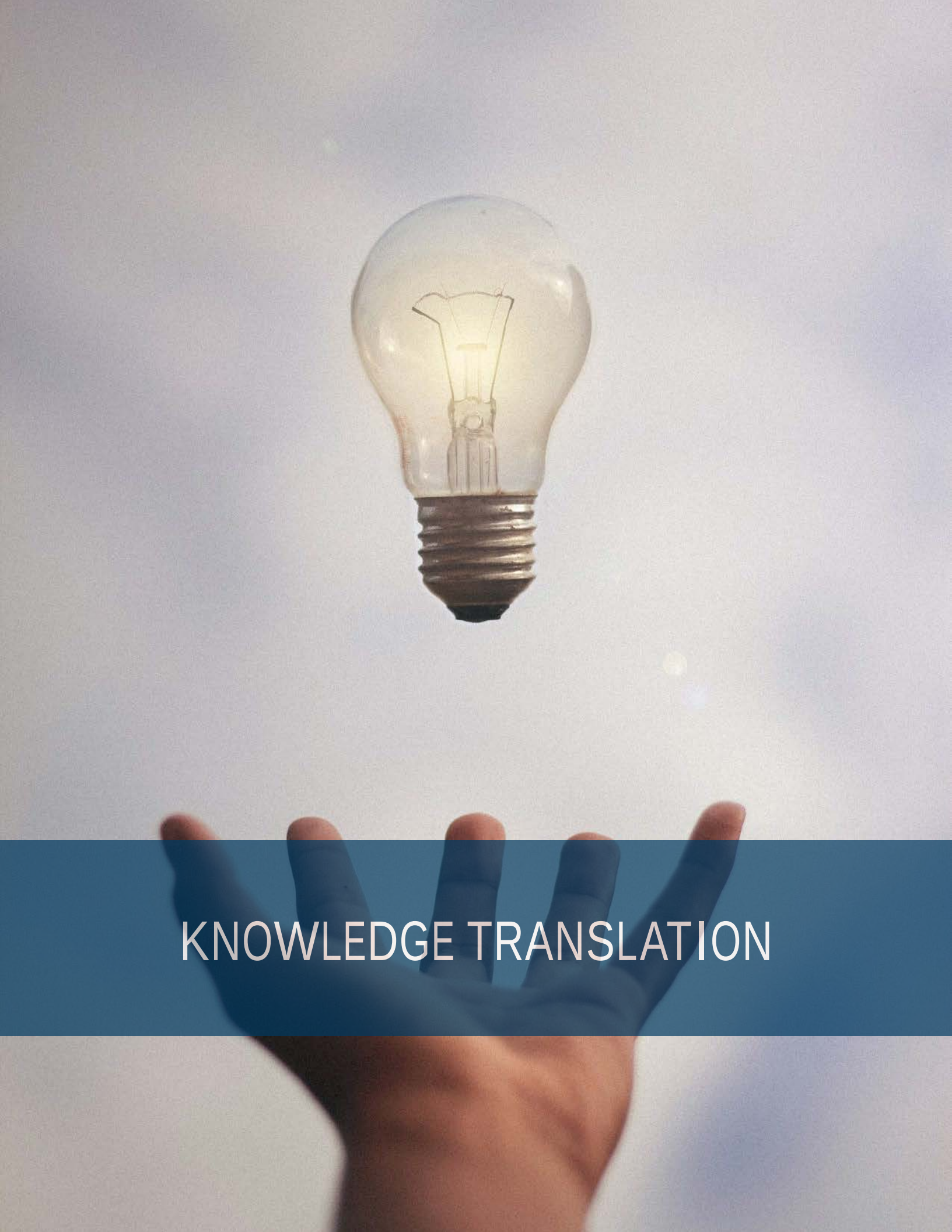
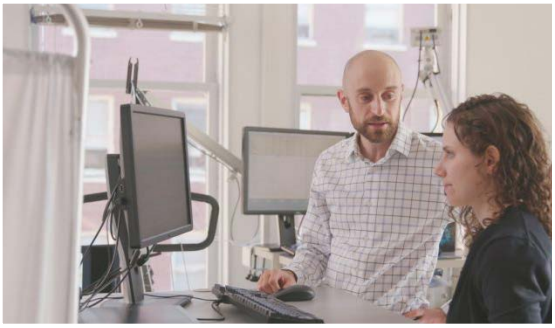
Impact factors and journal rankings are based on the Thomson Reuters Incites Journal Citation report for 2017.
HLI Principal Investigators are in **bold**.



KNOWLEDGE TRANSLATION

Drs. Jordan Guenette and Michele Schaeffer featured in BC Lung Association's Lung Month Celebration



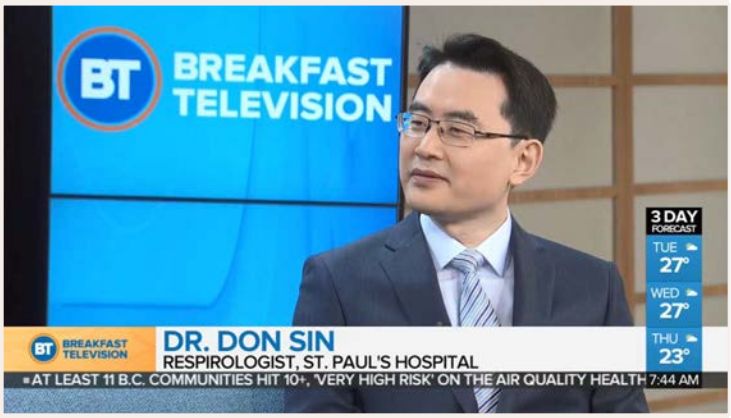
Interstitial lung disease is a category of disorders that cause scarring, or fibrosis of the lungs. People who suffer from interstitial lung disease often experience shortness of breath, which leads them to avoid or minimize physical activity. This in turn makes them weaker and can lead to even more severe symptoms of breathlessness.

In a video made by BC Lung Association, Dr. Jordan Guenette, a clinical exercise physiologist, and his trainee Dr. Michele Schaeffer explained their idea to give these patients extra oxygen to reduce their symptoms of breathlessness.

In this study, Drs. Guenette and Schaeffer found that patients who were given supplemental oxygen improved dramatically. With these results, they have secured over $2.1 million to take this intervention across the nation, launching a multi-centre clinical trial at eight different sites. This video was shown at the BC Lung Association's Lung Month Celebration in November 2018.

Read more about Dr. Guenette's research at Providence Health Care's The Daily Scan and in the Research Spotlight.

Dr. Don Sin comments on air quality during the BC wildfire season



In the summer of 2018, much of BC – including Vancouver and the Lower Mainland – had air quality advisories in effect. With over 500 wildfires burning across the province, the city was covered in a thick, smoky haze and air levels of particulate matter were 10 to 20 times higher than normally expected.

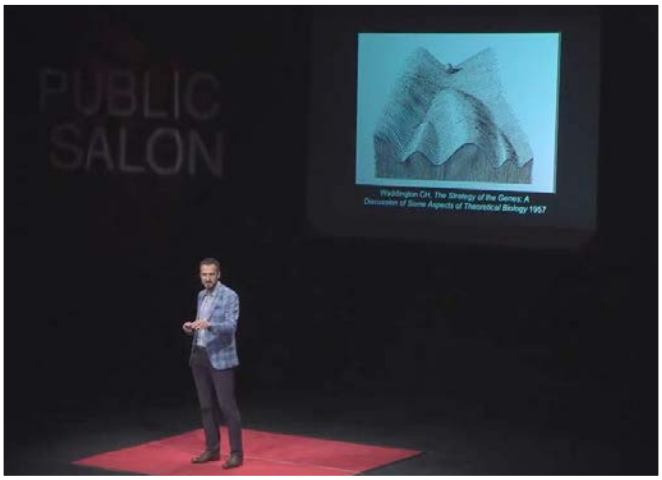
In an interview with CBC, Dr. Don Sin, a respirologist at St. Paul's Hospital and a Professor of Medicine in the HLI, commented that the air quality was like "smoking continuous cigarettes". Continued exposure to these conditions may cause long-term health problems in up to 10% of people.

During interviews with Global News and Breakfast Television, Dr. Sin commented that around 10 to 20% of the population were particularly susceptible to poor air quality, such as those who have chronic obstructive pulmonary disease (COPD), asthma, or underlying heart conditions. In the emergency room and other urgent clinics, there was an increase in the number of patients with symptoms of chest tightness, heart issues, breathing trouble, and cough.

To minimize exposure, Dr. Sin recommended that individuals avoid physical activity outdoors and to use properly fitted N95 masks that can properly filter out particles from the air. Surgical masks, on the other hand, may do more harm than good, as they can cause quicker rates of breathing and increase exposure to particulate matter.

Read more on Dr. Sin's recommendations in CBC News, Global News, and News 1130.

Dr. Liam Brunham educates the public on using stem cells to study adverse drug reactions



Adverse drug reactions, or side effects from prescribed medications, are the fourth leading cause of death in Canada and the United States. These undesired effects arise from variabilities in how different individuals respond to the same drug, which could be related to their age, sex, weight, and most importantly, underlying genetic differences.

During a Public Salon in June 2018, Dr. Liam Brunham explained to a public audience how his research group is developing tools to predict and prevent adverse drug reactions. Using inducible pluripotent stem cells derived from the patients' blood, Dr. Brunham and his team tested the response of specific cell types to drugs, and found that the cells' responses closely mimicked how the actual patients responded to the drug.

This finding has the potential to shift the paradigm of how medications are prescribed by allowing physicians to predict whether adverse drug reactions will occur before patients are actually treated.

Dr. Chris Carlsten warns about the unknown effects of long term vaping

Vaping, or the act of inhaling the vapour produced by e-cigarettes and similar devices, is rising in popularity as a less harmful alternative to smoking tobacco. However, emerging evidence suggests that the potential for harm reduction is not being realized to the extent that was hoped for.

Dr. Chris Carlsten, a Professor in Respiratory Medicine and the Director of UBC's Occupational Lung Disease Clinic, commented on the current vaping trend in a CBC radio interview.

Because e-cigarettes deliver nicotine very efficiently – approximately 15 to 20 times more than normal cigarettes – Dr. Carlsten believes young people are becoming more addicted to nicotine. In fact, individuals under the age of 21 are 10 times more likely to develop a dependance on nicotine, compared to those who start to use nicotine at an older age.

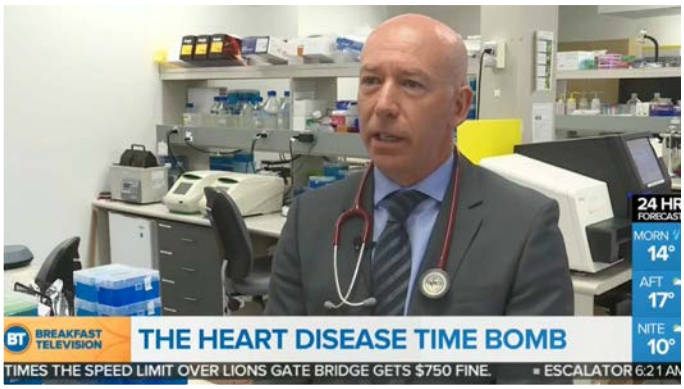
During the interview, Dr. Carlsten also draws attention to the parallels between the past popularity of cigarettes and the current trend of e-cigarettes. Similar to when cigarettes first came to market, he believes "the product is ahead of the science", and that potential longer term health effects will not be realized until decades later.

In order to fully understand the risks and benefits associated with vaping, more research is needed, but until then, Dr. Carlsten believes that proper education is critical, and that government regulations and policies should be put in place to ensure that only the products that are backed up by robust, concrete data be let into the marketplace.

Read more on Dr. Carlsten's interview in CBC News.

Dr. Simon Pimstone discusses the diagnosis and treatment of individuals with early onset cardiovascular disease

Heart disease is a leading cause of death in Canada. Although the rates of incidence have stabilized in older populations, the numbers are still climbing for the young. For patients with early onset heart disease – males under 50 years old and females under 55 years old – their immediate family is at even greater risk of developing heart disease, up to 10 times higher than normal.



Last May, in interviews with Global News and CityTV Breakfast Television, Dr. Pimstone commented that heart disease is generally known to be a male disease, resulting in underdiagnosis and undertreatment in women.

SAVE BC (Study to Avoid cardiovascular disease in British Columbia) is a study that was launched in 2015 by Drs. Simon Pimstone and Liam Brunham to identify ways to predict, treat, and reduce cardiovascular disease in these high-risk patients and families.

The SAVE BC study currently has over 600 enrolled participants, and the team hopes to roll out the program to the rest of BC and eventually to the rest of Canada.

Dr. Scott Lear: Exercise is medicine

Exercise is key to preventing chronic illnesses and has important benefits in treating diseases. For example, it reduces prevents early death and risks of depression, type 2 diabetes, heart disease, stroke, and many cancers. According to the World Health Organization, physical inactivity is the fourth leading cause of death in the world, and current guidelines for physical activity is a minimum of 150 minutes per week.

In a commentary published in The Conversation and Global News, Dr. Scott Lear, a Professor in the Faculty of Health Sciences at SFU, discusses the importance of prescribing exercise as medicine.

For example, exercise is currently used in cardiac rehabilitation for patients who have suffered a heart attack, and in Australia, the Clinical Oncology Society released a position statement recommending exercise as part of standard-of-care. Current and future physicians will need to be educated on when and how to prescribe exercise to their patients, which will hopefully reduce the global burden of chronic diseases on the healthcare system.

Dr. Lear is the Pfizer/Heart & Stroke Foundation Chair in Cardiovascular Prevention Research. He is actively involved in knowledge translation – articles and podcasts can be found at https://drscottlear.com/.

The Airway Centre creates interdisciplinary dialogue at its inaugural conference

Chronic obstructive pulmonary disease (COPD) is currently the leading cause of hospitalizations in Canada, affecting over 2.5 million Canadians. The inaugural Creation of a Pan-Canadian Airway Network Conference, hosted by the Airway Centre in November 2018, brought together over 130 faculty, industrial and government partners, and trainees. These included panel experts such as Drs. Jonathon Leipsic (UBC), Grace Parraga (Robarts Research Institute), Jonathan Rayment (BC Children's), Karen Cheung (UBC), Edmond Young (U. Toronto), Jeremy Hirota (McMaster), Ma'en Obeidat (UBC), Maxwell Libbrecht (SFU), Yohan Bosse (Laval), Chris Carlsten (UBC), Mohsen Sadatsafavi (UBC), and Shawn Aaron (U. Ottawa).

Through brief presentations and extended open-forum discussions, the conference was designed to consolidate and implement multidisciplinary research strategies to accelerate the discovery of COPD drugs and biomarkers. Each of the Airway Centre's four major research themes were featured: 1) Bioimaging, 2) Biomedical Engineering, 3) Genetics/ Genomics, and 4) Clinical Translation. Based on these discussions, several sites were identified as important nodes for the four research themes, and multi-centre, interdisciplinary projects are underway to improve COPD care across all the national sites.

The Airway Centre was founded in 2017 by respirologist and HLI Director, Dr. Don Sin, the current and first Tier 1 Canada Research Chair for COPD, to bring new biomarker and therapeutic solutions to patients with COPD and related airway conditions.

Spin-off Companies

To date, the HLI has launched five UBC spin-off companies: Cyon Therapeutics, viDA Therapeutics Inc, Aspect Biosystems, Black Tusk, and PROOF Centre.

Cyon Therapeutics: Better Outcomes in Sepsis

Driven by the knowledge that better outcomes in sepsis are possible, Cyon Therapeutics Inc. was formed in 2014 to make this a reality. Led by a team of HLI scientists and critical care physicians, Drs. Keith Walley, Jim Russell and John Boyd, and supported by two CEOs, the goal of the company is to bring a novel treatment platform to sepsis. Through their groundbreaking scientific discoveries, the team is developing the means to boost the body's natural ability to clear infectious toxins from the bloodstream.

viDA Therapeutics: Novel Treatments for Inflammatory and Age-related Diseases

Founded in 2008 by Dr. David Granville, viDA Therapeutics is committed to the discovery, development, and commercialization of novel and targeted therapeutics for the treatment of inflammatory and age-related diseases. Their unique discovery platform is based on novel research regarding a distinctly different and recently identified extracellular role for Granzymes in the destruction and inflammation of tissues.

Aspect Biosystems: Human Tissues on Demand

Dr. Sam Wadsworth, leading cell biologist at the HLI, co-founded the award-winning biotechnology company, Aspect Biosystems Ltd., with Dr. Konrad Walus' research group in November 2013. Aspect Biosystems specializes in 3D bioprinting and tissue engineering, bringing together a multi-talented team of individuals to develop cutting-edge custom human tissue technology for use in the life sciences.

PROOF Centre: Biomarkers to prevent organ failure

The PROOF (Prevention of Organ Failure) Centre is a not-for-profit organization that develops blood tests to better predict, diagnose, manage, and treat heart, lung and kidney disease. PROOF is a cross-disciplinary biosignature development engine of partners representing academia, health care, government, industry, patients, and the public. The PROOF Centre, led by HLI PI and former HLI Director Dr. Bruce McManus, was initially established by the Networks of Centres of Excellence Secretariat under the Centre of Excellence for Commercialization and Research (NCE CECR) Program, and is co-hosted by the University of British Columbia and Providence Health Care in Vancouver, British Columbia, Canada.

Black Tusk Research Group Inc.

Founded in 2014 by HLI Clinical Research Core Manager Ms. Lynda Lazosky and HLI PI Dr. John Boyd, Black Tusk Research Group Inc. is a site monitoring organization supporting clinical trials and biobanking. BTRG supports Principal Investigators by initiating and managing pharmaceutical clinical trials (phase II, III, IV) and academic grant funded clinical research projects.

Dr. Bruce McManus with graduate students

TRAINING THE NEXT GENERATION

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.

HLI Summer Student Research Program

About the HLI-SSRP

Throughout the year, numerous undergraduate students are trained at the HLI through co-operative education programs, directed studies programs, or other 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 senior professor and an immediate research 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 techniques per four-month or eight-month fellowship, but, more importantly for this formative period of learning, students develop critical thinking abilities, team and communications skills, and a passion for scientific research.

In addition to technical and scientific training, students learn to present their original work at the Summer Student Research Day, a one-day conference featuring both oral and poster presentations by student researchers.

In 2018, the HLI hosted **43 summer students** through our Summer Student Research Program.

Over the last 10 years the HLI has hosted over 600 undergraduate students

Summer Student Research Day

The annual Summer Student Research Day took place on August 10, 2018, at St. Paul's Hospital. During this one-day event, summer students – mostly undergraduates and a few high school students – had the opportunity to present their research findings to their peers and other researchers at the Centre. For many students, this is one of their first opportunities to showcase their most exciting research findings to a large audience.

This year, a total of 16 students gave oral presentations in three categories: heart, lung, and innovation. An additional 15 students presented posters on their research. Topics ranged from basic science research on asthma and chronic obstructive pulmonary disease (COPD), to clinical studies on heart disease.

The 2018 SSRD was once again a huge success, with thanks to the generous event sponsors: St. Paul's Hospital Foundation, Providence Health Care Research Institute, Michael Smith Foundation for Health Research, and the HLI. The oral and poster presentations were judged by a panel of HLI senior invesitgators, and awards were presented to the outstanding students below. Congratulations to all of our next generation of researchers!

2018 Dr. Bruce McManus Presentation Awards

Award	Recipient	HLI Supervisor
Top Heart Oral Presentation	Antyrah de Guzman	Keith Walley, Alex Leung
Top Lung Oral Presentation	Aileen Hsieh	Tillie Hackett
Top Innovation Oral Presentation	Sophie Guo	Liam Brunham
Top Poster	Katrina Besler	Gordon Francis

Heart + Lung FEST

The annual Heart + Lung Health FEST is developed and hosted by the community-wide umbrella organization, the Institute for Heart + Lung Health. FEST is an opportunity for HLI trainees to present their ongoing research and engage and learn alongside professionals from all relevant heart and lung domains. The 2018 FEST was held February 6 - 7th at the Sheraton Vancouver Wall Centre Hotel.

HLI Trainee Research Day

On October 16, 2018, the HLI hosted the second annual Trainee Research Day. During this exciting day of science and discovery, HLI trainees presented their research and progress towards finding cures for heart, lung, vessel, and critical care disease. Dr. Jim Hogg delivered the keynote presentation of the day, "Why the small conducting airways are the 'Achilles heel' of the lungs". This event was generously sponsored by Providence Health Care Research Institute, St. Paul's Foundation, and Michael Smith Foundation for Health Research.

Trainees presented in three categories: Heart, Lung and Innovation. Congratulations to the award recipients!

Heart
1st prize: Arash Tehrani (Bernatchez lab) Runner-up: Yasir Mohamud (Luo lab)

Lung
1st prize: Steve Booth (Hackett lab) Runner-up: Kimia Shahangian (Sin lab)

Innovation
1st prize: Stephanie Sellers (Leipsic lab) Runner-up: Tim Xue (Luo lab)

Poster
1st prize: Amy Nguyen (DeMarco lab) | 2nd prize: Alex Leung (Boyd lab) | 3rd prize: Feng Xu (Hogg lab)

Participants in the HLI Trainee Research Day were invited to apply for a Travel Award to attend a conference of their choice.

The awards were presented to **Mark Trinder** (Brunham Lab) to attend the European Atherosclerosis Society Congress in the Netherlands, and **Yasir Mohamud** (Luo Lab) to attend the International Conference on Regulators of Autophagy and Cell Biology in Osaka, Japan.

HLI Career Day

Every year the HLI holds a Career Day for trainees. In 2018, the focus of Career Day was to provide trainees with career options in science and research. Seminars on preparing posters and writing scientific journal articles were also offered.

High School Science Week

In the spring and fall each year, high school students participate in the High School Science Week hosted by the HLI. Eight students are invited to participate in laboratory sessions and seminars. This program is a unique opportunity for highschool students to receive hands-on biomedical lab experience that can help shape their future aspirations.

Students who participate in the High School Science Week are eligible to apply for the $2,000 **Peter D. Paré Scholarship,** an eight-week summer internship at the HLI.

The Peter D. Paré Scholarship recipient for 2018 was **Nima Toussi**. Nima worked in Dr. Chun Seow's lab with Dr. Lu Wang to test a structure model for a smooth muscle contractile unit. Nima presented his research at the 2018 HLI Summer Student Research Day.

HLI Weekly Seminars

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.

The HLI Friday Seminar Series features research presentations from local and international experts to foster education and collaboration. Detailed information about the 2018 HLI Friday Seminars can be found in Appendix C. The Research in Progress seminar series provides graduate students and post-doctoral fellows at the HLI a forum to present their ongoing research to other HLI researchers. These seminars provide trainees access to a critical but supportive audience with varied expertise throughout the their research programs. A full schedule of the 2018 Research in Progress Seminars can be found in Appendix D.

HLI Trainee Association

As part of an effort to enhance the current training environment, Dr. Scott Tebbutt, newly appointed HLI Educational Director, spearheaded the formation of the first HLI Trainee Association. The inaugural meeting of the Association was held in December 2018. The Association established the following mission statement:

"We aim to enhance the academic experience of all trainees by providing an environment to foster enhanced collaboration, education, professional growth, and career success."

Trainee Awards in 2018

Trainee Fellowships and Scholarships

Name	Award	Awarding Body
Alyson Wong	Clinical Fellowship	Canadian Pulmonary Fibrosis Foundation
Anna Siedlecki	Microgrant	Rare Disease Foundation
Anna Siedlecki	Affiliation Bursary Award	UBC
Anna Siedlecki	Graduate Award	UBC Faculty of Medicine
Arash Tehrani	Microgrant	Rare Disease Foundation
Arash Tehrani	Graduate Award	UBC Faculty of Medicine
Chris Turner	Young Investigator of the Year	Autralasian Wound & Tissue Repair Society
Christopher Qi	Summer Studentship	AllerGen
Daniela Castillo-Saldana	Microgrant	Rare Disease Foundation
Daniela Castillo-Saldana	Graduate Award	UBC Faculty of Medicine
Guangze Zhao	C. L. Wang Memorial Scholarship	UBC
Guangze Zhao	Graduate Award	UBC Faculty of Medicine
Julia Yang	JSPS Summer Student Program	Mitacs
Junyan Shi	Research Trainee Fellowship	Michael Smith Foundation for Health Research
Lauren Forgrave	CGS-M	Candian Institutes of Health Research
Marissa Lee	Summer Studentship	Cystic Fibrosis Canada
Nafeez Syed	BAO Allied Health Fellowship	Lung Association
Nancy Yang	Graduate Award	UBC Faculty of Medicine
Paul Hanson	Research Trainee Fellowship	Michael Smith Foundation for Health Research
Reid Mitchell	Postgraduate Scholarship - Doctoral	NSERC
Reid Mitchell	4-year Fellowship	UBC
Sameer Desai	Research Fellowship	Cystic Fibrosis Canada
Sameer Desai	Doctoral Studentship	Cystic Fibrosis Canada
Sameer Desai	Health System Impact Fellowship	Canadian Institutes of Health Research
Serena Singh	Research Trainee Fellowship	Michael Smith Foundation for Health Research
Stephanie Sellers	Research Trainee Fellowship	Michael Smith Foundation for Health Research
Tony Guo	Summer Studentship	AllerGen
Yannick Molgat-Seon	Research Trainee Fellowship	Michael Smith Foundation for Health Research
Yannick Molgat-Seon	Respiratory Rehabilitation Fellowship	BC Lung Association
Yaroslav Uryumtsev	Summer Studentship	UBC Faculty of Medicine
Yasir Mohamud	Doctoral Fellowship	ALS Canada Brain Canada

Other Trainee and Staff Awards and Recognitions

Name	Award	Awarding Body
Aida Eslami	Travel Award	CIHR - Institute Community Support
Amy Nguyen	Honours, student/fellow competition	Alzheimer's Association International Conference
Andrew Ramsook	Student Travel Award	Canadian Society of Exercise Physiology
Andrew Ramsook	Travel Award	CIHR - Institute Community Support
Anna Siedlecki	Travel Award	CIHR - Institute Community Support
Anthony Tam	Travel Award	CIHR - Institute Community Support
Arash Tehrani	Travel Award	CIHR - Institute Community Support
Chris Turner	Travel and Oral Presentation Award	2018 Wound Healing Society
Chris Turner	Top Science Presentation	2018 UBC Plastic Surgery Day
Chris Turner	Travel Award	CIHR Institute of Aging
Daniela Castillo-Saldana	Travel Award	CIHR - Institute Community Support
Diana Vikulova	Travel Award	CIHR - Institute Community Support
Emmanuel Osei	Travel Award	AllerGen
Feng Xu	Travel Award	CIHR - Institute Community Support
Fernando Studart	2018 Sreedhar Nair Early Stage Investigator Award in COPD	ATS Assembly on Clinical Problems
Fernando Studart	Abstract Scholarship	American Thoracic Society
Fernando Studart	Travel Award	CIHR - Institute Community Support
Gurpreet Singhera	Travel Award	AllerGen
Josh Dubland	Travel Award for Young Investigators	ATVB
Josh Dubland	Travel Award	CIHR - Institute Community Support
Junyan Shi	Travel Award	CIHR - Institute Community Support
Keerit Tauh	Travel Award	CIHR - Institute Community Support
Keerit Tauh	Best Science Poster	Canadian Cardiovascular Congress
Keir Martyn	Top Undergraduate Student Poster	UBC Pathology Day
Kelly Genga	Travel Award	CIHR - Institute Community Support
Kimia Shahangian	Travel Award	CIHR - Institute Community Support
Mark Trinder	Travel Award	CIHR - Institute Community Support
Minhee Jin	Travel Award	CIHR - Institute Community Support
Miranda Kirby	Travel Award	CIHR - Institute Community Support
Paul Hanson	Trainee Travel Award	ASIP Histochemical Society
Serena Singh	Postdoctoral Research Lecture	UBC Pathology Day
Tatjana Milacic	Travel Fellowship	CALAS Pacific
Yasir Mohamud	Presentation Award	ALS Meeting

TRAINEE CAREER PATHS

The HLI is dedicated to training the next generation of leaders in heart, lung, and blood vessel research. Here are some current careers and positions of former HLI graduate students and postdoctoral fellows who completed their programs in 2018.

Trainee	Supervisor	HLI End Date	Degree/Study Level	Present Position
Nawaf Alotaibi	Don Sin	March 2018	MSc Student	Physician
Kamel Boukais	Gordon Francis	February 2018	Postdoctorate	Pharmaceutical Company Scientist, Paris
Ju Yi Cho	Don Sin	February 2018	Visiting Professor	Assistant Professor, Medicine, Gyeongsang National University Hospital, Korea
Josh Dubland	Gordon Francis	December 2018	PhD Student	Clinical Assistant Professor, BC Children's Hospital
Sabina Guler	Chris Ryerson	March 2018	Postdoctorate	Attending Physician and Clinical Researcher, Pulmonary Medicine, University Hospital Insepspital Bern, Switzerland
Seo Am Hur	Chris Ryerson	June 2018	MSc Student	Medical Student, UBC
Young Woong Kim	Scott Tebbutt	May 2018	PhD Student	Postdoctoral Fellow
Richard Munthali	Denise Daley	September 2018	Postdoctorate	Research Statistician, Wits Reproductive Health and HIV Institute, South Africa
Amreen Toor	Scott Tebbutt	May 2018	MSc Student	PhD Student
Kei Yamasaki	Stephan van Eeden	December 2018	Postdoctorate	Assistant Professor, Respiratory Medicine, University of Occupational and Environmental Health Japan, Kitakyusyu, Fukuoka, Japan

HLI OPERATIONS

Centre Operational Highlights

In 2018, the HLI Operations Team began procurement of equipment for our latest Canada Foundation for Innovation grant, including:

- -80C freezers to aid in our ever expanding heart and lung tissue registry inventories
- a new mass spectrometer for protein analysis
- Xenon gas lung imaging pieces for a new Magnetic Resonance Imaging system at St. Paul's Hospital

Our maintenance team successfully handled over 130 work request tickets, providing ongoing maintenance service to staff and students in over 50,000 square feet of office, wet lab, and dry lab spaces. Some highlights from our Core service groups are listed below.

Molecular Phenotyping Core Laboratory

The Molecular Phenotyping Core Laboratory (MPCL) participated in large projects with Providence Health Care, Vancouver Coastal Health Research Institute, and UBC Departments of Gastroenterology, Surgery, Cardiology, and Respirology. In 2018, the team supported the creation of a BC Glomerulonephritis Biobank, a pilot study for kidney transplant recipients, and a multinational respirology study.

The MPCL team provides expertise in molecular biology by mentoring and training students and staff on sample preparation and lab equipment usage. The team's goal is to promote proper collection and storage of specimens that are used in downstream applications such as flow cytometry, protein, and DNA/RNA analysis.

Cellular Imaging and Biophysics Core

The Cellular Imaging and Biophysics Core (CIB) had a productive year, with many significant projects wrapping up and producing important clinical and scientific findings. Using microCT imaging at the CIB core, HLI researchers made important discoveries that has resulted in a paradigm shift in the understanding of COPD. This was published in Lancet Respiratory Medicine. For more details, see the Research Spotlight section.

The CIB also recently developed a multiphoton, super-resolution imaging technique that will enable increased sensitivity in future measurements. In the coming year, the CIB will be involved in imaging projects examining idiopathic pulmonary fibrosis, cancer, and prosthetic heart valve degeneration.

Preclinical Services

The Preclinical Services, also called Genetically Engineered Models (GEM), Team made significant contributions to developing new therapeutic strategies for Amyotrophic Lateral Sclerosis, Marfan's Syndrome, COPD, sepsis, Coxsackievirus B infection, and atherosclerosis.

IT Services

In 2018, HLI's Information Technology team overcame many challenges related to power outages and infrastructure renovation issues. They updated caching software and expanded HLI's storage to keep up with ever increasing demands, handling over 2,100 service tickets. Registry database features were also improved for the benefit of coordinators and registry managers.

Safety and Environment

The Faculty of Medicine Joint Occupation Health and Safety Committee (FoM JOHSC) was formed in 2017 and is comprised of the Centre for Heart Lung Innovation (HLI) and other FoM members.

Reporting to the Provost & VP Academic, the FoM JOHSC is one of 23 JOHSCs that oversees and works to improve occupational health and safety at UBC. These committees were created in consultation with WorkSafeBC to serve the exponentially growing number of employees in the University.

In support of the FoM JOHSC, HLI's Local Safety Team (LST) met monthly in 2018 to advise on and facilitate all matters of health and safety within HLI, improving the occupational health and safety of all HLI members. All recommendations and policies developed by the HLI LST were reviewed and approved by the FoM JOSHC.

The HLI Safety committee was also worked with Providence Health Care and the St. Paul's Hospital Joint Occupational Health and Safety Committee (SPH JOHSC) to assist in integrating safety policies. To date, several policies have been aligned across all centres at St. Paul's Hospital. The HLI Safety webpage has been used as a model for other research groups.

This year, our Safety Team completed the clearing out and disposing of 400 kg chemical waste. They also successfully completed Transport Canada and UBC Radiation Safety inspections.

Mental Health Initiatives

Take 5 Cafes

In 2018, HLI's Training and Environment team continued our Mental Initiative program, which is funded by UBC THRIVE'S Healthy Workplace Healthy Initiative Program. "Take 5 Cafes" encourage staff and students to take a 5-minute break and socialize with their colleagues in a fun, informal setting. Take 5 Cafes were held throughout the year with different themes, games, and activities to create conversations on and emphasize the importance of addressing mental health in the workplace.

Pink Shirt Day, 2018.

Providence in the Park care packages drive

As part of the HLI Mental Health Initiative program, staff and students donated supplies and built hundreds of basic care packages for Providence in the Park, a bi-annual Providence Health Care outreach program that distributes the packages to those who need them the most.

Diversity by Design Workshop

On October 24, the HLI hosted UBC Equity and Inclusion Office's Diversity by Design Workshop to learn how to better understand and celebrate the differences and similarities in our community.

Scleroderma Ride for Research

The HLI team rode together at the 7th Annual Scleroderma Ride for Research to raise awareness and funds for the Scleroderma Association of BC.

Lights of Hope Campaign

The St. Paul's Hospital Foundation's Lights of Hope campaign raises critical funds for the greatest needs of patients, caregivers, residents, and families. The HLI once again achieved a Gold Star on the annual Lights of Hope display. In total, the HLI community raised $34,760 for the 21st annual fundraiser.

www.hli.ubc.ca/services

Centre for Heart Lung Innovation

Core and Technical Services

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

The Centre for Heart Lung Innovation staff have extensive training and experience to provide consistent and reliable results with minimal turnover time. Some of our services, equipment and tools available are:

HLI Cardiovascular and Lung Tissue Registries

- Tissue and sample archiving
- Gross and microscopic specimen images
- Gross specimen photography
- New expanded formalin storage facility

Cellular Imaging & Biophysics

- Automatic tissue processing capabilities
- Nikon Model XTH225ST Micro Computed Tomography System
- Pelco BioWave Microwave Processor
- Image processing work stations
- Wide Field Fluorescence Microscope
- Leica Upright Fluorescence Microscope with Fast Confocal Scanner and CCD camera
- Leica Inverted Fluorescence microscope with Confocal Scanner
- Tunable Ultra-short pulse Infrared Laser for Two-Photon Excitation microscopy

Imaging Services

- Digital slide scanning
- Poster and banner printing

Histology

- Processing and embedding
- Staining and Sectioning
- Immunohistochemistry
- Immuno-peroxidase
- Immuno-alkaline phosphatase
- FITC immunofluorescence
- TUNEL staining
- In situ Hybridization (ISH)

Molecular Phenotyping

- BeckmanCoulter Astrios EQ® high speed cell sorter
- Laser Capture Microdissection Pixcell II
- Siemens Advia 2120 Hematology analyzer
- BeckmanCoulter Gallios® Flow Cytometer
- Miltenyi AutoMACS
- ABI ViiA 7 Real-Time PCR
- Luminex IS100 XYP
- NanoString nCounter System
- Biobanking services
- SpectraMax i3 Plate Reader

Preclinical Services

- Contract animal research projects
- Flexivent Lung Function system
- DSI Telemetry
- Visualsonics Echocardiography
- Mouse Specifics Gait Analyzer
- Level 2 Containment suite
- Colony management services
- Microsurgical / Tech services

Clinical Research

- Consultation and project management
- Assistance with ethics applications

Information Technology

- Advanced computing services
- Hosting of physical servers, virtual servers
- Secured and controlled access
- Long term storage
- Custom database and data management services
- Secure web development

For more information contact:
Claire Smits, Operations Director
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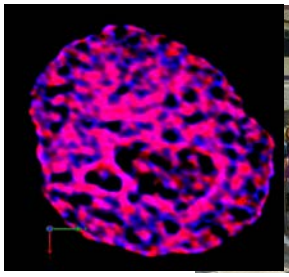

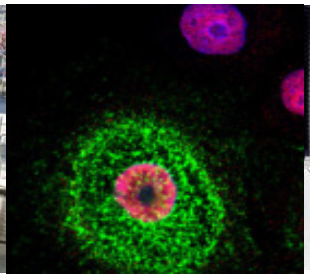
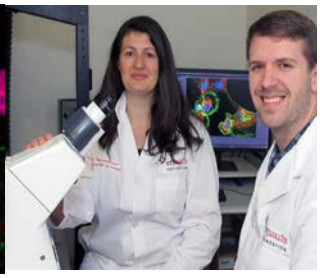

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Partnerships and Acknowledgements

The HLI is grateful to our patients, donors, and funding partners: Canada Foundation for Innovation, British Columbia Knowledge Development Fund, Providence Health Care, University of British Columbia, Heart and Stroke Foundation of Canada, BC Lung Association, the St. Paul's Hospital Foundation, Michael Smith Foundation for Health Research, and many vendors and industry 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, Karen Jung, Claire Smits, Chris Robinson, Gwen Sin, Bryan Wong, Ivan Leversage, Dr. Don Sin and all the HLI Principal investigators.

Supporting our fight against heart and lung diseases

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
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APPENDICES

APPENDIX A: HLI GRANTS, CONTRACTS, CLINICAL TRIALS AND AGREEMENTS*
(April 2018 – March 2019)

*Trainee grants are listed with their respective PIs

Principal Investigator	Funding Agency	Award Amount	Project Title	Award Type
Bernatchez, Pascal	Heart and Stroke Foundation of Canada	$99,500.00	The role of endothelial function in the pathogenesis and management of Marfan syndrome-associated aortic disease	Grant
Bernatchez, Pascal	Canadian Institutes of Health Research (CIHR)	$1,000.00	Heterogeneity of angiotensin II receptor blockers in the inhibition of Marfan-associated aortic root dilation independent of blood pressure effects	Grant
Bernatchez, Pascal	Innovation, Science and Economic Development Canada	$5,000.00	Optimization of angiotensin II receptor type 1 blockers (ARBs) in chronic obstructive pulmonary disease (COPD)	Grant
Bernatchez, Pascal	Providence Health Care	$8,333.33	Optimization of angiotensin II receptor type 1 blockers (ARBs) in chronic obstructive pulmonary disease (COPD)	Grant
Bernatchez, Pascal	Province of British Columbia	$5,000.00	Optimization of angiotensin II receptor type 1 blockers (ARBs) in chronic obstructive pulmonary disease (COPD)	Grant
Boyd, John	Michael Smith Foundation for Health Research	$41,500.00	The role of PCSK9 in the clearance of bacterial lipids and the development of anti-PCSK9 treatment for sepsis	Grant
Boyd, John	Canadian Institutes of Health Research (CIHR)	$100,980.00	Organ donation after cardiac death: optimizing the donor heart.	Grant
Boyd, John	Canadian Institutes of Health Research (CIHR)	$1,000.00	PCSK9 loss-of-function (LOF) genotype is associated with decreased readmission or death in sepsis associated with stock and/or pulmonary dysfunction	Grant
Boyd, John	Takeda Pharmaceutical Company Limited	$7,994.00	A Phase 2b, Randomized, Multi-Center, Double-Blind, Dose-Ranging Study to Assess the Efficacy, Safety and Pharmacokinetics of Intravenous TAK-954 in Critically Ill Patients With Enteral Feeding Intolerance	Clinical Trial
Brunham, Liam	Providence Health Care Research Institute (PHCRI)	$6,352.66	Targeted next generation sequencing to improve the diagnosis and treatment of familial hypercholesterolemia in British Columbia	Grant
Brunham, Liam	AMGEN Canada Inc.	$1,995.00	Guidelines Oriented Approach to Lipid lowering in Canada (GOAL I & II)	Clinical Trial

Brunham, Liam	Cerenis Therapeutics	$17,751.70	Phase III, Multi-Center, Randomized, 48 Weeks, Double-Blind, Parallel-Group, Placebo-Controlled Study to Evaluate Efficacy and Safety of CER-001 on Vessel Wall Area in Patients with Genetically Defined Familial Primary Hypoalphalipoproteine	Clinical Trial
Brunham, Liam	Canada Foundation for Innovation	$47,437.00	Harnessing advances in genomics to improve the care of patients with dyslipidemias	Grant
Brunham, Liam	Canadian Institutes of Health Research (CIHR)	$116,280.00	Investigating pharmacogenetic mechanisms of doxorubicin-induced cardiotoxicity in human pluripotent stem cell-serviced cardiomyocytes	Grant
Brunham, Liam	The Medicines Co.	$8,611.15	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
Brunham, Liam	Genome British Columbia	$85,331.00	Using genomics to improve the care of patients with familial hypercholesterolemia	Agreement
Brunham, Liam	Canadian Institutes of Health Research (CIHR)	$1,000.00	Genetic variation in the cholesteryl ester transfer protein (CETP) gene influences HDL cholesterol levels and clinical outcomes in sepsis	Grant
Brunham, Liam	Canadian Institutes of Health Research (CIHR)	$1,000.00	Very premature atherosclerotic cardiovascular disease in British Columbia: A cohort study of 12,519 individuals over a 16 year period	Grant
Camp, Pat	Canada Foundation for Innovation	$7,500.00	CFI Infrastructure Operating Fund	Grant
Camp, Pat	British Columbia Lung Association	$12,500.00	Pulmonary rehabilitation in rural BC: Engaging with communities to create novel telehealth approaches	Grant
Camp, Pat	British Columbia Lung Association	$25,000.00	"Bayis Il Tus - A Strong Breath" A community-based research project to improve lung health in remote and rural First Nations communities in British Columbia	Grant
Camp, Pat	Canadian Institutes of Health Research (CIHR)	$160,650.00	Niwh Yizt'iyh Hilht'iz Nets'eelh'iyh - Strengthening our Bodies: A Community-based Research Project to Create Pulmonary Tele-Rehabilitation in Remote and Rural First Nations Communities in Northern British Columbia	Grant

Camp, Pat	Canadian Institutes of Health Research (CIHR)	$106,355.00	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
Coxson, Harvey	British Columbia Lung Association	$25,000.00	Development and validation of novel non-invasive imaging tools to enhance our understanding of airways in asthma	Grant
Daley, Denise	Michael Smith Foundation for Health Research	$22,458.33	Development of hierarchical models to investigate the role of long non coding RNA regions in the etiology of asthma	Grant
Daley, Denise	Allergy, Genes and Environment Network (AllerGen) - Networks of Centres of Excellence (NCE)	$107,500.00	Causes and Prevention: Identifying the genetic basis of peanut allergy	Grant
Daley, Denise	Canadian Institutes of Health Research (CIHR)	$1,000.00	Genome wide meta-analysis of parent-of-origin effects of asthma, atopy and airway hyperresponsiveness in four cohorts	Grant
DeMarco, Mari	Brain Canada	$246,486.33	Translating research into practice: Investigating the impact of Alzheimer's disease diagnostics in Canada (IMPACT-AD)	Grant
DeMarco, Mari	Canadian Institutes of Health Research (CIHR)	$1,000.00	A new LC-MS/MS assay for rapid quantitation of apolipoprotein A1 targeting the fast-forming proteotypic peptide in human plasma	Grant
Demarco, Mari	Ministry of Health	$50,000.00	Clinical mass spectrometry teaching laboratory	Grant
Demarco, Mari	St. Paul's Hospital Foundation	$4,975.00	Testing guidance for the BC Infliximab therapeutic drug monitoring program	Grant
Dorscheid, Delbert	Novartis Pharmaceuticals Canada Inc.	$4,664.00	REal-LIfe EFfectiveness and safety of omalizumab in patients with severe allergic asthma: The Latin American and Canadian experience (RELIEF)	Clinical Trial
Dorscheid, Delbert	AstraZeneca Canada Inc.	$3,292.81	A Multicentre, Randomized, Parallel Group, Phase 3 Safety Extension Study to Evaluate the Safety and Tolerability of Benralizumab (MEDI-563) in Asthmatic Adults and Adolescents on Inhaled Corticosteroid Plus Long-acting ÃŸ2 Agonist	Clinical Trial
Dorscheid, Delbert	sanofi-aventis Canada Inc.	$5,176.89	A randomized, double blind, placebo controlled, parallel group study to evaluate the efficacy and safety of dupilumab in patients with severe steroid dependent asthma	Clinical Trial

Dorscheid, Delbert	Novartis Pharmaceuticals Canada Inc.	$21,058.00	A 52-week, multicenter, randomized, double-blind, placebo- controlled study to assess the efficacy and safety of QAW039 when added to existing asthma therapy in patients with uncontrolled severe asthma	Clinical Trial
Dorscheid, Delbert	Novartis Pharmaceuticals Canada Inc.	$2,998.00	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
Dorscheid, Delbert	AstraZeneca Canada Inc.	$47,028.67	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
Dorscheid, Delbert	British Columbia Lung Association	$25,000.00	IgE-mediated inflammation generated by the airway epithelium is antigen independent - a cause of a novel asthma phenotype	Grant
Dorscheid, Delbert	GlaxoSmithKline (Canada) Inc.	$15,663.38	A randomized, double-blind, parallel group, multicenter, stratified study evaluating the efficacy and safety of repeat doses of GSK3772847 compared with placebo in participants with moderately severe asthma	Clinical Trial
Dorscheid, Delbert	Allergy, Genes and Environment Network (AllerGen) - Networks of Centres of Excellence (NCE)	$15,000.00	Clinical investigator collaborative - Severe asthma	Grant
Dorscheid, Delbert	Allergy, Genes and Environment Network (AllerGen) - Networks of Centres of Excellence (NCE)	$3,500.00	Airway epithelial repair: cell subtypes or differentiation dependent?	Grant
Dorscheid, Delbert	AstraZeneca Canada Inc.	$8,825.00	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
Francis, Gordon	Canada Foundation for Innovation	$81,114.99	Molecules to man: enhanced phenotyping for the discovery, prevention and treatment of heart, lung and blood vessel disease	Grant

Francis, Gordon	Canada Foundation for Innovation	$2,789.75	Molecules to man: enhanced phenotyping for the discovery, prevention and treatment of heart, lung and blood vessel disease	Grant
Francis, Gordon	Canada Foundation for Innovation	$166,303.00	Molecules to human: enhanced phenotyping for discovery, prevention, & treatment of heart, lung, & blood vessel disease	Grant
Francis, Gordon	Canadian Institutes of Health Research (CIHR)	$163,756.00	The unrecognized importance of smooth muscle foam cells in atherosclerosis development and treatment	Grant
Francis, Gordon	Ionis Pharmaceuticals, Inc.	$29,553.28	An Open-Label Extension Study of Volanesorsen Administered Subcutaneously to Patients with Familial Chylomicronemia Syndrome (FCS)	Clinical Trial
Francis, Gordon	Canadian Institutes of Health Research (CIHR)	$102,510.00	Relative deficiency of lysosomal acid lipase in arterial smooth muscle cells as a novel target for atherosclerosis treatment and prevention	Grant
Francis, Gordon	Canadian Institutes of Health Research (CIHR)	$1,000.00	Lysosomal dysfunction in smooth muscle cells relative to macrophages provides new insights into foam cell lipid accumulation	Grant
Frohlich, Jiri	AMGEN Canada Inc.	$5,118.43	Creation and implementation of a Registry for Familial Hypercholesterolemia	Grant
Guenette, Jordan	Natural Sciences and Engineering Research Council of Canada (NSERC)	$30,000.00	Sex-differences in respiratory sensation and muscle function during conditions of physiological stress	Grant
Guenette, Jordan	Canada Foundation for Innovation	$7,500.00	CFI Infrastructure Operating Fund	Grant
Guenette, Jordan	British Columbia Lung Association	$25,000.00	A double-blind placebo-controlled crossover study to assess the effects of bronchodilation on dyspnea, ventilatory responses, and exercise tolerance in adults with cystic fibrosis	Grant
Guenette, Jordan	British Columbia Lung Association	$10,000.00	Impact of diesel exhaust on exercise endurance, breathlessness and airway physiology in mild-to-moderate chronic obstructive pulmonary disease	Grant
Guenette, Jordan	Michael Smith Foundation for Health Research	$24,208.33	Investigating the role of skeletal muscle dysfunction on dyspnea and exercise intolerance in interstitial lung disease	Grant
Guenette, Jordan	Canadian Institutes of Health Research (CIHR)	$1,000.00	Ventilatory and sensory responses during exercise in adults with a Fontan circulation	Grant
Hackett, Tillie Louise	Canadian Institutes of Health Research (CIHR)	$44,269.00	Molecular determinants of small airway obstruction in COPD	Grant

Hackett, Tillie Louise	Canada Foundation for Innovation	$199.00	Molecular determinants of obstructive lung disease	Grant
Hackett, Tillie Louise	Canada Foundation for Innovation	$395.00	Molecular determinants of obstructive lung disease	Grant
Hackett, Tillie Louise	Canadian Institutes of Health Research (CIHR)	$40,000.00	Multimodal characterization of airway remodeling with label-free nonlinear optical imaging and spectroscopy	Grant
Hackett, Tillie Louise	Canadian Institutes of Health Research (CIHR)	$5,000.00	Multimodal characterization of airway remodeling with label-free nonlinear optical imaging and spectroscopy	Grant
Hackett, Tillie Louise	Canadian Institutes of Health Research (CIHR)	$135,068.00	The Role of Small Airways Disease Heterogeneity in Asthma	Grant
Hackett, Tillie Louise	Innovation, Science and Economic Development Canada	$3,000.00	Apply deep neural network to detect malignant lung nodules in CT scans	Grant
Hackett, Tillie Louise	Province of British Columbia	$3,000.00	Apply deep neural network to detect malignant lung nodules in CT scans	Grant
Hogg, James	National Institutes of Health	$146,761.95	Parametric response mapping in COPD	Agreement
Hogg, James	British Columbia Lung Association	$45,000.00	Hyperpolarized 129Xe MRI in symptomatic smokers with preserved pulmonary function	Grant
Hogg, James	Canadian Institutes of Health Research (CIHR)	$1,000.00	The nature of the hot spot for issue destruction in COPD	Grant
Hogg, James	Canadian Institutes of Health Research (CIHR)	$1,000.00	Computed tomography total airway count predicts disease changes in the quiet zone in severe COPD	Grant
Hogg, James	British Columbia Lung Association	$25,000.00	Analysis of airway pathology in interstitial lung disease using a combination of computed tomography, micro-computed tomography, histology, and gene expression	Grant
Laksman, Zachary	St. Paul's Foundation	$160,542.55	Research and administrative costs account	Grant
Leipsic, Jonathon	Michael Smith Foundation for Health Research	$24,208.33	Structural valve degeneration in bioprosthetic heart valves	Grant
Leipsic, Jonathon	Medtronic	$216,666.66	Post-implant LT sub study core lab	Contract
Leipsic, Jonathon	Edwards Lifesciences	$375,000.00	Impact CT imaging core lab low risk trial	Clinical Trial
Leipsic, Jonathon	London Drug Radiology Research	$11,250.00	Mechanisms and prediction of bioprosthetic valve structural degeneration	Grant
Leung, Janice	Canadian Institutes of Health Research (CIHR)	$181,072.00	Epigenetic and transcriptomic disturbances in HIV-associated COPD	Grant

Leung, Janice	British Columbia Lung Association	$25,000.00	The role of the gut-lung axis in the aging HIV lung	Grant
Leung, Janice	National Institutes of Health	$3,925.20	Sphingolipids in HIV-associated chronic obstructive pulmonary disease	Agreement
Leung, Janice	Canadian Institutes of Health Research	$114,762.00	An 'Omics Approach to Understanding COPD Phenotypes and Endotypes	Grant
Luo, Honglin	Heart and Stroke Foundation of Canada	$92,460.00	Molecular chaperones in viral cardiomyopathy	Grant
Luo, Honglin	Natural Sciences and Engineering Research Council of Canada (NSERC)	$44,000.00	Understanding the interplay between coxsackieviruses and the host ubiquitin-proteasome system	Grant
Luo, Honglin	Heart and Stroke Foundation of Canada	$75,750.00	Enteroviral control of autophagy: Relevance to heart failure	Grant
Luo, Honglin	British Columbia Lung Association	$25,000.00	Engineering coxsackievirus B3 for KRAS-driven lung cancer therapy	Grant
Luo, Honglin	Canadian Institutes of Health Research (CIHR)	$253,878.50	Role of enteroviral infection in amyotrophic lateral sclerosis	Grant
Luo, Honglin	Innovation, Science and Economic Development Canada	$7,500.00	Development of coxsackievirus B3 as an oncolytic virus for KRAS-mutant lung cancer treatment	Grant
Luo, Honglin	Province of British Columbia	$7,500.00	Development of coxsackievirus B3 as an oncolytic virus for KRAS-mutant lung cancer treatment	Grant
Luo, Honglin	Virogin Biotech Canada Ltd.	$15,000.00	Development of coxsackievirus B3 as an oncolytic virus for KRAS-mutant lung cancer treatment	Grant
Luo, Honglin	Amyotrophic Lateral Sclerosis Society of Canada	$25,000.00	Characterizing enterovirus disruption of autophagy as a disease mechanism for ALS	Agreement
McManus, Bruce	Canada Foundation for Innovation	$5,622.00	CFI Infrastructure Operating Fund	Grant
McManus, Bruce	Michael Smith Foundation for Health Research	$41,500.00	Development and validation of blood-based biomarkers for improved heart failure managemnet	Grant
McManus, Bruce	Canadian Institutes of Health Research (CIHR)	$436,050.00	HEARTBiT: A novel multi-marker blood test for management of acute cardiac allograft rejection	Grant
McManus, Bruce	Myocarditis Foundation	$52,530.00	Personalizing myocarditis diagnostics through novel biomarkers	Agreement
McManus, Bruce	Michael Smith Foundation for Health Research	$6,708.33	Personalizing myocarditis diagnostics through novel biomarkers	Grant

Obeidat, Ma'en	Canadian Institutes of Health Research (CIHR)	$75,000.00	Gene by sex interactions in COPD	Grant
Obeidat, Ma'en	British Columbia Lung Association	$25,000.00	The interaction of genes and sex in COPD	Grant
Obeidat, Ma'en	UBC Faculty of Medicine	$10,000.00	Integrative genomics to identity novel therapeutics and biomarkers for COPD	Grant
Obeidat, Ma'en	Mitacs & Providence Airway Centre	$30,000.00	The Genetics of Blood Biomarkers in COPD	Grant
Obeidat, Ma'en	Mitacs & Providence Airway Centre	$15,000.00	Developing statistical methods to discover genetic variants underlying longitudinal decline in lung function	Grant
Quon, Bradley	Canada Foundation for Innovation	$5,000.00	CFI Infrastructure Operating Fund	Grant
Quon, Bradley	Vertex Pharmaceuticals (Canada) Inc.	$32,849.91	A Phase 3, Open-label, Rollover Study to Evaluate the Safety and Efficacy of Long-term Treatment WithVX-661 in Combination With Ivacaftor in Subjects Aged 12 Years and Older With Cystic Fibrosis, Homozygous or Heterozygous for the F508del-C	Clinical Trial
Quon, Bradley	Cystic Fibrosis Canada	$21,327.00	Randomized Controlled Trial of Prednisone in Cystic Fibrosis (CF) Pulmonary Exacerbations (PIPE Study)	Clinical Trial
Quon, Bradley	Proteostasis Therapeutics, Inc.	$14,150.00	A Phase I, multi-center, randomized, placebo-controlled, study designed to assess the safety, tolerability, and pharmacokinetics of PTI-428 in subjects with cystic fibrosis	Clinical Trial
Quon, Bradley	Cystic Fibrosis Canada	$91,919.00	PIPE-CF Biomarker Study	Grant
Quon, Bradley	ProMetic BioSciences, Inc.	$1,525.00	A Phase 2, Double Blind, Placebo Controlled Study to Evaluate the Safety & Tolerability of PBI-4050 and its Effects on Pancreatic and Pulmonary Function in Cystic Fibrosis Patients with Abnormal Glucose Tolerance	Clinical Trial
Quon, Bradley	Novoteris LLC	$83,410.45	Prospective, randomized, placebo controlled trial of the efficacy and safety of inhaled nitric oxide (NO) in cystic fibrosis (CF) patients	Clinical Trial
Quon, Bradley	Cystic Fibrosis Foundation (US)	$59,790.00	Host RNA biosignatures to predict imminent CF pulmonary exacerbations	Grant
Quon, Bradley	Proteostasis Therapeutics, Inc.	$3,815.90	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 P	Clinical Trial

Quon, Bradley	British Columbia Lung Association	$25,000.00	TH2 inflammation during cystic fibrosis pulmonary exacerbations	Grant
Quon, Bradley	Cystic Fibrosis Canada	$4,000.00	Barriers and facilitators to research participation for individuals with CF	Grant
Quon, Bradley	Corbus Pharmaceuticals	$9,025.00	A Multicenter, Randomized, Double-Blind, Placebo-Controlled Phase 2 Trial to Evaluate Efficacy and Safety of Lenabasum in Cystic Fibrosis	Clinical Trial
Quon, Bradley	Canadian Institutes of Health Research (CIHR)	$21,875.00	Improving cystic fibrosis care in British Columbia epidemiological, clinical and economic trends - a model for other highly complex chronic conditions	Grant
Quon, Bradley	Michael Smith Foundation for Health Research	$15,000.00	Improving cystic fibrosis care in British Columbia epidemiological, clinical and economic trends - a model for other highly complex chronic conditions	Grant
Quon, Bradley	Proteostasis Therapeutics, Inc.	$6,885.00	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
Quon, Bradley	Vertex Pharmaceuticals Inc.	$93,974.80	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 Minimal Function Mutation (F/MF)	Clinical Trial
Quon, Bradley	Cystic Fibrosis Canada	$75,000.00	Cystic Fibrosis Canada Accelerating Clinical Trials Network (CFCanAct)	Grant
Quon, Bradley	Canadian Institutes of Health Research (CIHR)	$1,000.00	Cystic fibrosis, asthma or ABPA? - Unravelling the chaos of pulmonary exacerbations	Grant
Quon, Bradley	Vertex Pharmaceuticals (Canada) Inc.	$7,950.00	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
Ryerson, Chris	InterMune Inc.	$2,000.00	A Prospective Observational Study to Evaluate Adherence and Treatment Outcomes in Patients with Idiopathic Pulmonary Fibrosis (IPF) treated with EsbrietÂ® (pirfenidone) in Canada	Clinical Trial
Ryerson, Chris	Boehringer Ingelheim (Canada) Ltd.	$287,142.86	The Canadian Cohort for Pulmonary Fibrosis	Clinical Trial
Ryerson, Chris	Boehringer Ingelheim (Canada) Ltd.	$236,250.00	High Oxygen Delivery to Preserve Exercise Capacity in PIF Patients Treated with Nintedanib: The HOPE-IPF Study	Clinical Trial

Ryerson, Chris	Boehringer Ingelheim (Canada) Ltd.	$8,552.30	A 24-week, double-blind, randomized, parallel-group study evaluating the efficacy and safety of oral nintedanib coadministered with oral sildenafil, compared to treatment with nintedanib alone, in patients with idiopathic pulmonary fibrosis	Clinical Trial
Ryerson, Chris	Hoffmann-La Roche Ltd. (Canada)	$37,981.26	Multicenter, international, doubleblind, two-arm, randomized, placebo controlled phase II trial of pirfenidone in patients with unclassifiable progressive fibrosing ILD	Clinical Trial
Ryerson, Chris	British Columbia Lung Association	$25,000.00	Quantitative computed tomography in hypersensitivity puenmonitis	Grant
Ryerson, Chris	Canadian Institutes of Health Research (CIHR)	$1,000.00	Quantitative computed tomography in systemic sclerosis-associated interstitial lung disease	Grant
Sandford, Andrew	British Columbia Lung Association	$50,000.00	Genetic variants of TSLP in asthma	Grant
Seow, Chun	Canadian Institutes of Health Research (CIHR)	$132,345.00	Mechanisms underlying the bronchodilatory effect of deep inspiration in health and asthma: from airway smooth muscle to the whole lung	Grant
Seow, Chun	Natural Sciences and Engineering Research Council of Canada (NSERC)	$48,000.00	Molecular mechanisms for length adaptation in smooth muscle cells	Grant
Seow, Chun	British Columbia Lung Association	$25,000.00	Cytoskeletal stiffness of airway smooth muscle - A new target of asthma therapy	Grant
Sin, Don	AstraZeneca Canada Inc.	$13,771.00	A randomised, double-blind, chronic dosing (56 week), placebo-controlled, parallel group, multicentre, phase III study to evaluate the efficacy and safety of 2 doses of benralizumab (MEDI-563) in patients with moderate to very severe Chroni	Clinical Trial
Sin, Don	AstraZeneca Canada Inc.	$80,000.00	A Study to Investigate the Differential Effects of Inhaled Symbicort and Advair on Lung Microbiota	Clinical Trial
Sin, Don	Canadian Institutes of Health Research (CIHR)	$292,381.00	Using multi-omics to discover novel biomarkers and therapeutic targets fo chronic obstructive pulmonary disease	Grant
Sin, Don	Francis Family Foundation	$63,022.50	integrative genomics to identify novel therapeutic targets and biomarkers for COPD	Grant

Sin, Don	CSA Medical Inc	$35,133.76	A Prospective Safety and Feasibility Study of the RejuvenAirâ„¢ System Metered Cryospray Therapy for Chronic Bronchitis Patients	Clinical Trial
Sin, Don	IKOMED Technologies Inc.	$93,897.30	Frequency Treatment for Emphysema Rat Model	Contract
Sin, Don	St. Paul's Foundation	$65,384.46	Providence Airway Centre (PAC)	Grant
Sin, Don	British Columbia Knowledge Development Fund (BCKDF)	$2,206,311.00	TORCH (Towards omics and imaging to revolutionize COPD and asthma health) in Canada	Grant
Sin, Don	Canada Foundation for Innovation	$12,545.73	TORCH (Towards omics and imaging to revolutionize COPD and asthma health) in Canada	Grant
Sin, Don	Canada Foundation for Innovation	$2,206,311.00	TORCH (Towards omics and imaging to revolutionize COPD and asthma health) in Canada	Grant
Sin, Don	Canada Foundation for Innovation	$7,745.09	TORCH (Towards omics and imaging to revolutionize COPD and asthma health) in Canada	Grant
Sin, Don	St. Paul's Hospital Foundation	$280,345.00	TORCH (Towards omics and imaging to revolutionize COPD and asthma health) in Canada	Grant
Sin, Don	Canadian Institutes of Health Research (CIHR)	$100,000.00	The role of genes and sex in determining therapeutic responses in chronic obstructive pulmonary disease (COPD)	Grant
Sin, Don	Innovation, Science and Economic Development Canada	$1,500.00	Role of smoking-induced surfactant protein-D in inflammatory bowel disease	Grant
Sin, Don	Province of British Columbia	$1,500.00	Role of smoking-induced surfactant protein-D in inflammatory bowel disease	Grant
Sin, Don	Canadian Institutes of Health Research (CIHR)	$1,000.00	Biological role of FAM13A in lipopolysacchande-induced inflammatory response	Grant
Sin, Don	Canadian Institutes of Health Research (CIHR)	$1,000.00	Sputum microbiome is associated with 1-year mortality in COPD exacerbations	Grant
Sin, Don	Canadian Institutes of Health Research (CIHR)	$1,000.00	Murine sensitization with house-dust mite extract alters the immune response towards H1N1	Grant
Sin, Don	Canadian Institutes of Health Research (CIHR)	$1,000.00	The expression of Diacetyl/L-Xylulose Reductase (DCXR) in airway epithelium in chronic obstructive pulmonary disease (COPD)	Grant
Sin, Don	IKOMED Technologies Inc.	$45,000.00	Radiofrequency treatment for emphysema in rat model	Grant

Sin, Don	Innovation, Science and Economic Development Canada	$22,500.00	Radiofrequency treatment for emphysema in rat model	Grant
Sin, Don	Province of British Columbia	$22,500.00	Radiofrequency treatment for emphysema in rat model	Grant
Sin, Don	Canadian Institutes of Health Research (CIHR)	$10,000.00	Creation of a pan-Canadian airway network	Grant
Sin, Don	UBC VP Research & Innovation	$170,000.00	Airway centre	Grant
Sin, Don	Mitacs & IKOMED Technologies	$90,000.00	Radiofrequency treatment for emphysema in rat model	Grant
Sin, Don	Mitacs & Providence Airway Centre	$45,000.00	In vitro validation of canddiate therapeutic targets for chronic obstructive pulmonary disorder (COPD)	Grant
Sin, Don	Mitacs & Providence Airway Centre	$26,666.67	Simulation of nanoparticle adsorption and transport in microfluidic lung-on-a-chip devices	Grant
Tebbutt, Scott	Natural Sciences and Engineering Research Council of Canada (NSERC)	$34,000.00	When human and fungal worlds collide - a systems biology approach to understanding the dynamic interactions between human bronchial epithelial cells and conidiospores of Aspergillus fumigatus	Grant
Tebbutt, Scott	National Institutes of Health	$84,088.19	Systems biology to identify biomarkers of neonatal vaccine immunogenicity: Project 1 - Innovative OMIC integration to predict immunogenicity	Agreement
Tebbutt, Scott	National Institutes of Health	$33,122.75	Systems biology to identify biomarkers of neonatal vaccine immunogenicity: DMC	Agreement
Tebbutt, Scott	Allergy, Genes and Environment Network (AllerGen) - Networks of Centres of Excellence (NCE)	$50,000.00	Biomarker development for monitoring responses in CIC clinical trials	Grant
Tebbutt, Scott	British Columbia Lung Association	$25,000.00	Novel diagnosis of Western Red Cedar Asthma	Grant
Tebbutt, Scott	National Institutes of Health	$16,642.94	Dengue Human Immunology Project Consortium (DHIPC)	Agreement
Tebbutt, Scott	Allergy, Genes and Environment Network (AllerGen) - Networks of Centres of Excellence (NCE)	$3,500.00	Diagnosis of western read cedar asthma using a blood-based biomarker test	Grant

Tebbutt, Scott	Allergy, Genes and Environment Network (AllerGen) - Networks of Centres of Excellence (NCE)	$50,000.00	OMIC data integration and visualization for biomarkers and mechanistic insights of the late-phase asthmatic response: an interactive data tool to enhance AllerGen's clinical investigator collaborative	Grant
Tebbutt, Scott	UBC Faculty of Medicine	$100,000.00	Career Development Initiative: Preparing the Next Generation of Heart and Lung Health Researchers for Careers Beyond Academia	Grant
Walley, Keith	Canadian Institutes of Health Research (CIHR)	$545,653.00	Translational research to improve sepsis outcomes	Grant
Yang, Decheng	Heart and Stroke Foundation of Canada	$76,432.00	Role of translation initiation factor DAP5 in viral myocarditis	Grant
Yang, Decheng	Natural Sciences and Engineering Research Council of Canada (NSERC)	$34,000.00	Mechanisms of selective host gene translation regulation in picornavirus infection	Grant

APPENDIX B: PUBLICATIONS BY PIs AND ECIs IN 2018

1. Abdel-Razek O, Sadananda SN, Li X, Cermakova L, Frohlich J, **Brunham LR**. Increased prevalence of clinical and subclinical atherosclerosis in patients with damaging mutations in ABCA1 or APOA1. J Clin Lipidol. 2018 Jan - Feb;12(1):116-121. doi: 10.1016/j.jacl.2017.10.010. Epub 2017 Nov 10. PubMed PMID: 29150341.
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Appendix C: 2018 HLI Friday Seminar Series

Month	Day	Speaker	Host	Title of Lecture
January	8	**Michael Wechsler**	Don Sin	EGPA and other eosinophilic lung diseases
	19	**Rubin Tuder**	Jim Hogg	Fatty acid oxidation and the metabolic landscape in pulmonary vascular disease
	26	**Decheng Yang**	HLI	MicroRNAs in coxsackieviral pathogenesis of myocarditis
February	2	**Fabio Rossi**	Pascal Bernatchez	Novel insights in the role of stromal cells in cardiac pathology
	9	**Benjamin Raby**	Don Sin	Integrative genomics for mapping disease genes in asthma: discovery and functional dissection
	16	**Philippe Pibarot**	Jonathon Leipsic	New insights into the pathogenesis of calcific aortic stenosis and future perspectives for pharmacological treatment
	23	**Sam Wadsworth**	Tillie Hackett	How 3D Bioprinting can shape the future of medicine
March	2	**Teija Beck**	HLI	How St. Paul's Foundation can help support your research
	9	**Thomas Geiser**	Chris Ryerson	Novel aspects and possible therapeutic approaches in lung fibrosis
	16	**Jeffrey Reed Galvin**	Jim Hogg	Idiopathic Pulmonary Fibrosis (IPF): diffuse lung injury modified by lung mechanics
	23	**Cormac McCarthy**	Bradley Quon	Rare lung diseases: a molecular pathogenesis-based approach to therapies
	30	**Good Friday - No Lecture**		
April	6	**Peter Zandstra**	Keith Walley	Engineering cell fate and function
	20	**Anne Sperling**	Del Dorscheid	Type 2 immune mechanisms in allergic lung disease
	27	**Byron Caughey**	Mari DeMarco	Prions and the transmissibility of protein misfolding diseases
May	4	**Christopher Rembold**	Chun Seow	Regulation of vascular smooth muscle force
	11	**Matthew Miller**	Honglin Luo	Lessons from nature: how pandemics are helping us build better influenza virus vaccines and therapeutics
	18	**American Throacic Society Conference - No Lecture**		

June	1	**Mireille Ouimet**	Gordon Francis	Autophagy as a regulator of immunometabolism and atherosclerosis
	22	**Tom Lagace**	Gordon Francis	Targeting PCSK9 for advanced LDL-cholesterol lowering
July - August	**Summer Hiatus**			
September	14	**Megan Levings**	Jim Hogg	Measuring and engineering immune tolerance
	21	**Kelly McNagny**	HLI	Immune regulation of inflammatory disease, fibrosis and tissue repair
	28	**Jonathan Rayment**	Bradley Quon	Something old and something new: novel measures of respiratory function in paediatric cystic fibrosis
October	12	**Craig Wheelock**	Chris Carlsten	Molecular phenotyping of obstructive lung disease
	19	**Eric Jan**	Honglin Luo	From insects to humans: insights into viral strategies that hijack host functions
	26	**Sepideh Pakpour**	Don Sin	Human microbiome-based diagnostics and therapeutics at the frontier of personalized medicine
November	2	**Janet Scott**	HLI	Is this personal information?
	16	**Pratik Sinha**	Keith Walley	Tackling heterogeneity in ARDS
	23	**Angela Devlin**	Pascal Bernatchez	Preventing cardiometabolic disease in children
	30	**David Granville**	Gordon Francis	The long and winding road: translating basic science discoveries towards clinical application and commercialization
December	7	**PHC**	HLI	The PHC strategic plan discussion
	14	**Colin Ross**	Maen Obeidat	Using genetics to help improve the safety and effectiveness of medications

Appendix D: 2018 HLI Research in Progress Seminars

Month	Day	Speaker	Title of Lecture
January	8	**Aida Eslami**	Genome wide meta-analysis of parent of origin effects of asthma and related phenotypes
	15	**Sabina Guler**	Frailty and sarcopenia in fibrotic interstitial lung disease
	22	**Chhavi Tripathi**	Harmonization of SNP identifiers
	29	**Anna Siedlecki**	Using serum biomarkers to evaluate causes of TH2 inflammation during pulmonary exacerbation in cystic fibrosis patients
February	5	**Josh Dubland**	Low expression of lysosomal acid lipase in smooth muscle cells relative to macrophages provides new insights into foam cell lipid accumulation
	12	**Family Day – No Lecture**	
	19	**Kang Dong**	Characterizing CFTR activity in peripheral blood monocytes and nasal epithelial cells from CF patients
	26	**Reid Mitchell**	Physiological determinants of freely chosen cadence in highly trained cyclists
March	5	**Young Woong Kim**	Investigating systemic immune responses in the pathophysiology of allergic rhinitis using peripheral blood
	12	**Feng Xu**	Hot spot for terminal bronchiolar destructions in COPD
	19	**Kyle Boyle**	The effects of diaphragm fatigue on the multidimentional components of dyspnea
	26	**Tadanaga Shimada**	Very low density lipoprotein receptor sequesters LPS into adipose tissue during sepsis
April	2	**Easter Monday - No Lecture**	
	9	**Seo Am Hur**	Physical activity in fibrotic interstitial lung disease
	16	**Kimia Shahangian**	Investigations into the H1N1 pandemic: the role of IL-4Ra as a mediator of morbidity and mortality
	23	**Ling Luo**	What controls shortening velocity in airway smooth muscle?
	30	**Effie Christidi**	Modeling doxorubicin induced cardiotoxicity using induced pluripotent stem cell derived cardiomyocytes
May	7	**David Jaw**	Myeloperoxidase inhibition prevent plaque rupture in mice
	14	**Mark Trinder**	Cholesteryl ester transfer protein genotype influences high-density lipoprotein levels and survival during sepsis
	21	**Victoria Day and American Thoracic Society Conference - No Lecture**	
	28	**Haojun Huang**	CRISPR/Cas9 genome-editing in human induced pluripotent stem cells to study the functional impacts of RARG variant in doxorubicin-induced cardiotoxicity

June	4	**Phil Hansbro**	Understanding pathogenesis to develop new treatments for respiratory diseases
July - August	**Summer Hiatus**		
September	10	**Lauren Forgrave**	Characterization of TDP deposits in frontotemporal degeneration
	17	**Huitao Liu**	Development of coxsackievirus B3 as an oncolytic virus for lung cancer treatment
	24	**Fall Quarterly Meeting - No Lecture**	
October	1	**Nancy Yang**	Anti-inflammatory action of long-acting beta agonists on bronchial epithelium
	8	**Thanksgiving - No Lecture**	
	15	**Yannick Molgat-Seon**	CT-derived measures of pectoralis muscle area and their association with pulmonary function, dyspnea, and functional capacity in patients with interstitial lung disease
	22	**Amy Nguyen**	Quantification of amyloid-ß 1-40, 1-42 and familial variants using high performance liquid chromatography mass spectrometry: pre-analytical and analytical considerations
	29	**Taylor Pobran**	TDP-43 enrichment using RNA aptamers
November	5	**Airway Conference - No Lecture**	
	12	**Remembrance Day - No Lecture**	
	19	**Fernando Studart**	Investigating the sputum microbiome in COPD exacerbations and its association with 1-year mortality
December	3	**Daniela Castillo-Saldana**	Quantitative computed tomography in systemic sclerosis-associated interstitial lung disease (SSc-ILD): a densitometric assessment of disease severity

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