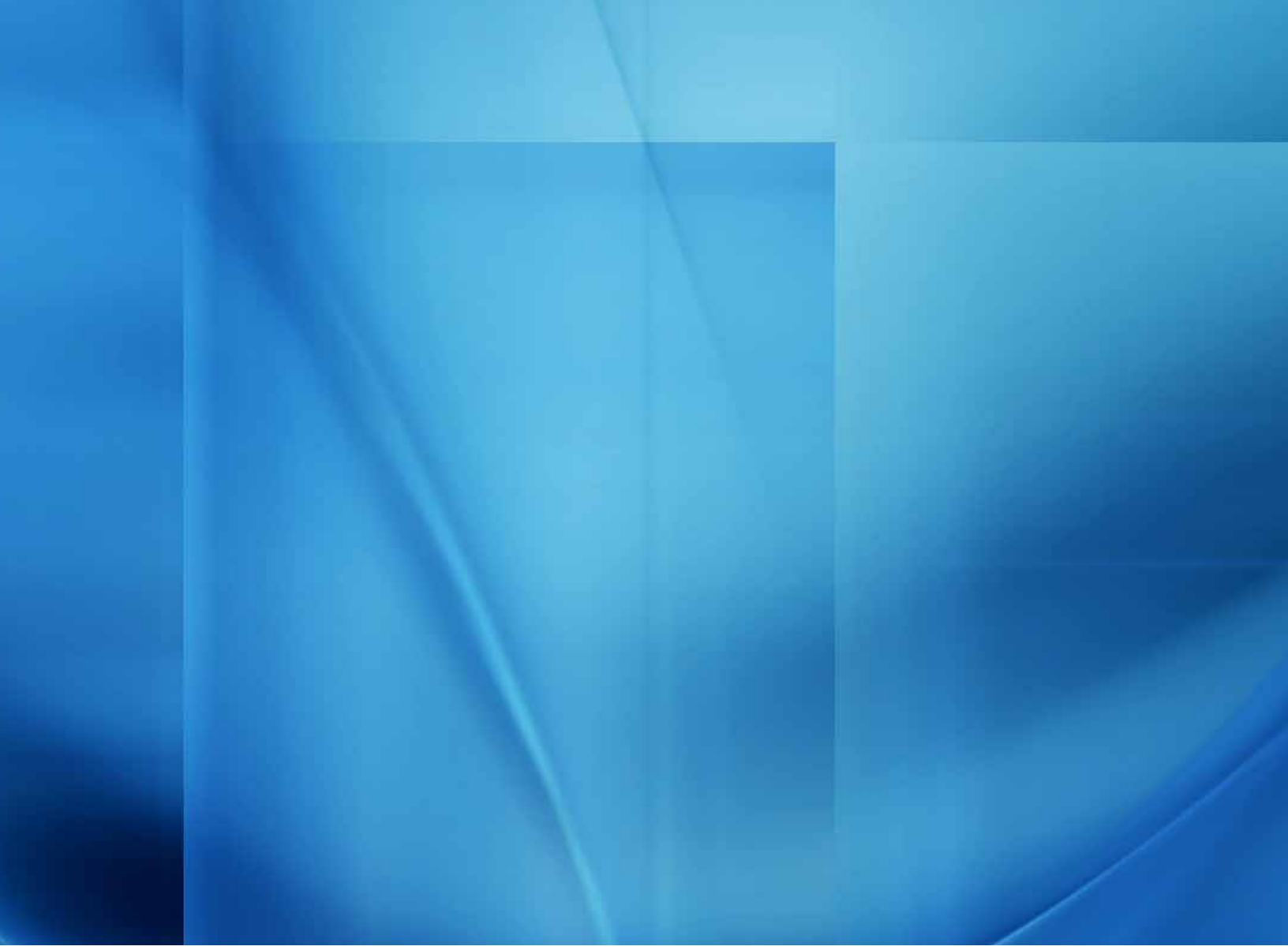
Institut de recherche
Centre universitaire de santé McGill

Research Institute
McGill University Health Centre

IN THE NAME OF LIFE

Annual Report 2011 - 2012



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Message

from the Executive Director and Chief Scientific Officer
Research Institute of the MUHC

A major task of the Executive Director and Chief Scientific Officer of the Research Institute of the McGill University Health Centre (RI-MUHC) is to help the organization achieve its goals while supporting faculty members. All of this works towards the common goal of continuously improving health outcomes through research.

I am delighted to report that this year researchers at the RI have again made significant contributions to health care and wellbeing. A sample of these contributions is featured in this report.

At the national level, the RI-MUHC ranked third of Canada's Top 40 Research Hospitals based on research income in 2011. We ranked first in Quebec. Early in 2012, the Fonds de recherche du Quebec–Santé (FRQS) reviewed the accomplishments of the RI-MUHC over the 2008–2012 period. With a glowing recommendation, the FRQS renewed the portion of provincial funding it contributes to our operating budget. Our ability to successfully secure research funding in a competitive and challenging environment testifies to the expertise and excellence of our members. It ensures that our research carries on.

While the construction of new facilities at the Glen continues, plans to renovate facilities at the Montreal General Hospital are also well underway. The effort required for our redevelopment project that began in 2007 cannot be overstated. The contributions of our numerous colleagues, partners, foundations and researchers, all working together to plan the future, make a long list.

Looking forward in an environment where funding will become more restricted, we must clearly define our priorities and set realistic goals to accomplish our ambitions. The landscape is changing, and we must take advantage of that in order to participate and lead, at the global as well as local level, in shaping our new research environment. In the coming years, we will focus on exploring new horizons and building new partnerships while we work to reinvent ourselves.

Science has already made a vast impact on the understanding of complex medical issues and how patients are cared for. As we move towards tomorrow, new contributions to the health and wellbeing of all mankind, *In the Name of Life*, will continue to map our paths and shape our futures.

Vassilios Papadopoulos, D.Pharm., PhD
Executive Director and Chief Scientific Officer, Research Institute of the MUHC
and Associate Executive Director for Research, MUHC

"Our ability to successfully secure research funding in a competitive and challenging environment testifies to the expertise and excellence of our members. It ensures that our research carries on."

Message

from the Chairman of the Board of Directors

Research Institute of the MUHC

“Whether it comes in the form of deciphering the genetic origins of various types of cancer, or developing simplified tests or vaccines for developing countries, research knows no boundaries.”

Clear goals drive the Research Institute of the McGill University Health Centre (RI-MUHC) and support its structure. Science is an international language and its community has deep connections around the globe.

Whether it comes in the form of deciphering the genetic origins of various types of cancer, or developing simplified tests or vaccines for developing countries, research knows no boundaries.

That the RI-MUHC ranks high in surveys and external reviews is due to a number of factors more obvious to those of us presiding over one of the largest medical research institutes in Canada. First and foremost is its ability to secure research funding in increasingly high-pressured grant competitions. The second factor is the sheer scope of so many highly trained and expert investigators within our midst, and the third is how the Institute has been governed and managed. I commend the senior leadership team for their vision and dedication. It is people who keep this Institute on top. Clear direction assures that we all walk towards the same future.

Building a research institute connected to a major academic health centre in 2012 comes with serious challenges, as does refurbishing the Montreal General Hospital. Community support for this massive initiative has been outstanding, and with the help of our foundations, fundraising goals continue to provide the much-needed backing for this highly anticipated and important facility.

As the Chairman of the Board working with a multidisciplinary team of experts in science and in business, I have no doubts about catapulting the RI to even higher echelons where research contributions continue to improve health care for everyone, here and around the world. We will continue to add to an already rich history of medical contributions that began here in Montreal over a hundred years ago.

I gratefully acknowledge the talent and contributions of all of the members of the RI. *In the Name of Life*, we will keep moving.

Raymond Royer
Chairman, Board of Directors
Research Institute of the MUHC

Message

from the Director General and Chief Executive Officer
McGill University Health Centre

It is with pleasure that I endorse the 2011-2012 annual report of the Research Institute of the McGill University Health Centre (RI-MUHC) and comment on both the past year and the future.

These are both exciting and challenging times for the Institute, for the McGill University Health Centre (MUHC) and the population we serve. Our redevelopment project offers us a golden opportunity to shape the world's best practices and create a truly integrated academic health care model—an opportunity that can only be realized, in my opinion, by enhancing interdisciplinary collaboration across Canada and internationally. The RI-MUHC has done an admirable job in forging partnerships on six continents, and I believe that these relationships will only be strengthened as we address society's big issues. Our entire organization must embrace this approach.

Construction of the RI-MUHC's new facilities at the Glen site advanced significantly in the past year, while plans for modern space at the Montreal General Hospital continued to be developed. We are confident that these facilities will be Canada's finest and will allow us to establish the ideal platform upon which to streamline operations and improve the health of individuals throughout their life span.

With this being said, to effect positive changes, insights must move beyond the bench and bedside to the business environment and community. The business component represents a major challenge but also myriad opportunities, which the RI-MUHC is pursuing under the strategic guidance and vision of Dr. Vassilios Papadopoulos and the operational strengths of Mr. François Schubert. Supporting the team is a new Board of Directors that provides greater synergies among the MUHC, McGill University and the RI-MUHC, and richer business acumen, probity and accountability. These synergies should lend themselves well to the development of complementary connections with other industries, for example.

On a final note, allow me to congratulate all of our investigators for maintaining such determined focus on their scientific endeavours. The impact of their efforts is measurable in personal satisfaction and the Institute's international reputation for excellence; in the trust that partners and granting agencies have when they provide funding for new pursuits; and in improved health outcomes throughout the circle of life.

Normand Rinfret, CRIA
Director General and Chief Executive Officer, MUHC

"The RI-MUHC has done an admirable job in forging partnerships on six continents, and I believe that these relationships will only be strengthened as we address society's big issues."

Message

from the Chairman of the Board of Directors

McGill University Health Centre

"As this and past annual reports demonstrate, not only does research matter to everyone at the Institute but it is in their blood, while quality of life also remains top of mind."

As the Chairman of the Board of the McGill University Health Centre (MUHC), I am honoured to have an opportunity to commend management and researchers of the Research Institute of the McGill University Health Centre (RI-MUHC) on the past year's scientific and administrative accomplishments. As this and past annual reports demonstrate, not only does research matter to everyone at the Institute; it is in their blood, while quality of life also remains top of mind.

Indeed, without the intensity of research carried out at the RI-MUHC, the MUHC would not be a world-class organization, nor would it have as great a global impact as it has today and will undoubtedly have in the coming years. After all, this report may present a sampling of work within a given period of time, but research is ongoing, demanding, complicated and, because we can only imagine what the fruits of the investigators' labour will be, also very exciting.

At the heart of this labour are the RI-MUHC's talented people. Combined with their local, national and international partners, their potential for making a difference in the lives of people—from the youngest to the oldest— is limited only by the extent of brain power, persistence and the emergence of insights.

Their high-quality efforts deserve recognition and consistent financial support. On behalf of the Board of Directors of the MUHC, I would like to recognize the leadership of Dr. Vassilios Papadopoulos and Mr. François Schubert and their team on a challenging but successful 2011-2012 fiscal year. I also underscore that the Board of Directors of the MUHC welcomed the recent changes to the RI-MUHC Board and is committed to supporting its members.

Seeing the Research Institute's overall vision across the McGill University Health Centre materialize is in all of our interests.

Claudio Bussandri
Chairman, MUHC Board of Directors

The Research Institute of the MUHC at the Glen

The Research Institute of the McGill University Health Centre (RI-MUHC) at the Glen Site will include the Centre for Innovative Medicine, a self-contained clinical research facility, and the Centre for Translational Biology, specializing in advanced genetics research. Both centres will be unique in Canada and will help move discoveries from the laboratory to the patient's bedside.

- The proximity to hospital facilities will give researchers direct access to clinicians and patients
- The organization of researchers into "neighbourhoods" will encourage teams from different fields to work together towards new breakthroughs

View from St-Jacques Street

The RI-MUHC is an international research powerhouse with a worldwide reputation in the field of biomedical sciences and health care:

- First in Quebec; third overall in Canada in a ranking of Canada's 40 top research hospitals based on research intensity (grants and contracts)*
- More than 600 researchers and over 1,200 graduate and post-doctoral students and fellows, two-thirds of whom will be based at the Glen
- 2,100 technical and administrative staff members
- 230 laboratories (fundamental and translational research)
- Over 1,700 publications per year
- 12 patents issued for its research work each year
- More than $175 million in external funding attracted by researchers in the 2011-12 fiscal year

* Source: Research Infosource

The Future Research Institute

Research at the Glen

Experts say a major paradigm shift is needed in the pharmaceutical and biotechnology industry. For pharmaceutical research to continue progression, strategic alliances must be created allowing researchers access to a greater understanding of the origins and mechanisms of diseases. Effective partnerships would lead to the development of preventive, active or curative drugs and/or procedures, whose added value would assure the support of healthcare payers. Reliable collaborations would further the role of the pharmaceutical sector in improving public health systems and healthcare management in the pursuit of a better quality of life for the community.

The healthcare and life sciences community must prepare for a major shift around the world: healthcare systems are in crisis. Infectious diseases travel the globe rapidly, and the North American population is aging. Chronic illnesses impose new challenges, patients who want to understand their illnesses look to the Internet for explanation.

Almost two centuries of world-changing discoveries

Since 1821, the Research Institute of the McGill University Health Centre (RI-MUHC) and its predecessors have been responsible for some of the most significant scientific breakthroughs in medicine. Renowned worldwide, the RI-MUHC continues to attract highly qualified scientists and technologists from many nations.

As the RI moves in a new direction that will create synergy between basic research and clinical medicine, it has launched an extraordinary initiative to create a state-of-the art research environment where all stages – from basic research to the development of a clinical discovery – will be supported under one roof.

Centre for Translational Biology

The new Centre for Translational Biology at the Glen will host biomedical scientists organized into research neighbourhoods with shared technology platforms. The proximity between clinical and basic investigators will provide intellectual synergy and technological support for translation of findings from molecular and animal studies to population health, and back. These components will support research themes selected on the basis of our current strengths and our strategic plan, along with their potential impact on population health and their alignment with the clinical mission of the Glen site.

Centre for Innovative Medicine

The Centre for Innovative Medicine (CIM) will be a world-class research platform dedicated exclusively to clinical research.

The CIM is a major component of the clinical research enterprise of the MUHC, whose mission is to provide facilities and services for the MUHC clinical investigators. The physical facility will be located at the Glen site, extending from the new Children's to the adult hospitals. The CIM will provide patient-care rooms for observational studies and will have the flexibility to support either inpatient or outpatient services, thereby maximizing the use of all rooms. It will provide around-the-clock support, seven days a week. The facility will include a patient care area; laboratory services, including biostatistics and bioanalysis; imaging; specialized testing rooms; and administrative space. A major part of the plan is to make the CIM function as the central part of an integrated MUHC network for clinical research spanning the clinics spread throughout MUHC.

Focus
on Continuous Improvement

By all measures, 2011-2012 was a year of continuous improvements and new strides. While we must be financially strong to achieve our mission, to flourish we know we must excel in quality and service. And this is exactly where our focus was this year, and will continue to be in the years to come.

The construction of the new Glen site supporting our vision of providing world-class and integrated biomedical research is progressing rapidly. To face this upcoming change, we must dedicate great effort to prepare for the transition and implement the processes, structure and programs that will give greater effectiveness and strength to the current and future Research Institute of the McGill University Health Centre (RI-MUHC).

Enhancing the RI-MUHC

Harmonization, consolidation and efficiency are at the heart of our day-to-day activities. Indeed, collaborative efforts in business development, administration efficiencies, automation, information systems, and investments in facilities and technology have bolstered and supplemented our progress, creating the favourable environment required to prepare for the Glen move and the redevelopment at the Montreal General Hospital.

Several projects aiming at harmonizing and standardizing our processes and procedures, such as the roll out of Standard Operating Procedures across all sites (animal resources, human resources, health and safety, technical services, etc.), were also undertaken in the course of the year. The challenge – indeed, the goal that we have set and achieved – is to do more with less. A greater administrative and structural efficiency means more resources for our mission, yielding more discoveries and innovation. The task is huge, but so is our commitment.

Along with our planning and coordination of the transition and move to the Glen site, we are currently developing a three-year strategic communication plan that will foster a better understanding of our vision and direction. Ultimately, the engagement of everyone – employees, research community, foundations, funding partners, general public – will not only allow for a smooth transition, but also the triumph of our historic enterprise.

François Schubert
General Manager and Chief Administrative Officer

Child Health and Development:
Growing with Our Strengths

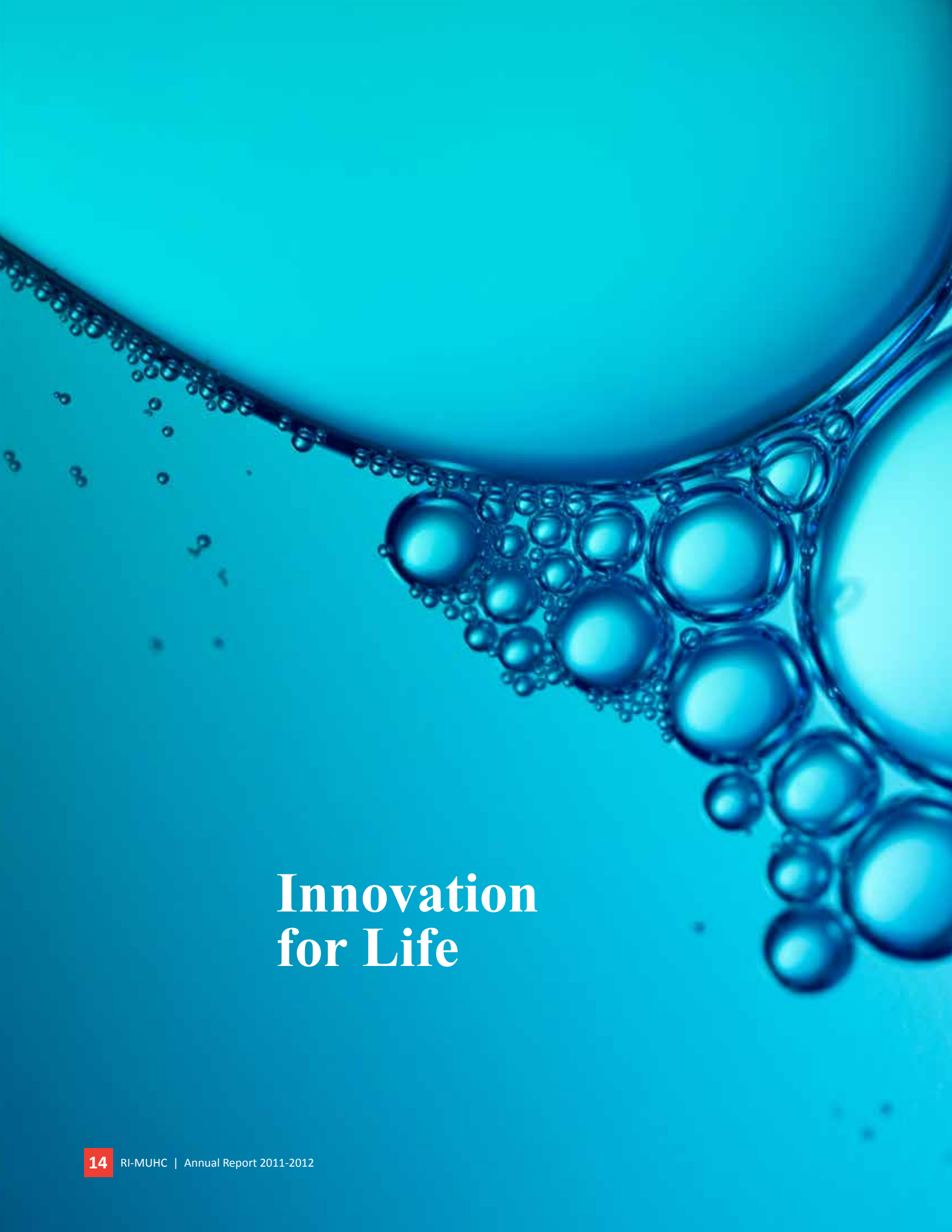
Dedication to continuous improvement of health outcomes for children and adults is at the heart of research at the RI-MUHC and at the Montreal Children's Hospital (MCH).To keep growing with our strengths, it is necessary to reflect on what we do best and how to amplify that "best" by matching our strengths with the strengths of colleagues, using the technological advances from neighbouring disciplines to increase momentum. Our success in this quest for improvement is expressed, not only in the research achievements celebrated in this annual report, but each time that a positive impact on a patient's life may be associated with an MUHC or McGill laboratory.

In child health research, we are especially aware of the perspectives we owe to the people we work with and the young patients we work for. The result of this ability to focus on a common purpose is that our joint ventures with colleagues in adult medicine are driving discoveries in a wide range of diseases.

Traditional research strengths at the MCH include the genetics and genomics of rare disease, common disease and cancer; prenatal and childhood origins of disease; and brain, behaviour and development. This year, major genetic breakthroughs by MCH scientists in the fields of pediatric brain tumour research and child blindness afforded a preview of what we can do, *In the Name of Life*, when we join our traditional strengths with next-generation sequencing technologies, working with collaborators at the MUHC, McGill and across the globe.

As we begin to reorganize programs for the new facilities at the Glen, we know that the foundations of the new MUHC and its Research Institute will support the vision of a Child Health and Development program that fully integrates maternal and fetal health research with historical strengths at the MCH.

Jacquetta Trasler, MD, PhD
Deputy Executive Director and
Deputy Chief Scientific Officer (Pediatrics)



Innovation for Life

Research and Collaboration

Research offers the promise of finding better ways to diagnose, prevent and treat disease. To reach these goals, investigators must often focus on very specific questions. To facilitate focus while encouraging collaboration across research disciplines, the Research Institute of the McGill University Health Centre (RI-MUHC) is organized into 11 axes or programs.

Axes span the spectrum of medical research

Some of our axes are dedicated to research into specific diseases such as cancer, respiratory illness and cardiovascular disease. Others are focused on the study of genetics, genomics and health outcomes – areas of science that are relevant across the broader spectrum of health care. Researchers work with colleagues in other axes, forming multidisciplinary teams to study the many complex questions confronting modern medicine.

Research Axes

Cancer

Research in the Cancer axis focuses on the cause and prognosis of cancers from infancy to adulthood. The axis has developed translational strengths in four areas – breast, prostate, melanoma and colon cancer – that are global public health concerns and represent a major clinical burden on the healthcare system.

As a designated breast cancer and melanoma referral center for Québec, members of this axis, in conjunction with the UROMED Prostate Cancer Center, have investigated and refined the diagnostic and prognostic tools for breast and prostate cancer and melanoma. This research has led to the development of technology to identify genetic signatures of cancer, which can be used to predict, prevent and personalize medicine.

Research in this axis contributes to the improvement of quality of life and the provision of optimal palliative care at all stages of disease. Researchers from the Cancer axis have received international recognition for the development of quality of life measures for palliative care patients and their families.

The research currently pursued by Cancer axis scientists can be grouped into five major thematic programs with distinct, yet complementary, strengths that collectively examine different aspects of the process of cancer progression and dissemination. These programs will be the investigational backbone of the Cancer axis, allowing us to identify areas to be strengthened through new recruits or intra- and inter-team collaborations.

Cardiovascular Diseases and Critical Care

The Cardiovascular Disease and Critical Care axis is dedicated to the understanding and treatment of cardiovascular diseases, which represent the major cause of death and disability in both Canada and around the world. The major research focus of the axis involves lipoprotein metabolism and cardiovascular genetics, vascular biology and response to inflammatory stress, cellular and mathematical models for the study of cardiac electrophysiology, and assessment of technologies in cardiovascular health.

Methodologies used by our researchers include molecular cellular biology, integrative physiology, and clinical and epidemiological studies. Research in this axis continues to benefit from the large annual patient volume and medical procedures conducted in the Division of Cardiology and Critical Care at the MUHC, which include 40,000 out-patients, over 3,600 cardiac catheterization procedures and 1,200 open heart surgeries, providing a wealth of clinical material vital to the success of these studies.

The Clinical Unit, which already includes cardiac catheterization laboratories and a Coronary Care Unit, now has a new Non-Invasive Laboratory with two state-of-the-art echocardiology machines dedicated to the study of vascular function. This cutting-edge technology will allow the study of large populations of specific metabolic or genetic disorders in a non-invasive fashion.

Major basic research themes are genetics of coronary artery disease and cardiovascular risk factors, genetics of HDL and HDL Biogenesis, cellular biology of cholesterol transport and vascular biology. The clinical themes are varied and focused on the highly specialized areas of care provided to patients with cardiovascular diseases.

Endocrinology, Diabetes, Nutrition and Kidney Diseases

The Endocrinology, Diabetes, Nutrition and Kidney Diseases axis has a diverse team of clinical investigators who, in collaboration with fundamental and epidemiological researchers, comprise the largest division of Endocrinology and Metabolism in Canada and one of the most comprehensive in North America. Researchers in this axis study a broad range of disorders, including kidney disease, hormone related cancers, and diabetes, which has become a worldwide epidemic, affecting over 2 million Canadians.

The axis has extensive expertise in biochemistry and cell biology of hormone receptors and related signaling pathways, as well as in genetic analyses of how DNA sequence variation modulates disease risk.

Axis researchers use a broad array of conceptual and methodological tools and utilize technologies ranging from high-throughput genotyping, proteomics, and mass spectrometry to transgenic and knockout animal models.

The large clinical patient volume at the MUHC represents a rich resource for clinical epidemiological research in endocrine diseases. Researchers in this axis have identified the molecular mechanisms important in diabetes, kidney and neurodegenerative diseases, which in turn have led to potential therapeutic strategies applied by our investigators in large-scale clinical studies. This is part of our bench-to-bedside philosophy that allows patients to benefit rapidly from the latest research advances.

Obesity, diabetes and its complications remain major global public health problems. To address this, our axis has three major research themes, which are aimed at understanding the underlying basis of the many metabolic abnormalities of diabetes and identifying new treatments, the cellular mechanisms by which hormones exert their effects, and the mechanisms underlying kidney development and disease. Through the recruitment of additional researchers over the past four years, we are now even better positioned to meet the challenges ahead.

Health Outcomes

The overall aim of the Health Outcomes axis is to optimize outcomes through the evaluation of health interventions, systems and policies. Members of this axis conduct epidemiological, biostatistical and evaluative research on the distribution and determinants of health states in the general population and clinical populations. The overall aim of the Health Outcomes axis is to optimize outcomes through the evaluation of health interventions, systems and policies.

Members of this axis conduct epidemiological, biostatistical and evaluative research on the distribution and determinants of health states in the general population and clinical populations. By using administrative data, axis members can initiate large scale investigations on a range of subjects, such as the effectiveness of drug therapies, existing and emerging technologies, health policies, clinical informatics and trends in acute and chronic health conditions. Health Outcomes axis investigators are at the forefront of research into patient-reported outcomes (PROs) – a topic that has stimulated this field in recent years – and are recognized experts in the methodological and biostatistical methods used to advance understanding of the effects of health conditions on individuals, their families and society.

Researchers in this axis have conducted a great deal of research on clinical informatics, which provide researchers with access to a rich volume of clinical data from the implementation of a new electronic health record system at the MUHC. The capacity to use linked clinical and administrative data to track emerging epidemics is crucial in the wake of
E. coli and C. difficile outbreaks and makes investigators at the Research Institute among the most competitive research groups in the world.

The axis members are also heavily involved with Nursing and with the School of Physical and Occupational Therapy, providing a truly interdisciplinary axis. The Health Outcomes axis brings together a diversity of health backgrounds including medicine, dentistry, surgery, anesthesiology, psychology, nursing and rehabilitation.

Human Reproduction and Development

Research in the Human Reproduction and Development axis is focused on the genetic and physiological basis of reproduction and infertility, and on the biology of development. Axis researchers focus on some of the major issues that affect society today, such as declining fertility rates, developmental disorders that arise during pregnancy, and the connection between environmental toxicants and reproductive failure.

A major focus of the clinical research of the axis is improving assisted reproduction. The Reproductive Centre has developed several novel methodologies in assisted reproductive technologies, including a new technique of oocyte cryopreservation, termed vitrification, which enables women to preserve oocytes for future fertilization. Importantly, oocyte vitrification can also provide hope for patients with malignant diseases such as cancer, who need chemotherapy and therefore become infertile.

Researchers in the Human Reproduction and Development axis are leaders in the field of spermatogenic stem cells, the founding cells of the male germline. Studies aimed at gaining a better understanding of male reproduction and fertility include projects on factors that regulate the development of germ cells from spermatogonial stem cells to sperm. Specifically, RI-MUHC investigators examine how

environmental and therapeutic agents induce germ cell damage leading to infertility, cancer and/or defective spermatozoa that can transmit alterations to their progeny.

A key future objective is to bring our members, who currently work at three different locations, together at the new research facility at the Glen Campus. The resulting intellectual exchange will facilitate new research collaborations as well as provide an enriched training environment for our students and clinical and postdoctoral fellows.

Close physical proximity will, of course, also enable more efficient use of resources, including transgenic animals, tissue culture facilities and tools and equipment for cellular imaging. It will also stimulate new collaborations regarding stem cells in medicine. Embryonic stem cell biology has obvious direct implications for the field of human reproduction, but of great interest now is the use of stem cells to treat organ damage later in life. We envisage this as a major area to expand in years to come.

Infection and Immunity

The Infection and Immunity axis is a large, multidisciplinary group that encompasses the rapidly expanding fields of immunology, host defense, autoimmunity and atopic disorders, such as asthma and eczema. These programs are representative of the complexity of our research effort spanning a broad range of microbial targets and human hosts as well as geographical areas.

Many factors make the research conducted by this axis ever more relevant in today's world. Changes in Canadian and Québec immigration policies, increases in international movement of livestock and consumables, significant expansion of overseas travel, commerce and studies, and global warming have all contributed to increased risk from infectious diseases that kill millions of people every year.

Axis investigators continue to focus on major emerging pathogens and international concerns, including malaria, salmonella, measles, tuberculosis, leishmania, mycobacteria and leprosy. Elucidation of the microbiological underpinnings of idiopathic and so-called immune conditions are an increasing feature of this work. Advanced studies of the host response to HIV and studies of HIV co-pathogens, logically fall into this axis. Axis researchers use advanced genomic, microarray and proteomic tools in both animal models and human disease to discover determinants of pathogenicity and host response.

The Infection and Immunity axis is unique in that it drives a large number of investigator-initiated grants to industry as well as being active in a large number of multi-centre trials. These trials are aimed at defining optimal utilization of novel therapeutic molecules to combat inflammatory conditions or resistant infections. Novel innovations that the axis is driving include characterization of the genome in mycobacterial strains and their relationship to disease presentation and diagnosis, immune modulation to optimize bone marrow and solid organ transplantation, and strategic use of immune prophylactic therapies in oncology patients. The axis has also continued to build and expand in its traditional areas of strength, such as HIV-AIDS.

Medical Genetics and Genomics

Medical genetics relates to almost every human condition, from cancer to tuberculosis and brain tumours, as well as drug resistance and vaccine development. Research in this axis is focused around three central themes: identification of genes associated with disease, mechanisms of genetic disease and applied genetics.

Gene and mutation discovery continue to be major themes for both simple Mendelian traits and for complex genetic and infectious diseases. Mouse models of complex genetic traits and multifactorial diseases, epigenetic germline modification, and host resistance to infection have been developed and continue to play an important role in the understanding of human genetic disease. Statistical genetics studies, which involve the mapping and identification of genetic variation contributing to disease, are a crucial underpinning of the analysis of complex genetic diseases.

The introduction of new technologies to identify mutations or cytogenetic abnormalities and the development of testing procedures for recently characterized disorders are continuing objectives of the axis. Large-scale genomics projects such as Genetic Regulation of Disease (GRID) and genome sequencing of important pathogens such as C. difficile were initiated by axis researchers at McGill University and the Genome Quebec Innovation Centre. The capability of the Genome Centre to generate large datasets on allelic variants in populations raises ethical issues that must be dealt with if society is to benefit from the influx of new knowledge. For this reason, ethical, legal and social issues also continue to be essential components of the axis program.

The axis will continue to emphasize the three themes that are relevant to its mission. Next-generation sequencing technologies have quickened the pace of disease gene discovery, and it is likely that the genetic basis of most Mendelian disorders will be known within the next two years. The focus of genetics in the post-genomic era is already shifting toward a more detailed understanding of gene-gene-environment interactions in complex, common diseases with a genetic influence, and in the role of susceptibility genes, particularly in genome-wide association studies.

Mental Illness and Addiction

Unravelling pathophysiology to design novel therapeutics is a priority for modern psychiatric research and a key goal of this research axis. The emphasis of this group is to investigate the behavioural and brain correlates of neurotransmitter dysfunction, using functional neuroimaging techniques, genetic dissection and pharmacological manipulations. It also aims to ensure continuous dialogue between basic and clinical research and rapid knowledge transfer from the bench to the bedside and back.

The addiction program combines the strengths of a well-established hospital-based treatment unit and an emerging translational neuroscience program. The research program covers many important concerns ranging from behavioural neuroscience and neurophysiology to pharmacology, the genetic risk for developing addiction, and hospital and community-based treatment programs in addiction. Mood disorders studies involve the research of novel antidepressant treatments, such as compounds that act on the cannabinoid systems, and high-frequency deep brain or vagus nerve stimulation in treatment-refractory depressed patients.

Autism research within the axis is world renowned, and involves identification of environmental risk factors, secular trends in incidence, and efficacy of psychosocial and psychopharmacological interventions. The autism research program is supported by a strong clinical program recognized as a major tertiary and quaternary centre for the province of Québec. Research on Attention-Deficit Hyperactivity Disorder (ADHD) involves evaluating the efficacy of novel interventions combining psychopharmacology and psychotherapeutical techniques across age ranges. Pharmacogenetic studies are also being pursued to better understand mechanisms that underlie response to drug treatment in this disorder.

Musculoskeletal Disorders

The overall goals of the Musculoskeletal Disorders Axis are to improve our understanding of disease mechanisms and expedite the development of strategies for the prevention, diagnosis and management of musculoskeletal disorders.

Clinical investigators in this axis focus on the study of musculoskeletal disorders, particularly musculoskeletal repair and the biological and genetic bases of bone disorders and bone cancer. Current research projects include identification of molecular pathways of medical conditions affecting bones and joints, such as degenerative and inflammatory joint and disk diseases, primary and metastatic cancer, osteoporosis and axial/peripheral insufficiency fractures, and musculoskeletal development problems like osteogenesis imperfecta, congenital malformations and scoliosis. Current ground-breaking research is being done on the development of minimally invasive spine surgery concepts, including robotic science and minimally open technology, as well as the investigation of agents that trigger new bone formation. Genetic studies in animal models include gene expression in bone precursors of osteoporosis, candidate genes for osteoporosis, and the interaction of hormones and cancer cells with the skeleton in order to discover new ways of preventing or reversing major bone diseases. The axis is also a site of the Canadian Multicentre Osteoporosis Study (CAMOS), which, along with other epidemiological projects, continue to gather critical information in Québec on the impact of specific drugs on the skeleton.

The clinical investigators of this axis are providing opportunities to test the most recent therapeutic approaches in a variety of clinical disorders such as osteoporosis, skeletal complications of cancer, osteogenesis imperfect and other rare genetic bone diseases. A unique cohort of patients with rare genetic disorders diagnosed and followed at the Shriners Hospital for Children have now reached adulthood and are treated and studied at the Bone Metabolism Centre of the MUHC. All these unique patient cohorts are entered in a database and blood, DNA and tissues are collected for future clinical studies. The MUHC takes pride in being one of the major hubs of musculoskeletal research in North America and in the world, thanks to the active collaboration between clinical and basic researchers studying skeletal disorders throughout the lifespan.

Neurosciences

The major goals of this axis are to promote the development of therapeutic approaches to neurological disease through a program of basic and clinical research. Translational research programs, including clinical trials, are being conducted on a range

of neurological disorders including multiple sclerosis, Parkinson's disease, amyotrophic lateral sclerosis, cerebrovascular disease, epilepsy, migraines, brain aneurysms and brain tumours.

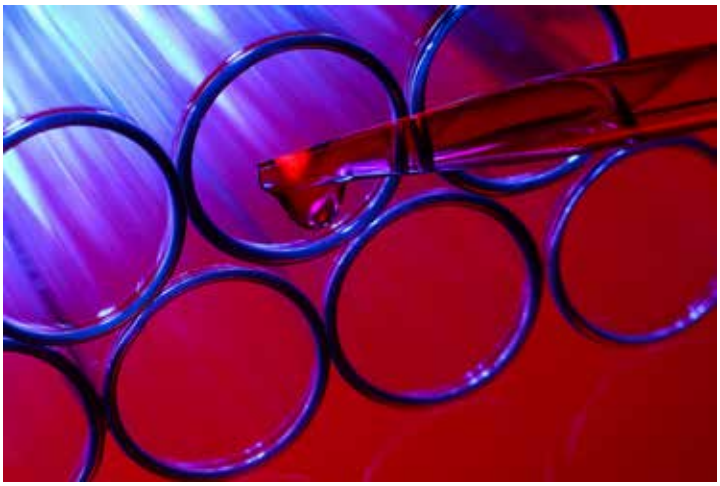
The axis is also enhancing its efforts, and visualization of behavioural and disease-related changes in the brain, using the extremely high resolution of confocal microscopy in mice and rats. This cutting-edge technology allows researchers to document changes at individual synapses in animals subjected to learning paradigms or with neurodegenerative disorders.

An important new initiative for the axis has been the initiation of programs in Neuro-Engineering as well as in Regenerative Medicine/ Nanotechnology. A team of physicists, chemists, material scientists and neuroscientists is developing innovative artificial substrates for neuronal growth and synapse formation with the goal of restoring function to the damaged nervous system.

For more than 50 years, McGill University has been a world leader in the science of brain function and the treatment of neuronal disorders. This lead role continues today. Members of this axis are carrying out a range of research within several thematic groups overseen by an administrative structure that speeds scientific progress through enhanced collaborative interactions. These groups include: fundamental biology of excitable tissue, neural trauma and regeneration, cognitive neuroscience, brain imaging, epilepsy, neuroimmunology and multiple sclerosis, neuromuscular research, brain tumour research, neurogenetics, visual neuroscience, cerebrovascular disease, complex neural systems, movement disorders and Parkinson's disease.

Respiratory Health

Researchers in the Respiratory Health axis work collaboratively to characterize the inflammatory nature of a wide range of respiratory diseases, including asthma, tuberculosis, Chronic Obstructive Pulmonary Disease (COPD), cystic fibrosis, obstructive sleep apnea (OSA) and the role of infection in chronic inflammatory respiratory diseases.



Asthma is perhaps the largest area of research within this axis, reflecting the increased prevalence of this disease, which now affects one in four children worldwide. The natural history of asthma is being addressed through an integrated program focusing on wheezing in children and its relationship to asthma in adulthood, development of allergy and antigen processing within the respiratory mucosa, and different mechanisms by which specific infections can affect exacerbation and impact treatment of the disease. Our researchers are also exploring new mechanisms that underlie persistent asthma in adults. New targets for therapy are being assessed in both animal models and human tissues, and the role of cytokines, leukotrienes and growth factors will soon become important areas of research for this group.

The axis is organized into two strong components: a fundamental and translational pathobiology theme, and a clinical and evaluative theme. The fundamental research program of the axis is currently comprised of several sub-themes of research: obstructive airway diseases, sleep disordered breathing, respiratory muscle dysfunction and respiratory infectious diseases. The clinical and evaluative respiratory health research theme has sub-themes addressing several major pathologies of interest in the fundamental and translational pathobiology theme, such as obstructive airway diseases, sleep-disordered breathing and tuberculosis.

The principal goal of the fundamental and translational theme is to identify the pathways of disease based on host responses to environmental triggers through the use of cellular and animal models of disease and the translation of key findings to human tissues and abnormal integrative physiology. The clinical and evaluative research theme is supported by a strong research unit, the Respiratory Epidemiology and Clinical Research Unit (RECRU). The axis has a range of expertise from basic biochemistry, biophysics, integrated cardiorespiratory physiology, intervention evaluative research and modeling, to the examination of population health.

“The best preparation for tomorrow is to do today’s work superbly well.”

Dr. William Osler

Discoveries: Up Close

Genetic breakthrough for brain cancer in children

An international research team led by the Research Institute of the McGill University Health Centre (RI-MUHC) has made a major genetic breakthrough that could change the way pediatric cancers are treated in the future. The researchers identified two genetic mutations responsible for up to 40 per cent of glioblastomas in children – a fatal cancer of the brain that is unresponsive to chemo and radiotherapy treatment. The mutations were found to be involved in DNA regulation, which could explain the resistance to traditional treatments, and may have significant implications on the treatment of other cancers. The study was published in the journal *Nature*.

Using the knowledge and advanced technology of the team from the McGill University and Génome Québec Innovation Centre, the researchers identified two mutations in an important gene known as the histone H3.3. This gene, one of the guardians of our genetic heritage, is key in modulating the expression of our genes. "These mutations prevent the cells from differentiating normally and help protect the genetic information of the tumour, making it less sensitive to radiotherapy and chemotherapy," says Dr. Jabado, who is also an Associate Professor of Pediatrics at McGill University. "It is clear now that glioblastoma in children is due to different molecular mechanisms than those in adults, and should not be treated in the same way. Importantly, we now know where to start focusing our efforts and treatments instead of working in the dark."

Inappropriate regulation of this gene has been observed in other cancers such as colon, pancreatic, lymphoma, leukemia and pancreatic neuroendocrine cancer, and future research could therefore reveal improved treatments for these diseases. "What is significant here is that for the first time in humans we have identified a mutation in one of the most important genes that regulates and protects our genetic information. This is the irrefutable proof that our genome, if modified, can lead to cancer and probably other diseases. What genomics has shown us today is only the beginning," says Dr. Jabado.

Brain tumours are the primary cause of death for children with cancer in Europe and North America. The diagnosis of glioblastoma in a child or adolescent remains a death sentence and about 200 children in Canada die every year of this cancer. Most children will die within two years of their diagnosis, regardless of treatment.

"This research helps explain the ineffectiveness of conventional treatments against cancer in children and adolescents – we've been failing to hit the right spot."

Dr. Nada Jabado, hematologist-oncologist at the Montreal Children's Hospital of the McGill University Health Centre (MUHC) and principal investigator of the study

This work was supported by the Cole Foundation, and was funded in part by Genome Canada and the Canadian Institutes of Health Research (CIHR) with co-funding from Genome BC, Génome Québec, CIHR-ICR (Institute for Cancer Research) and C17, through the Genome Canada/CIHR joint ATID Competition.

Blood test for Alzheimer's Disease

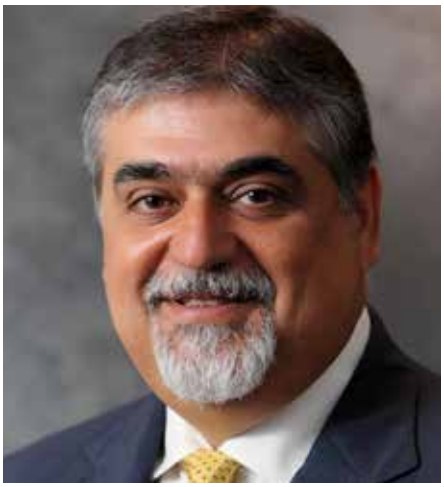
A new blood test that will diagnose Alzheimer's disease may soon hit the market, thanks to an innovative study from the Research Institute of the McGill University Health Centre (RI-MUHC). Their findings have characterized a unique biochemical diagnosis, which identifies patients with this devastating disorder. This research, published in the *Journal of Alzheimer's Disease*, has implications for the half-a-million Canadian sufferers and many millions more worldwide.

"Until now, there has been no definitive diagnostic tool for Alzheimer's, other than postmortem analysis of brain tissue," says senior author Dr. Vassilios Papadopoulos.

The biochemistry behind the test

Papadopoulos and colleagues based the Alzheimer's blood test on the production of a brain hormone called dehydroepiandrosterone (DHEA). This hormone is present at high levels in the brain, where it has a wide range of biological effects.

The researchers were able to promote the production of DHEA, using a chemical process called oxidation, in blood taken from non-Alzheimer's patients. However, oxidation of blood from Alzheimer's patients did not result in an increase of DHEA. "There is a clear correlation between the lack of ability to produce DHEA through oxidation in the blood and the degree of cognitive impairment found in Alzheimer's disease," says Papadopoulos. "We demonstrated we could accurately and repetitively detect Alzheimer's disease, with small samples of blood. This test also allowed for differential diagnosis of early stages of Alzheimer's disease, suggesting this can be used as a test to diagnose the disease in its infancy."



"Our clinical study shows that a non-invasive blood test, based on a biochemical process, may be successfully used to diagnose Alzheimer's at an early stage and differentiate it from other types of dementia."

Dr. Vassilios Papadopoulos, senior author and Executive Director and Chief Scientific Officer, RI-MUHC

Treatment implications

"There are many candidate disease-modifying therapies that target the underlying development of Alzheimer's disease, which are in clinical trials," adds Papadopoulos. "However, the implementation of any therapy is dependent on the reliability of the diagnosis."

Currently the diagnosis of Alzheimer's follows the sequence of family history, information, mental assessment and the physical exam, focusing on neurological signs.

"An accurate, easy and specific non-invasive biochemical test that correlates with clinical findings is vital. We believe our results demonstrate that the DHEA-oxidation blood test can be used to diagnose Alzheimer's at a very early stage and monitor the effect of therapies and the evolution of the disease."

This work was supported by funds from the National Institutes of Health and Samaritan Pharmaceuticals.

Saliva HIV test passes the grade

A saliva test used to diagnose the human immunodeficiency virus (HIV), is comparable in accuracy to the traditional blood test, according to a new study led by the Research Institute of the McGill University Health Centre (RI-MUHC) and McGill University. The meta-analysis, which compared studies worldwide, showed that the saliva HIV test, OraQuick HIV1/2, had the same accuracy as the blood test for high risk populations. The test sensitivity was slightly reduced for low-risk populations. Published in *The Lancet Infectious Diseases journal*, the study has major implications for countries that wish to adopt self-testing strategies for HIV.

"Oral HIV tests can be a powerful tool for high risk populations, but self-testing must be accompanied by linkage to care to achieve good health outcomes."

Dr. Nitika Pant Pai, lead author of the study, medical scientist at the RI-MUHC and Assistant Professor of Medicine at McGill University

"Testing is the cornerstone of prevention, treatment and care strategies," says the study's lead author, Dr. Nitika Pant Pai, a medical scientist at the RI-MUHC and assistant professor of Medicine at McGill University. "Although previous studies have shown that the oral fluid-based OraQuick HIV1/2 test has great promise, ours is the first to evaluate its potential at a global level."

Dr. Pant Pai and her colleagues analyzed and synthesized real-life field research data from five worldwide databases. Their findings showed that the saliva test is 99 percent accurate for HIV in high-risk populations, and about 97 percent in low-risk populations.

The oral HIV test has become one of the most popular tests because of its acceptability and ease of use. It is non-invasive, pain-free and convenient, and it produces results in 20 minutes. "Getting people to show up for HIV testing at public clinics has been difficult because of visibility, stigma, lack of privacy and discrimination. A confidential testing option such as self-testing could bring an end to the stigmatization associated with HIV testing," says Dr. Pant Pai.

High-risk populations fuel the expansion of HIV epidemics, but they face widespread discrimination, violence and social marginalization from healthcare services. UNAIDS estimates that globally, 90% of men who have sex with men lack access to the most basic sexual health services.

This work has been made possible by a Knowledge Syntheses Grant from Canadian Institutes of Health Research (CIHR).

Parasitic worms: Hidden global health threat

With close to one third of the world's population infected with parasitic worms, researcher Dr. Theresa Gyorkos is thinking big when it comes to finding a solution to this global public health challenge. As part of an international research and policy team, she is contributing to the soon-to-be-released WHO Strategic Plan to control intestinal worm infections in more than 100 countries. Dr. Gyorkos received the Canadian Public Health Association's (CPHA) 2011 International Award for her contributions to global public health at the CPHA annual conference this week in Montreal.

"The contributions made by my research team in Canada and with partners in other countries, on prevention and control of soil-transmitted helminth (STH) infections, aim to improve the lives of many people around the world," says Dr. Gyorkos, a researcher in Clinical Epidemiology at the RI-MUHC and a professor in Epidemiology, Biostatistics and Occupational Health at McGill University.

Soil-transmitted helminths – commonly known as intestinal worms – which include roundworms, whipworms, and hookworms, enter the human body in a number of ways, such as through fecally contaminated food, drinking water, fingers and objects, and even by walking on soil contaminated by the invisible parasite eggs. Once inside the body, the worms feed off their host and reproduce prolifically, shedding eggs into the external environment, to continue the life cycle.

Most of the estimated two billion people afflicted with parasitic worms live in developing countries where clean drinking water and sanitation systems are inadequate. Dr. Gyorkos's research program, which is now primarily based in Peru, focuses specifically on the three population groups at highest risk of worm-attributable morbidity: school-age children, preschool-age children and pregnant women.

"The challenge is getting governments to establish plans of action and health policy to ensure that anthelmintic drugs – that are now free of charge and administered in a single dose – can be distributed in as effective and efficient a way as possible in their country," says Dr. Gyorkos. "My research is increasingly oriented to ensure that deworming programs are optimally integrated into routine health and education systems and that they are monitored and evaluated periodically. In this way, the burden of disease caused by parasitic worms can be reduced, hopefully, to a level where they no longer pose an important threat to the health of so many in STH-endemic areas around the globe."

"Parasitic worm infections exacerbate co-existing malnutrition and weaken the immune system, causing fatigue and anemia, impairing cognition, and reducing productivity throughout the lifespan"

Dr. Theresa Gyorkos, researcher in Clinical Epidemiology at the RI-MUHC and Professor in Epidemiology, Biostatistics and Occupational Health, McGill University

Slowing the spread of breast cancer

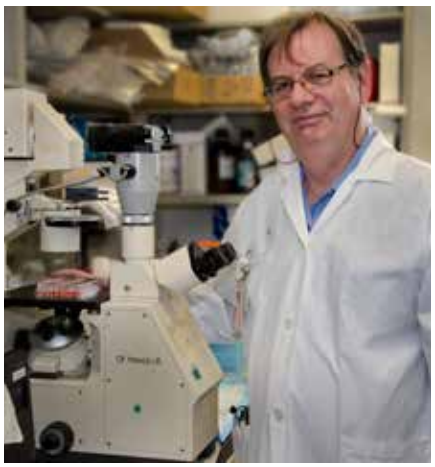
A new potential target to slow breast cancer tumour progression and metastasis has been identified by a team of researchers led by Dr. Richard Kremer from the Research Institute of the McGill University Health Centre (RI-MUHC). Complications in breast cancer patients are commonly caused by the spread of the disease through metastasis to other parts of the body, most often to the bones and lungs. These findings, published in the *Journal of Clinical Investigation* (JCI), suggest that a specific protein plays a key role in the progression of the disease outside of the initial tumour area.

Researchers showed that this particular target called parathyroid hormone-related protein (PTHrP), present at high levels in cancers, is involved in key stages of breast cancer initiation, progression and metastatic spread. "We are hoping for a significant effect on the prevention of breast cancer recurrence, growth and development by using a strategy to decrease the production of that particular protein," says Dr. Richard Kremer, co-director of the Musculoskeletal Axis of the RI-MUHC.

To better understand the role of PTHrP in cancer development, researchers eliminated the production of the hormone from breast cells using a strategy called "conditional knockout" and then studied the progression of the tumour. "The results showed that without the presence of PTHrP in the breast, even before the tumor developed, a reduction of 80 to 90 per cent in the growth of the tumour was observed," explains Dr. Kremer.

In order to bring this strategy one step closer to the patient, Dr. Kremer and his team developed a monoclonal antibody against PTHrP – a molecule that mimics the antibodies produced as part of the immune system's response to invaders, which is widely used in cancer treatment. Researchers were able to stop the growth of human breast tumours implanted in animal models and their metastatic spread, paving the way for clinical trials in the near future.

This study was made possible by grants from the Canadian Institutes of Health Research (CIHR), from the Susan G. Komen for the Cure Foundation and from the US Department of Defense.



"The removal of this hormone in the breast and breast tumours blocks not only the growth of the tumours but also the spread to different organs."

Dr. Richard Kremer, co-director of the Musculoskeletal Axis of the RI-MUHC and Professor of Medicine at McGill University

Neuron memory key to taming chronic pain

For some, the pain is so great that they can't even bear to have clothes touch their skin. For others, it means that every step is a deliberate and agonizing choice. Whether the pain is caused by arthritic joints, an injury to a nerve or a disease like fibromyalgia, research now suggests there are new solutions for those who suffer from chronic pain.

Led by McGill neuroscientist Terence Coderre, who is also affiliated with the Research Institute of the McGill University Health Centre (RI-MUHC), a team of researchers has found the key to understanding how memories of pain are stored in the brain. More importantly, the researchers are also able to suggest how these memories can be erased, making it possible to ease chronic pain.

It has long been known that the central nervous system "remembers" painful experiences, that they leave a memory trace of pain. And when there is new sensory input, the pain memory trace in the brain magnifies the feeling so that even a gentle touch can be excruciating.

"Perhaps the best example of a pain memory trace is found with phantom limb pain," suggests Coderre. "Patients may have a limb amputated because of gangrene, and because the limb was painful before it was amputated, even though the limb is gone, the patients continue to feel they are suffering from pain in the absent limb. That's because the brain remembers the pain. In fact, there's evidence that any pain that lasts more than a few minutes will leave a trace in the nervous system." It's this memory of pain, which exists at the neuronal level, that is critical to the development of chronic pain. But until now, it was not known how these pain memories were stored at the level of the neurons.

Recent work has shown that the protein kinase PKMzeta plays a crucial role in building and maintaining memory by strengthening the connections between neurons. Now Coderre and his colleagues have discovered that PKMzeta is also the key to understanding how the memory of pain is stored in the neurons. They were able to show that after painful stimulation, the level of PKMzeta increases persistently in the central nervous system (CNS).

Even more importantly, the researchers found that by blocking the activity of PKMzeta at the neuronal level, they could reverse the hypersensitivity to pain that neurons developed after irritating the skin by applying capsaicin – the active ingredient in hot peppers. Moreover, erasing this pain memory trace was found to reduce both persistent pain and also reduced heightened sensitivity to touch.

Coderre and his colleagues believe that building on this study to devise ways to target PKMzeta in pain pathways could have a significant effect for patients with chronic pain. "Many pain medications target pain at the peripheral level, by reducing inflammation, or by activating analgesia systems in the brain to reduce the feeling of pain," says Coderre.

This research was supported by grants from the Canadian Institutes of Health Research (CIHR), the Louise and Alan Edwards Foundation, National Institutes of Health (NIH) and an Astra-Zeneca/AECRP fellowship.

"This is the first time that we can foresee medications that will target an established pain memory trace as a way of reducing pain hypersensitivity. We believe it's an avenue that may offer new hope to those suffering from chronic pain."

Dr. Terence Coderre, neuroscience researcher at the RI-MUHC and Associate Professor, Department of Anesthesia, McGill University

Sharing knowledge for the health of the world

Seven universities across Canada — University of Western Ontario, McGill University, University of Toronto, McMaster University, University of British Columbia, University of Manitoba and Dalhousie University — have formed the CIHR Human Immunology Network (CHIN), funded by a $600,000 grant from the Canadian Institutes of Health Research (CIHR).

Canadian universities may be battling each other when it comes to sports or academic score, but when it comes to research, seven universities are now playing for the same team. Indeed, through the CIHR, the Human Immunology Network was created to promote and enhance research on the body's immune system (human immunology). The network will concentrate on research of the body's immune system and new vaccines for infectious diseases.

The network's aims:

- To be a source of standardized guidelines on immunology research.
- To allow better access to research on immunology.
- To speed up regulatory processes.
- To promote research in human immunology.
- To expedite the sharing of immunology research at the national and international levels.

In addition to acting as a coordinating resource for investigators working in different aspects of the immune system to ensure that human immunology in Canada remains at the forefront of the international effort, the CHIN will facilitate basic and clinical research and will help position Canada as a world leader in the development of new vaccines and therapies for infectious diseases, allergies, HIV/AIDS, cancer, and transplantation. Ultimately, it will improve global health.

"The goal is to work as a network where we pool our expertise and allow the schools to open up the lines of communication and exchange materials, information, students and trainees. Synergizing the effort is key if we want to achieve greater strides in science. We want to make sure discoveries translate into new treatments for diseases and education programs. It may also steer the research community towards a strategic area of research within human immunology," explains Dr. Ciriaco A. Piccirillo of the RI-MUHC.

From a general standpoint, the network will allow a collective reflection based on medical needs that arise in Canada, while influencing government policy and social issues. By combining the local and international expertise, it will be possible to maximize resources, minimize research duplication and crystallize multidisciplinary collaboration.

"From developing vaccines to discovering new therapies to treat autoimmune diseases and transplant rejection, to improving food and water safety and preparedness for emerging infections, CHIN will be an invaluable resource to the community."

Dr. Ciriaco A. Piccirillo, Canada Research Chair and Director, Immunoregulation Laboratory, McGill University; co-leader, Infection and Immunity Research Axis, RI-MUHC; Director, FOCIS Centre of Excellence in Translational Immunology; Director, Immune Phenotyping Platform, RI-MUHC; and Director, CIHR Human Immunology Network (Montreal centre)

C·H·I·N CIHR HUMAN IMMUNOLOGY NETWORK

Changing the effect of your genes on heart disease by eating greens

A long-held mantra suggests that you can't change your family, the genes they pass on, or the effect of these genes. Now, an international team of scientists, led by researchers at McMaster and McGill universities, is attacking that belief.

The researchers discovered the gene that is the strongest marker for heart disease can actually be modified by generous amounts of fruit and raw vegetables. The results of their study are published in the journal *PLoS Medicine*.

"We know that 9p21 genetic variants increase the risk of heart disease for those that carry it," said Dr. Jamie Engert, joint principal investigator of the study, who is a researcher in cardiovascular diseases at the Research Institute of the McGill University Health Centre (RI-MUHC) and associate member in the Department of Human Genetics at McGill University. "But it was a surprise to find that a healthy diet could significantly weaken its effect."

The research, which represents one of the largest gene-diet interaction studies ever conducted on cardiovascular disease, involved the analysis of more than 27,000 individuals from five ethnicities – European, South Asian, Chinese, Latin American and Arab – and the affect that their diets had on the effect of the 9p21 gene. The results suggest that individuals with the high risk genotype who consumed a prudent diet, composed of higher amounts of raw vegetables, fruits and berries, had a similar risk of heart attack to those with the low risk genotype.

The research suggests there may be an important interplay between genes and diet in cardiovascular disease. Future research is necessary to understand the mechanism of this interaction, which will shed light on the underlying metabolic processes of the 9p21 gene.

This study was funded by the Heart and Stroke Foundation of Canada. The first author, McGill PhD student Ron Do, was supported by a Canadian Institutes of Health Research (CIHR) Doctoral Research Award.

"Our results support the public health recommendations to consume a large number of servings of fruits and vegetables each day as a way to promote good health."

Dr. Jamie Engert, joint principal investigator of the study, researcher in cardiovascular diseases at the RI-MUHC and associate member in the Department of Human Genetics at McGill University

Secrets of the "sleep hormone"

A team from the Research Institute of the McGill University Health Centre (RI-MUHC) and McGill University has made a major breakthrough by unraveling the inner workings of melatonin, also known as the "sleep hormone." The research, conducted in collaboration with scientists in Italy, reveals the key role played by the melatonin receptor in the brain that promotes deep, restorative sleep. This discovery led the researchers to develop a novel drug called UCM765, which selectively activates this receptor. The results, published in *The Journal of Neuroscience*, may pave the way for the development of new and promising treatments for insomnia, a common public health problem that affects millions of people worldwide.

"We've spent many years developing medications that act selectively on a single melatonin receptor to specifically promote deep sleep, which we believe is the key to curing insomnia," says Dr. Gabriella Gobbi, a researcher in psychiatry at the RI-MUHC and the study's principal investigator. "Deep sleep has significant restorative effects, as well as the ability to increase memory and boost metabolism, while lowering blood pressure and slowing the heart rate." To date most treatments for insomnia, such as benzodiazepines, have not been selective for deep sleep, and can lead to dependence and cognitive impairment.

The researchers became interested in melatonin because of its effect on cerebral activity, and its involvement in sleep, depression and anxiety. Melatonin is a critical hormone produced by the pineal gland (located in the brain) in the absence of light stimulation. This hormone, present throughout the animal kingdom, is responsible for regulating sleep and circadian rhythms.

The research team discovered that two principal melatonin receptors, known as MT1 and MT2, played opposite roles in sleep regulation. "We discovered that MT1 receptors act on rapid eye movement (REM) sleep and block non-REM sleep, while MT2 receptors favour non-REM sleep, also known as deep sleep," explains Dr. Gobbi. "Specifying the role of MT2 receptors in melatonin represents a major scientific breakthrough that may designate them as a promising novel target for future treatments of insomnia. This discovery also explains the modest hypnotic effect of the over-the-counter melatonin pills, which act on both conflicting receptors."

This work was supported by grants from the Fonds de recherche du Québec – Santé (FRQS), by the Canadian Institutes of Health Research (CIHR), by the Canadian Foundation for Innovation (CFI), MSBi Valorisation, the McGill University Health Centre (MUHC), and the Quebec Ministry of Economic Development, Innovation and Exportation (MDEIE).

"This new molecule, contrary to traditional treatments for insomnia, increases deep sleep without destroying the "architecture" of sleep. In other words, it increases the duration of deep sleep while keeping the REM sleep episodes the same."

Dr. Gabriella Gobbi, principal investigator of the study, researcher in psychiatry at the RI-MUHC, and Associate professor of psychiatry in the Faculty

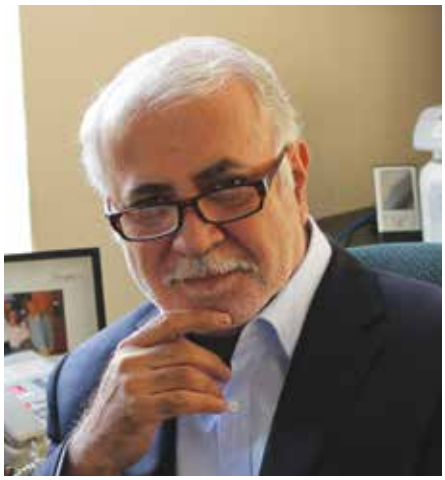
Personalized medicine for asthma: Are we there yet?

Asthma is the most common chronic lung disease. Fifteen percent of Canadians have asthma and a considerable number of them are difficult to treat and need to be referred to specialized centres for evaluation and disease management. At the Research Institute of the McGill University Health Centre (RI-MUHC), we have developed a program (Strauss Severe Asthma Program) that is focused on investigating these types of patients, to try to understand why they fail to respond to regular treatment. It is becoming clear that the "asthma" of these patients is different and that the underlying inflammatory process is complex. We and other researchers have identified different groups of this disease, which are characterized by specific pathological, molecular and clinical features. Thus asthma has been re-categorized into different groups called phenotypes and endotypes.

"Phenotyping and endotyping of severe asthma serve as stepping stones toward the practice of personalized medicine for this disease. The aim of personalized medicine is to "bring the right drug to the right patient at the right dose," so that therapeutic outcomes are maximized and side effects are minimized. With the advance of the "-omic" era, physicians are getting closer to being able to "tailor" treatment schemes, based on an individual's unique biology, with attention to genomic, transcriptomic and proteomic profiles, in addition to conventional clinical data such as family history, symptoms, and laboratory test results. Although the exact molecular mechanisms underlying asthma pathogenesis and treatment response are far from being clearly understood, asthma phenotypes/endotypes would allow physicians to treat based on an individual's biology/clinical features", as explained by Dr. Qutayba Hamid, Strauss Chair in Respiratory Medicine and Associate Director, RI-MUHC.

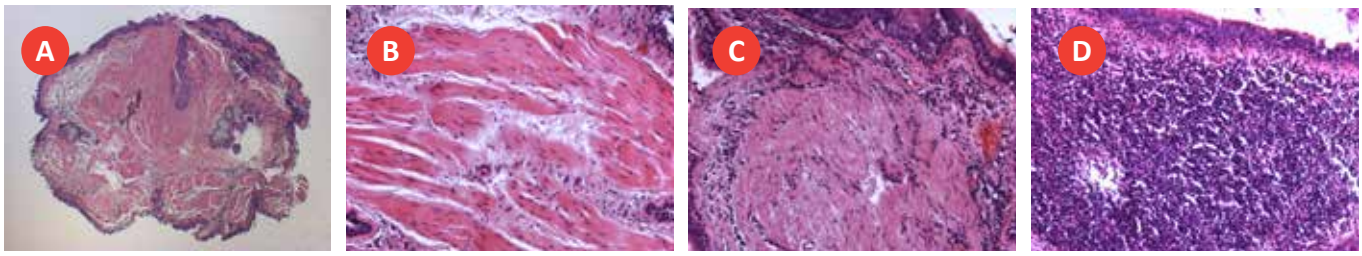
To date, some success has been achieved in clinical trials when treatments are tailored to endotypes. Examples of different treatments that target different types of asthmatic patients are the use of antibodies against immunoglobulin E and interleukin 5, and bronchial thermoplasty. The improvement in treatment outcomes will justify the use of more costly and newly developed drugs that were designed for specific phenotypes of asthma. Hence, although we are still far from practicing "personalized medicine," by treating asthma based on endotypes or phenotypes we would reduce the likelihood of prescribing ineffective drugs and decrease the number of difficult-to-treat asthmatics. This will have important implications in reducing the cost and minimizing the burden of this chronic inflammatory disease.

This research program in severe asthma is funded by the Richard and Edith Strauss Canada Foundation and by the Canadian Institutes of Health Research (CIHR). The Strauss Severe Asthma Program is run by Drs. Q. Hamid, J. Martin and R. Olivenstein in collaboration with a number of scientists, nurses and respiratory physicians from the MUHC and other Canadian institutes.

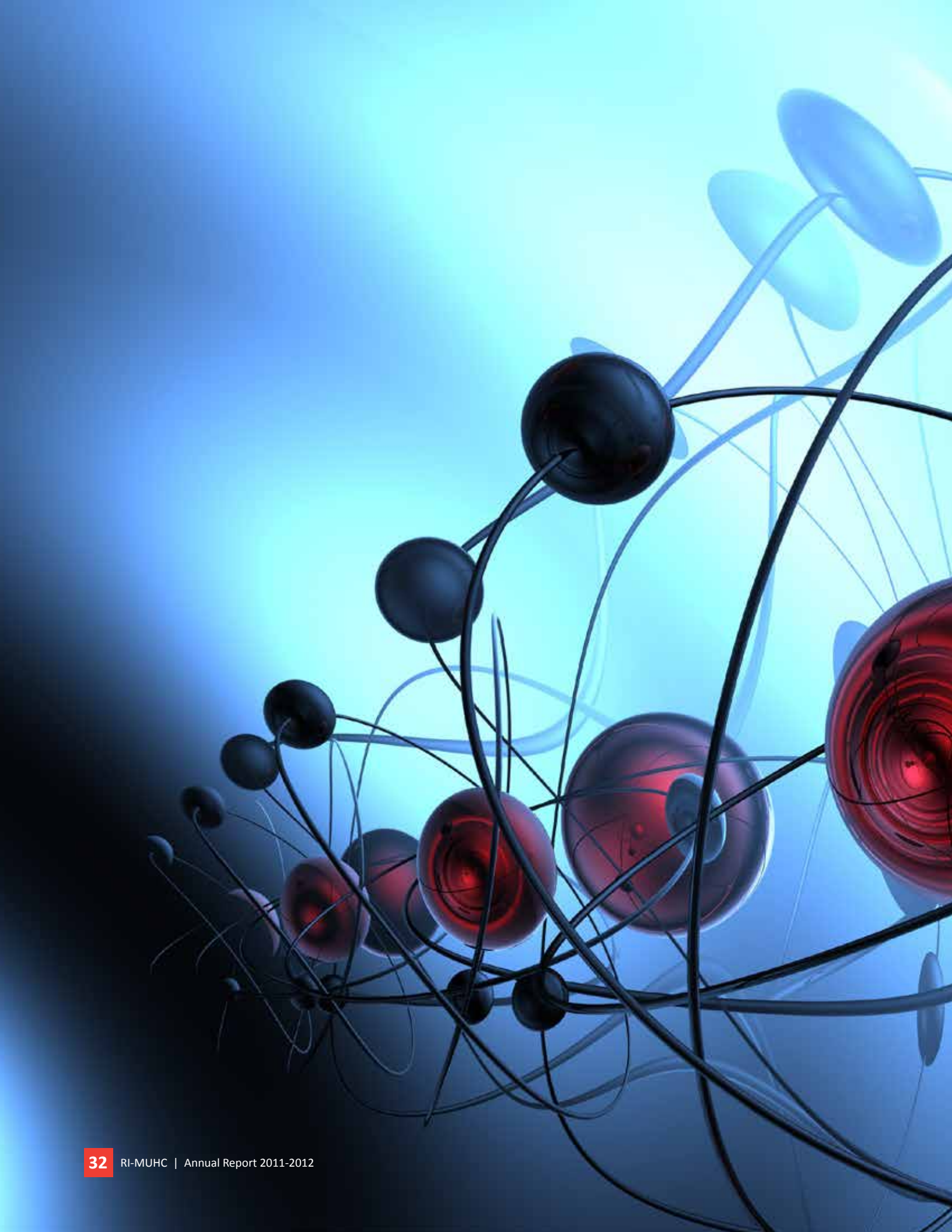


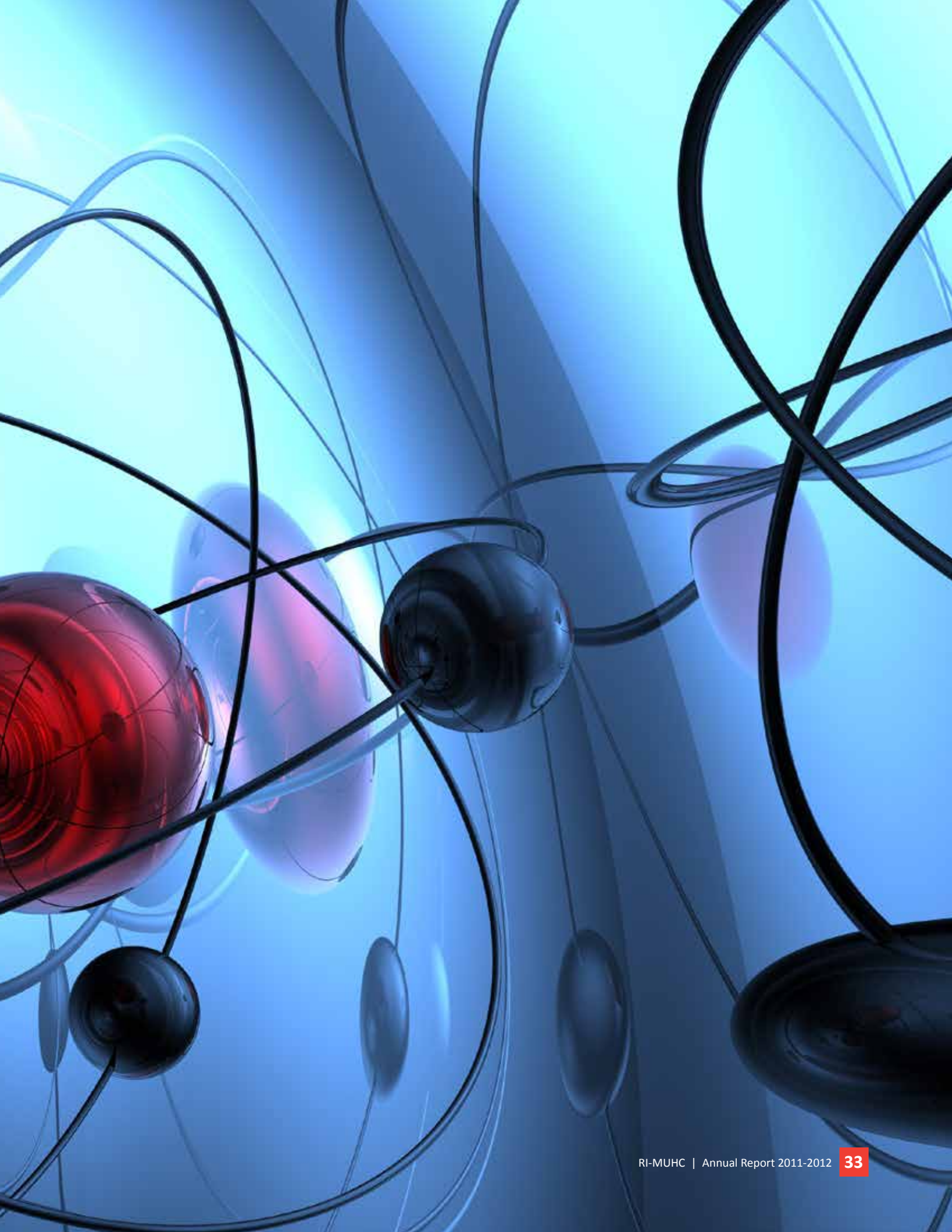
"Although the exact molecular mechanisms underlying asthma pathogenesis and treatment response are far from being clearly understood, asthma phenotypes/endotypes would allow physicians to treat based on an individual's biology/clinical features."

Dr. Qutayba Hamid, Director of the Meakins-Christie Laboratories, MUHC, Strauss Chair in Respiratory Medicine, McGill University, and Associate Director, RI-MUHC



Different faces of severe asthma. Airways of severe asthmatic patients (A) are often remodeled with an increase of airway smooth muscle cell number and size (B), excess production of collagens (C), and infiltration of inflammatory cells (D).





List of Researchers

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Cancer

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CHALUT, Dominic
CORRIVEAU, Marc Michel
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DANCEA, Adrian
DASKALOPOULOU, Styliani Stella
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HUSSAIN, Sabah N.A.
HUYNH, Thao
KISS, Robert
KRISTOF, Arnold
LOWENSTEYN, Ilka
MACKENZIE, Kent
MAGDER, Sheldon
MARELLI, Ariane
MARTUCCI, Giuseppe
MULDER, David S.
NGUYEN, Viviane
OPATRNY, Lucie
PELLETIER, Jean-Philippe
PELLETIER, Patricia
PRIMAVESI, Robert
QURESHI, Salman Tahir
SAMI, Magdi H.
SHEMIE, Sam
SHUM-TIM, Dominique
SMILOVITCH, Mark
SNIDERMAN, Allan D.
STEIN, Barry
STEINMETZ, Oren
THANASSOULIS, George
WARNER, Margaret
WITHINGTON, Davinia
ZAVALKOFF, Samara

Endocrinology, Diabetes, Nutrition and Kidney Diseases

AHMED, Najma
ALAM, Ahsan
ANDONIAN, Sero
BAASS, Alexis
BARRÉ, Paul
BATEMAN, Andrew
BENNETT, Hugh P.J.
BERGERON, John J.M.
CHEVALIER, Stéphanie
CYBULSKY, Andrey
DAHAN, Michael Haim
EMIL, Sherif
GOUGEON, Réjeanne
IQBAL, Sameena
KOKOEVA, Maia
KRISHNAMOORTHY, Preetha
LAPORTE, Stéphane
LAROSE, Louise
LATTERMANN, Ralph
LEGAULT, Laurent
LEMAY, Serge
LIU, Jun-Li
MARLISS, Errol Basil
MAYRAND, Serge
MELTZER, Sara J.
MORAIS, José Antonio
MORINVILLE, Veronique
MUCSI, Istvan
NILSSON, Tommy
PARASKEVAS, Steven
POLYCHRONAKOS, Constantin
POSNER, Barry Innis
RIVERA, Juan Andres
ROSENBERG, Lawrence
SCHRICKER, Thomas Peter Stephan
SHERMAN, Mark
SRIKANT, Coimbatore B.
TAKANO, Tomoko
TANNENBAUM, Gloria S.
TORBAN, Elena
TURCOTTE, Bernard
UNIKOWSKY, Bernard
VASILEVSKY, Murray Lewis
WING, Simon
YALE, Jean-François
ZAPPITELLI, Michele

Health Outcomes

ABRAHAMOWICZ, Michal
ADRIEN, Alix
AFIF, Waqqas
AHMED, Sara
ALBUQUERQUE, Rubens
ASENJO, Francisco
BACHER, Yves
BARKUN, Alan
BARKUN, Jeffrey S.T.
BARTLETT, Susan
BASSO, Olga
BASTIEN, Robert
BEAUDET, Nicole
BHATT, Maala
BILODEAU, Angèle
BINIK, Irving
BIRON, Alain
BLASCHUK, Orest W.
BRASSARD, Paul
BUCKERIDGE, David
CARLI, Francesco
CARNEVALE, Franco
CHRISTOU, Nicolas
CLARKE, Ann
CONSTANTIN, Evelyn
COX, John-Joseph
DA COSTA, Deborah
DASGUPTA, Kaberi
DENDUKURI, Nandini
DESCHÊNES, Jean
DOBKIN, Patricia
DOUGHERTY, Geoffrey E.
DUBROVSKY, Alexander Sasha
EL-SHERBINY, Mohamed
FATA, Paola
FEINE, Jocelyne
FELDMAN, Liane
FITZCHARLES, Mary-Ann
FORGET, Sylviane
FORTIER, Isabel
FOSTER, Bethany
FRIED, Gérald M.
GAGNON, Anita J.
GAGNON, Bruno
GAGNON, Robert
GAGNON, Serge
GALIC, Ivan John
GHALI, Maged
GROVER, Steven A.
GUZZO, Angelina
GYORKOS, Theresa W.
HANLEY, James A.
HUANG, Allen R.
JAFARIAN, Fatemeh
JOSEPH, Lawrence
KHALIFÉ, Samir
KHWAJA, Kosar
KOSKI, Lisa
KRAMER, Michael S.
LACH, Lucyna
LAIZNER, Andréa Maria
LAMBERT, Gilles
LAVOIE-TREMBLAY, Mélanie
LESSARD, Marie-Lucie
LI, Patricia
LIBEN, Stephen
MACDONALD, Mary Ellen
MAJNEMER, Annette
MANDEL, Romain
MANOUKIAN, John Jack
MAYO, Nancy E.
MCGILLIVRAY, David
MORISSETTE, Carole
NAKHLA, Meranda
PARADIS, Gilles
PATEL, Hema
PERREAULT, Robert
PILOTE, Louise
PLATT, Robert William
QUACH-THANH, Caroline
RAHME, Elham
RAJAN, Raghu Dhruva
RAZACK, Saleem Idris
RENAUD, Lise
RENNICK, Janet Elizabeth
RILEY, Patricia
RITCHIE, Judith
ROBILLARD, Pierre
RODRIGUEZ, Rosario (Charo)
ROSENBERG, Ellen
ROSSIGNOL, Michel
ROY, Élise
SAMPALIS, John
SEWITCH, Maida
SHIR, Yoram
SOLYMOSS, Susan
SOUNAN, Charles
STOCK, Susan
SULLIVAN, Michael
TAMBLYN, Robyn
TANNENBAUM, Terry Nan
THÉRIAULT, Gilles
TOUSIGNANT, Pierre
TOWERS, Anna
VALIQUETTE, Louise
WISEMAN, Jeffrey Gordon
WOLFSON, Christina
WONG, Philip
ANDONIAN, Sero
GANS, Mark
HORNSTEIN, David
HYDE, Krista
KOLIVAKIS, Theodore T.
NAKHLA, Meranda
STEINER, Warren

Human Reproduction and Development

BROWN, Richard
CARRIER, Serge
CHAN, Peter
CHIAN, Ri-Cheng
CIOFANI, Luisa
CLARKE, Hugh J.
CULTY, Martine
DANIEL, Sam Joseph
DUFORT, Daniel
FAROOKHI, Riaz
FAUCHER, Daniel J.
GILBERT, Lucy
GOODYER, Cynthia
GOODYER, Paul
GUPTA, Indra
JEDNAK, Roman
JEROME-MAJEWSKA, Loydie
KRISHNAMURTHY, Srinivasan
LABERGE, Jean-Martin
MONNIER, Patricia
NAGANO, Makoto
NAUMOVA, Anna K.
O'FLAHERTY, Cristian
PAPADOPOULOS, Vassilios
ROBAIRE, Bernard
RYAN, Aimée
SEMENIC, Sonia
SHEVELL, Michael
SHRIM, Alon
SLIM, Rima
SNIDER, Laurie
TAKETO-HOSOTANI, Teruko
TAN, Seang Lin
TULANDI, Togas

Infection and Immunity

ALIZADEHFAR, Reza
ALLARD, Robert
BEHR, Marcel
BEN-SHOSHAN, Moshe
BERNARD, Nicole F.
BITTON, Alain
BITZAN, Martin
BREWER, Timothy
CANTAROVICH, Marcelo
DE POKOMANDY, Alexandra
DESCHÊNES, Marc
DIVANGAHI, Maziar
FALLONE, Carlo
FALUTZ, Julian
FLETCHER, Susan
GOLD, Phil
HALEY, Nancy
HORN, Ruth
KARATZIOS, Christos
KLEIN, Marina
LALONDE, Richard

LECLERC, Pascale
LIBMAN, Michael
LOO, Vivian
MALO, Danielle
MANGES, Amee
MAZER, Bruce
MCCUSKER, Christine T.
MCDONALD, Jane
MOORE, Dorothy Louise
NASHI, Emil
NDAO, Momar
NEWKIRK, Marianna
NGUYEN, Dao
OLIVIER, Martin
PAI, Nitika
PICCIRILLO, Ciriaco
POTTER, Martin
RADZIOCH, Danuta
RAUCH, Joyce
REED, Michael
ROUTY, Jean-Pierre
RUBIN, Earl
SASSEVILLE, Denis
SCHURR, Erwin
SEIDMAN, Ernest G.
SEMRET, Makeda
SHEEHAN, Nancy L
SHEPPARD, Don
SKAMENE, Emil
STEVENSON, Mary
SZABO, Jason
TCHERVENKOV, Jean Ivanov
THOMSON, David M.P.
TSOUKAS, Christos
VINH, Donald
WARD, Brian
WILD, Gary

Medical Genetics and Genomics

BRAVERMAN, Nancy
DESROSIERS, Martin
DEWAR, Ken
FOULKES, William David
GILFIX, Brian
GLASS, Kathleen
JABADO, Nada
KAPLAN, Feige
KNOPPERS, Bartha Maria
KOENEKOOP, Robert K.
MAJEWSKI, Jacek
MITCHELL, John
MORGAN, Kenneth
NADON, Robert
PASTINEN, Tomi
PETERSON, Alan
ROSENBLATT, David
ROZEN, Rima
SCRIVER, Charles R.
SHOUBRIDGE, Éric Alan
SLADEK, Robert
TRASLER, Jacquetta
VIDAL, Silvia

Mental Illness and Addiction

ABBOTT, Frances Vivien
ANNABLE, Lawrence
BEAUCLAIR, Linda
BENKELFAT, Chawki
BLEAU, Pierre
BROUILLETTE, Marie-Josée
CERVANTES, Pablo
CHARNEY, Dara Alexandra
CHOUINARD, Guy
FOMBONNE, Eric
GILL, Kathryn June
GOBBI, Gabriella
GOTO, Yukiori
GREENFIELD, Brian
HECHTMAN, Lily
KOLIVAKIS, Theodore T.
LAPORTE, Lise
LEYTON, Marco
LOW, Nancy
MARGOLESE, Howard
Charles
MOSKOWITZ, Debbie S.
MYHR, Gail
PALMOUR, Roberta
PIHL, Robert O.
ROUSSEAU, Cécile
STEINER, Warren
SULLIVAN, Ronald M.
YOUNG, Simon N.

Musculoskeletal Disorders

BERNATSKY, Sasha
BERRY, Gregory
BOBYN, John Dennis
BURMAN, Mark L
CAMPILLO, Sarah
CHÉDEVILLE, Gaëlle
COLMEGNA, Ines
DIBATTISTA, Giovanni
FISHER, William D.
GOLTZMAN, David
HAGLUND, Lisbet
HAMDY, Reggie
HARVEY, Edward
HENDERSON, Janet
HENDY, Geoffrey
HEPPLE, Russell
JARZEM, Peter
KOMAROVA, Svetlana
KREMER, Richard
MARTINEAU, Paul
MCKEE, Marc D.
MORIN, Suzanne
MURSHED, Monzur
MÉNARD, Henri-André
OSKOUI, Maryam
OUELLET, Jean
PHILIP, Anie
PINEAU, Christian
RABBANI, Shafaat
REINDL, Rudy
RODD, Celia
SARAN, Neil
SCUCCIMARRI, Rosie
SEBAG, Michael
SHUSTIK, Chaim
STEFFEN, Thomas
STEIN, Michael
SÉGUIN, Chantal
TAIVASSALO, Tanja
TANZER, Michael
TURCOTTE, Robert E

Neurosciences

ANDERMANN, Eva
ANDERMANN, Frederick
ANTEL, Jack
ARNOLD, Douglas L.
AVOLI, Massimo
BACKMAN, Steven B.
BAKER, Curtis
BAR-OR, Amit
BARKER, Philip
BEDELL, Barry
BERNARD, Geneviève
BERNASCONI, Andrea
BOURQUE, Charles W.
BUSHNELL, Catherine
CARBONETTO, Salvatore
CHALK, Colin
CHEN, Brian
CHEN, John
CLOUTIER, Jean-François
CODERRE, Terence J.
COLLINS, Donald Louis
DAGHER, Alain
DAVID, Samuel
DE VILLERS-SIDANI, Étienne
DEL MAESTRO, Rolando
Fausto
DILENGE, Marie-
Emmanuelle
DJORDJEVIC, Jelena
DUBEAU, François
DUNN, Robert James
DURCAN, Liam
DURHAM, Heather
ELHILALI, Mostafa
EVANS, Alan
FARIVAR-MOHSENI, Reza
FELLOWS, Lesley
FINLAYSON, Roderick
FON, Edward A.
FOURNIER, Alyson
GAGNON, Isabelle
GANS, Mark
GENGE, Angela
GHOSH, Shuvo
GOTMAN, Jean
GOULET, Benoît
GUITTON, Daniel
HAEGERT, David
HAMEL, Édith
HASTINGS, Kenneth
HEMMERLING, Thomas
HESS, Robert
HOLLAND, Paul Charles
HYDE, Krista
JONES, Barbara Ellen
JONES-GOTMAN, Marilyn
KENNEDY, Timothy
KINGDOM, Frederick A.A.
KLEIN, Denise
KOBAYASHI, Eliane
LACHAPELLE, Pierre
LADBON BERNASCONI,
Neda
LAFONTAINE, Anne-Louise
LAPIERRE, Yves
LECANU, Laurent
LEONARD, Gabriel
LUSSIER, David
MARCOUX, Judith
MCBRIDE, Heidi
MCPHERSON, Peter Scott
MENDOLA, Janine
MILNER, Brenda
MULLEN, Kathy
MURAI, Keith
NALBANTOGLU, Joséphine
PACK, Christopher
PETRECCA, Kevin
PETRIDES, Michael
PIKE, Gilbert Bruce
PLOURDE, Gilles
POSTUMA, Ronald
PTITO, Alain
RAGSDALE, David
RAO, Yong
READER, Andrew
RICHARDSON, John
RIOPELLE, Richard
ROSENBLATT, Bernard
ROY, Jean-Pierre
RUTHAZER, Edward
SADIKOT, Abbas F.
SCHIRRMACHER, Esther
SCHWEINHARDT, Petra
SHMUEL, Amir
SJOSTROM, Per Jesper
SOSSIN, Wayne
SOUCY, Jean-Paul
STELLWAGEN, David
STIFANI, Stefano
STROH, Thomas
SZIKLAS, Viviane
SÉGUÉLA, Philippe Alain
TAMPIERI, Donatella
TEITELBAUM, Jeanne S.
THOMPSON, Christopher J.
TROJAN, Daria
TSUDA, Hiroshi
VALOIS GOMEZ, Terasa
VAN MEYEL, Donald
VEILLEUX, Martin
WARE, Mark
WEIN, Theodore
WINTERMARK, Pia
ZATORRE, Robert

Respiratory Health

ALI, Nabeel
BAGLOLE, Carolyn
BENEDETTI, Andrea
BOURBEAU, Jean
BROUILLETTE, Robert
CANAKIS, Anne-Marie
CHAMPAGNE, Kateri
DIAL, Mary Sandra
EIDELMAN, David
FIXMAN, Elizabeth D.
GIAID, Adel
GONZALEZ, Anne
GOTTFRIED, Stewart Brian
HAMID, Qutayba
HANRAHAN, John
HASTON, Christina
JACQUES, Louis
JENSEN, Dennis
KAMINSKA, Marta
KIMOFF, Richard John
KOST, Karen
LANDRY, Jennifer Sophie
LANDS, Larry
LAUZON, Anne-Marie
LUDWIG, Mara Susan
MARTIN, James Gerard
MATOUK, Elias
MENZIES, Richard
MOREL, Johanne
NGUYEN, Anh Tu Duy
NOYA, Francisco J.D.
OLIVENSTEIN, Ronald
PAI, Madhukar
PERRAULT, Hélène
PETROF, Basil
POWELL, William S.
PULIGANDLA, Pramod
ROHLICEK, Charles
ROUSSEAU, Simon
SANT' ANNA, Guilherme
SCHWARTZMAN, Kevin

Awards and Recognition

Dr. Alexandra De Pokomandy, Cancer, received the Prix Maria Rosa Saderra AIDS Fellowship from the Royal Victoria Hospital Foundation. Dr. De Pokomandy has devoted her research to cancers related to the human papilloma virus (HPV) in people living with HIV and to the health of HIV-positive women.

Dr. Jacques Genest, Cardiovascular Diseases and Critical Care, was awarded the inaugural Margolese National Heart Disorders Prize. The UBC Faculty of Medicine prize is bestowed on researchers who have made outstanding contributions to the treatment, amelioration or cure of heart disorders.

Dr. Kathleen Glass, Medical Genetics and Genomics, was awarded a Lifetime Achievement Award from the Canadian Bioethics Society.

Dr. Qutayba Hamid, Respiratory Health and Meakins-Christie Laboratory Director, was selected as this year's Distinguished Lecturer in Respiratory Sciences. This award, chosen both by the CIHR's Institute of Circulatory and Respiratory Health (ICRH) and by the Canadian Thoracic Society (CTS), is given to an outstanding investigator who has conducted the majority of his research in Canada and who has contributed significantly to the advancement of respiratory sciences.

Dr. Nada Jabado, Medical Genetics and Genomics, is the recipient of the Canadian Cancer Society William E. Rawls Award for excellence in cancer research. This honour is awarded each year by the National Council of the Canadian Cancer Society to an outstanding young investigator in cancer control research.

She also received the 2011 Aldo Award of Excellence in Research from The Montreal Children's Hospital Foundation, presented to a researcher whose initiatives have made unique and significant contributions to paediatric care.

She was named "Researcher of the Month" by Canadians for Health Research in March 2012.

Dr. Michael S. Kramer, Health Outcomes, was elected to the Royal Society of Canada in 2011, in recognition of the important impact that his research on infant feeding and adverse pregnancy outcomes has had on clinical practice and public health policy.

Dr. Annette Majnemer, Health Outcomes, was awarded membership in the American Occupational Therapy Foundation Academy of Research, the highest scholarly category of this organization and one of the highest in the occupational therapy community.

Dr. Nancy Mayo, Health Outcomes, was awarded the 2012 Enid Graham Memorial Lecture Award.

Dr. Dorothy Moore, Infection and Immunity, was honoured with the Canadian Paediatric Society (CPS) Member Recognition Award. The CPS gives the annual award in recognition of outstanding contributions of its members as spokespeople, peer reviewers and liaisons with other organizations, and as participants on the board of directors and other committees.

Dr. Madhukar Pai, Respiratory Health, was selected for the Canadian Rising Stars in Global Health grant from Grand Challenges Canada for his proposal entitled A Low-Cost, Multiplexed, Point-of-care Test for Extra-pulmonary Tuberculosis.

Dr. Nitika Pant Pai, Infection and Immunity, was selected for the Canadian Rising Stars in Global Health grant from Grand Challenges Canada for her proposal entitled To Develop a Synergistic, Innovative, Implementation Strategy for Self-Testing for HIV in South Africa.

Dr. Louise Pilote, Health Outcomes, received the Dr. George Fraser Award for excellence in clinical research in cardiology.

Dr. Constantin Polychronakos, Endocrinology, Diabetes, Nutrition and Kidney Diseases, received an honorary doctorate in 2011 from the Medical Faculty of the Aristotelean University in Greece.

Dr. Maya Saleh, Infection and Immunity, was awarded the 2011 inaugural Maude Abbot Prize. The new Faculty of Medicine prize recognizes outstanding women faculty members who excel in education, research, or administration with a focus on those at the early stages of their careers.

Salary Awards

Fonds de recherche du Québec–Santé

Newly funded applicants, 2011-2012

Applicants who received new funding (2 to 7 years) in fiscal 2011-2012

Chercheurs nationaux

Andrea Bernasconi
Edward A. Fon

Chercheurs-boursiers – Clinique et épidémiologique

Stéphanie Chevalier
Krista Hyde
Maida Sewitch

Chercheurs-boursiers – Fondamental

Maya Saleh
Robert Sladek

Chercheurs-boursiers cliniciens – Santé et Société

Mélanie Lavoie-Tremblay
Mary Ellen MacDonald

Chercheurs-boursiers cliniciens – Clinique et épidémiologique

Alexandra de Pokomandy
Bruno Gagnon
Anne Gonzalez
Suzanne Morin
Chantal Séguin
Michele Zappitelli

Chercheurs-boursiers cliniciens – Fondamental

Gabriella Gobbi
Wassim Kassouf

Canadian Institutes of Health Research (CIHR)

Clinician-Scientist

Étienne de Villiers-Sidani

New Investigator

Maziar Divangahi

Networks of Centres of Excellence (NCE)/Allergen

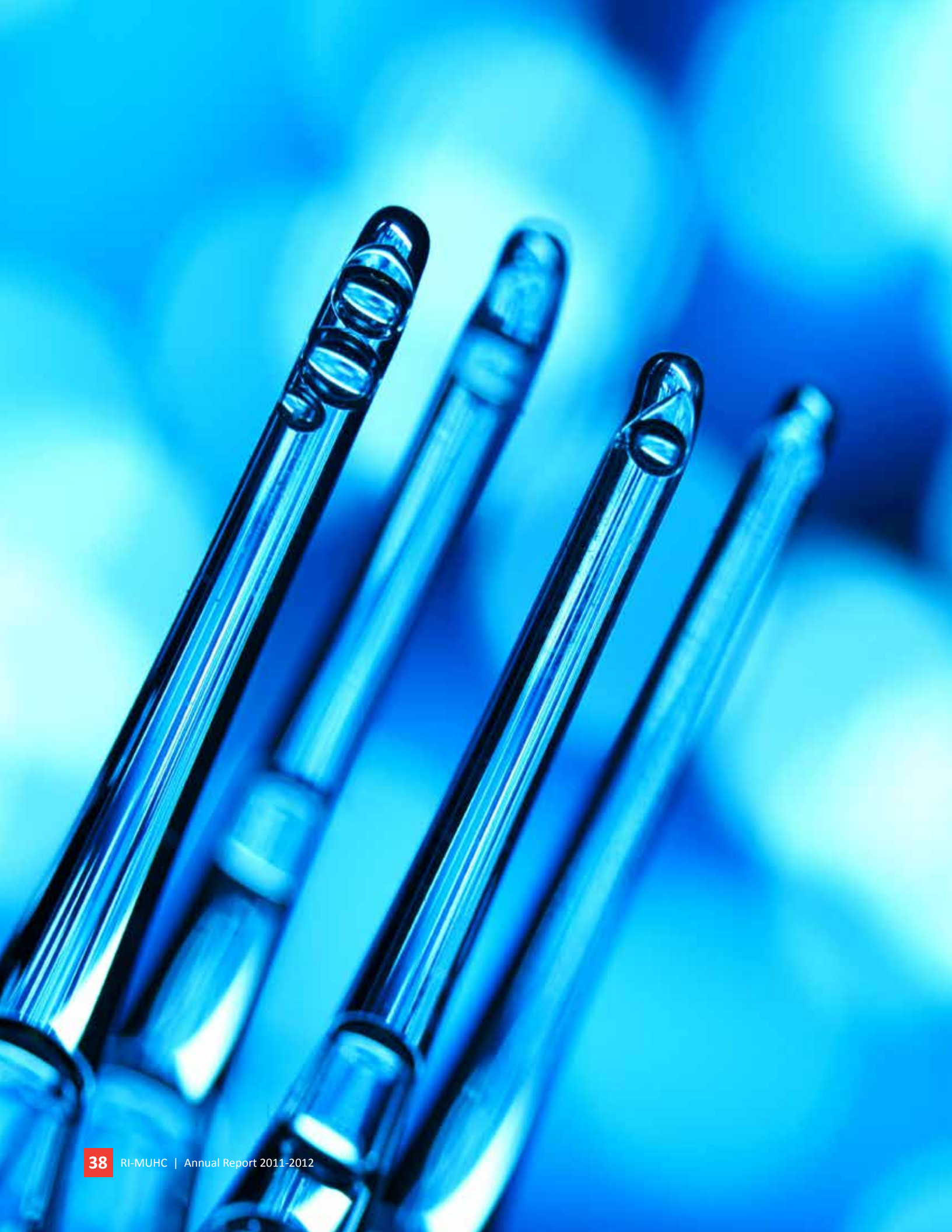
Emerging Clinician-Scientist

Dr. Moshe Ben-Shoshan

McGill University

James McGill Professor

Philip Barker



Selected Publications

2011

Rico de Souza Angela, Zago Michela, Pollock Stephen J., Sime Patricia J., Phipps Richard P., Baglole Carolyn J. **Genetic Ablation of the Aryl Hydrocarbon Receptor Causes Cigarette Smoke-induced Mitochondrial Dysfunction and Apoptosis.** J Biol Chem 286(50):43214-28, 2011.

Bernard Genevieve, Chouery Eliane, Putorti Maria Lisa, Tetreault Martine, Takanohashi Asako, Carosso Giovanni, Clement Isabelle, Boespflug-Tanguy Odile, Rodriguez Diana, Delague Valerie, Abou Ghoch Joelle, Jalkh Nadine, Dorboz Imen, Fribourg Sebastien, Teichmann Martin, Megarbane Andre, Schiffmann Raphael, Vanderver Adeline, Brais Bernard. **Mutations of POLR3A encoding a catalytic subunit of RNA polymerase Pol III cause a recessive hypomyelinating leukodystrophy.** Am J Hum Genet 89(3):415-23, 2011.

Ciura Sorana, Liedtke Wolfgang, Bourque Charles W. **Hypertonicity sensing in organum vasculosum lamina terminalis neurons: a mechanical process involving TRPV1 but not TRPV4.** J Neurosci 31(41):14669-76, 2011.

Alfares Ahmed, Nunez Laura Dempsey, Al-Thihli Khalid, Mitchell John, Melancon Serge, Anastasio Natascia, Ha Kevin. C. H., Majewski Jacek, Rosenblatt David S., Braverman Nancy. **Combined malonic and methylmalonic aciduria: exome sequencing reveals mutations in the ACSF3 gene in patients with a non-classic phenotype.** J Med Genet 48(9):602-5, 2011.

de Pokomandy Alexandra, Rouleau Danielle, Ghattas George, Trottier Helen, Vezina Sylvie, Cote Pierre, Macleod John, Allaire Guy, Hadjeres Rachid, Franco Eduardo L., Coutlee Francois. **HAART and progression to high-grade anal intraepithelial neoplasia in men who have sex with men and are infected with HIV.** Clin Infect Dis 52(9):1174-81, 2011.

Camille Nathalie, Tsuchida Ami, Fellows Lesley K. **Double dissociation of stimulus-value and action-value learning in humans with orbitofrontal or anterior cingulate cortex damage.** J Neurosci 31(42):15048-52, 2011.

Foulkes William D., Bahubeshi Amin, Hamel Nancy, Pasini Barbara, Asioli Sofia, Baynam Gareth, Choong Catherine S., Charles Adrian, Frieder Richard P., Dishop Megan K., Graf Nicole, Ekim Mesiha, Bouron-Dal Soglio Dorothee, Arseneau Jocelyne, Young Robert H., Sabbaghian Nelly, Srivastava Archana, Tischkowitz Marc D., Priest John R. **Extending the phenotypes associated with DICER1 mutations.** Hum Mutat 32(12):1381-4, 2011.

Ochoa-Sanchez R, Comai S, Lacoste B, Bambico FR, Dominguez-Lopez S, Spadoni G, Rivara S, Bedini A, Angeloni D, Fraschini F, Mor M, Tarzia G, Descarries L, Gobbi G. **Promotion of Non-Rapid Eye Movement Sleep and Activation of Reticular Thalamic Neurons by a Novel MT2 Melatonin Receptor Ligand.** J Neurosci 31(50):18439-18452, 2011.

Erman A., Veilleux A., Tchernof A., Goodyer C. G. **Human growth hormone receptor (GHR) expression in obesity: I. GHR mRNA expression in omental and subcutaneous adipose tissues of obese women.** Int J Obes (Lond) 35(12):1511-9, 2011.

Zhang Zhao, Iglesias Diana, Eliopoulos Nicoletta, El Kares Reyhan, Chu LeeLee, Romagnani Paola, Goodyer Paul. **A variant OSR1 allele which disturbs OSR1 mRNA expression in renal progenitor cells is associated with reduction of newborn kidney size and function.** Hum Mol Genet 20(21):4167-74, 2011.

Picard Martin, Ritchie Darmyn, Thomas Melissa M., Wright Kathryn J., Hepple Russell T. **Alterations in intrinsic mitochondrial function with aging are fiber type-specific and do not explain differential atrophy between muscles Aging Cell.** 10(6):1047-55, 2011.

Kouz Remi, Kouz Simon, Schampaert Erick, Rinfret Stephane, Tardif Jean-Claude, Nguyen Michel, Eisenberg Mark, Harvey Richard, Afilalo Marc, Lauzon Claude, Dery Jean-Pierre, Mansour Samer, Huynh Thao. **Effectiveness and safety of glycoprotein IIb/IIIa inhibitors in patients with myocardial infarction undergoing primary percutaneous coronary intervention: a meta-analysis of observational studies.** Int J Cardiol 153(3):249-55, 2011.

Li Jiarong, Karaplis Andrew C., Huang Dao C., Siegel Peter M., Camirand Anne, Yang Xian Fang, Muller William J., Kremer Richard. **PTHrP drives breast tumor initiation, progression, and metastasis in mice and is a potential therapy target.** J Clin Invest 121(12):4655-69, 2011.

Venugopalan Viswanath V., Casey Kevin F., O'Hara Caitlin, O'Loughlin Jennifer, Benkelfat Chawki, Fellows Lesley K., Leyton Marco. **Acute phenylalanine/tyrosine depletion reduces motivation to smoke cigarettes across stages of addiction.** Neuropsychopharmacology 36(12):2469-76, 2011.

Selected Publications

Loo Vivian G., Bourgault Anne-Marie, Poirier Louise, Lamothe Francois, Michaud Sophie, Turgeon Nathalie, Toye Baldwin, Beaudoin Axelle, Frost Eric H., Gilca Rodica, Brassard Paul, Dendukuri Nandini, Beliveau Claire, Oughton Matthew, Brukner Ivan, Dascal Andre. **Host and pathogen factors for Clostridium difficile infection and colonization.** N Engl J Med 365(18):1693-703, 2011.

Majewski Jacek, Wang Zibo, Lopez Irma, Al Humaid Sulaiman, Ren Huanan, Racine Julie, Bazinet Alex, Mitchel Grant, Braverman Nancy, Koenekoop Robert K. **A new ocular phenotype associated with an unexpected but known systemic disorder and mutation: novel use of genomic diagnostics and exome sequencing.** J Med Genet 48(9):593-6, 2011.

Afilalo Jonathan, Therrien Judith, Pilote Louise, Ionescu-Ittu Raluca, Martucci Giuseppe, Marelli Ariane J. **Geriatric congenital heart disease: burden of disease and predictors of mortality.** J Am Coll Cardiol 58(14):1509-15, 2011.

Nguyen Dao, Joshi-Datar Amruta, Lepine Francois, Bauerle Elizabeth, Olakanmi Oyebode, Beer Karlyn, McKay Geoffrey, Siehnel Richard, Schafhauser James, Wang Yun, Britigan Bradley E., Singh Pradeep K. **Active starvation responses mediate antibiotic tolerance in biofilms and nutrient-limited bacteria.** Science 334(6058):982-6, 2011.

Santschi Valerie, Chiolero Arnaud, Burnand Bernard, Colosimo April L., Paradis Gilles. **Impact of pharmacist care in the management of cardiovascular disease risk factors: a systematic review and metaanalysis of randomized trials.** Arch Intern Med 171(16):1441-53, 2011.

Bertos Nicholas R., Park Morag. **Breast cancer - one term, many entities?** J Clin Invest 121(10):3789-96, 2011.

Fulton Debra L., Denarier Eric, Friedman Hana C., Wasserman Wyeth W., Peterson Alan C. **Towards resolving the transcription factor network controlling myelin gene expression.** Nucleic Acids Res 39(18):7974-91, 2011.

Labos Christopher, Dasgupta Kaberi, Nedjar Hacene, Turecki Gustavo, Rahme Elham. **Risk of bleeding associated with combined use of selective serotonin reuptake inhibitors and antiplatelet therapy following acute myocardial infarction.** Cmaj 183(16):1835-43, 2011.

Watkins David, Schwartzentruber Jeremy A., Ganesh Jaya, Orange Jordan S., Kaplan Bernard S., Nunez Laura Dempsey, Majewski Jacek, Rosenblatt David S. **Novel inborn error of folate metabolism: identification by exome capture and sequencing of mutations in the MTHFD1 gene in a single proband.** J Med Genet 48(9):590-2, 2011.

Labbe Katherine, McIntire Christian R., Doiron Karine, Leblanc Philippe M., Saleh Maya. **Cellular Inhibitors of Apoptosis Proteins cIAP1 and cIAP2 Are Required for Efficient Caspase-1 Activation by the Inflammasome Immunity.** 35(6):897-907, 2011.

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Support from Foundations and Auxiliaries

The Auxiliary of the Montreal General Hospital

The Auxiliary of The Montreal General Hospital is a volunteer group of men and women dedicated to supporting the hospital and promoting its image in the community. The Auxiliary holds annual fundraising events and the money raised is used to purchase medical equipment, to sponsor annual research awards, and to support various projects that enhance patient care within the hospital and in some community organizations. Hospitality Corner, a branch of The Auxiliary, operates the sixth floor Gift Shop and Snack Bar with many volunteers, including catering service, Cedar Lobby Café, and Café des Pins near the Emergency Department. Tips received at all three restaurants are given to the RI-MUHC.

The Cedars Cancer Institute

For nearly half a century, the Cedars Cancer Institute (Cedars) at the MUHC has grown from a fledgling grassroots fund to an independent, mission-based cancer foundation, helping thousands of people along the way who are grappling with the effects of cancer. Cedars is dedicated to meeting the needs of all cancer patients, from young to old. The Sarah Cook Fund of the Cedars Cancer Institute is dedicated to supporting pediatric oncology while Cedars CanSupport meets the needs of adolescent and young adult (AYA) patients. From pediatric to geriatric, from initial diagnosis through survivorship or palliation, Cedars supports patients and families at every step of their cancer journey.

Through various activities in 2010-2011, the Cedars Cancer Institute was able to provide much needed funds to a variety of oncology-related initiatives at the MUHC. Thanks to events such as the 401 Bike Challenge, the Ride with Lance, the Dragonboat Race and Festival and the Raffle and Auction, Cedars was able to purchase state-of-the-art diagnostic equipment, improve facilities for the treatment and care of cancer patients, and also provide emotional, practical, psychosocial and financial support to cancer patients and their families.

Highlights of financial contributions include funding for: the acquisition of the DaVinci SI Robotic Surgical System; the MUHC Psychosocial Oncology Program; the MUHC/Cedars oncology E-Education modules; the RVH Oncology Day Centre renovations; state-of-the-art chemotherapy chairs for cancer patients; and equipment for esophageal cancer treatment at the MGH.

The Cedars' commitment to cancer research, education and awareness is fulfilled through its popular Cedars CanSupport "News You Can Use" free Public Lecture series, the Dr. Edward J. Tabah and Vivian Saykaly Visiting Professorships, and the Henry R. Shibata Cedars Fellowships in Oncology Research. In 2010-2011, Cedars awarded six Henry R. Shibata Cedars Research Fellowships, including the Kate McGarrigle Fellowship in Sarcoma Research and one Ocular Pathology Fellowship.

McGill University Health Centre (MUHC) Foundation

Throughout 2011-2012, the MUHC Foundation continued to work with MUHC partner foundations to advance the $330 million *Best Care for Life* campaign. Thanks to the generosity of our donors, the campaign has raised over $274 million to date.

The MUHC Foundation, in partnership with the Fondation du Centre hospitalier de l'Université de Montréal, is actively engaged in a joint corporate campaign directed at major corporate donors. Significant donations have been received from the J. Armand Bombardier Foundation, Rio Tinto Alcan, Domtar, Gaz Metro, and TD, to name but a few, with many more anticipated in the coming months.

The continued success of the MUHC's internal campaign, which has received gifts totaling nearly $1 million, underlines our community's support of the MUHC Redevelopment Project. In addition to its commitments at the Glen site, the MUHC Foundation has also supported Phase II of the new Mental Health Mission at the Montreal General Hospital.

Through *The Best Care for Life* Campaign, the MUHC Foundation is supporting the RI-MUHC's matching funds for the Canada Foundation for Innovation grant of $100 million to construct the new Research Institute at the Glen. With regard to current and ongoing research, The Kate McGarrigle Fund awarded four $20,000 fellowships to young researchers in oncolog-related fields. Given the generosity of funds established by the late Ernest Avrith and Mary Zilinskas Wallis, the MUHC Foundation also supports research and patient care in the areas of liver transplant and geriatrics.

Montreal Chest Institute Foundation

The Montreal Chest Institute (MCI) Foundation supports the healthcare professionals at the MCI—leaders in respiratory diseases such as asthma, chronic obstructive pulmonary disease (COPD), cystic fibrosis, pulmonary hypertension, obstructive sleep apnea, and Duchenne muscular dystrophy.

Throughout 2011-2012, The Foundation funded pioneering equipment and research initiatives to help improve the lives of patients suffering from these devastating illnesses. Three mobile endobronchial ultrasound machines (EBUS) were purchased to better stage lung cancer. State-of the-art computer software was acquired for the MCI's newly-launched smoking cessation program, and an innovative bronchial thermoplasty procedure can now be performed on patients with severe asthma.

The Montreal Children's Hospital Foundation

Generous support from donors committed to child health enabled The Montreal Children's Hospital Foundation to make disbursements of $1,935,922 in support of child health research in 2011–2012.

Among the major contributors were the J. Armand Bombardier Foundation, TD Canada Trust, the Cole Foundation, Leucan, Sears National Kids Cancer Ride (the Coast to Coast Against Cancer Foundation), the Research Institute of the MUHC's Special Fund, the Squash Crohn's Tournament, the Montreal Children's Hospital Research Endowment Fund, Judith and Charles Mappin, Louie Trakakis, and a number of loyal groups and individuals. Their gifts led to significant advances in pediatric research in such areas as oncology, inflammatory bowel disease, and the study of allergies and mental health.

The Montreal Children's Hospital Foundation Best Care for Children Campaign has raised $105 million and counting for the construction of the new Children's and its new Research Institute home on the Glen Campus.

Montreal General Hospital Foundation

The mission of the Montreal General Hospital (MGH) Foundation is to support excellence in patient care, teaching and research at the MUHC. Over the past decade, the Foundation has contributed over $120 million to the Hospital and Research Institute. Support from The MGH Foundation for research this past year remained steadfast.

In the past year, with the help of over 8,800 donors, the MGH Foundation contributed more than $11.1 million to the Hospital and Research Institute to support excellence in patient care, teaching and research. Donor support for Research Chairs also contributed to the recruitment and retention of nationally and internationally recognized researchers. During 2011-2012, more than 80 clinical researchers received support from the MGH Foundation. Nursing and nursing research benefited from the beneficiaries of generous ongoing support by the MGH Foundation. Awards and Scholarships totalled more than $2.8 million in 2011-2012.

Royal Victoria Hospital Foundation

The Royal Victoria Hospital Foundation has always recognized that excellence in patient care begins with excellence in research. The Foundation committed over $3.2 million over the past two years alone to research projects focusing on a wide cross-section of medical disciplines. Knowing that the future of medicine depends on today's research, the Foundation's continued priority is to provide leadership support to the Research Institute through the visionary generosity of its faithful contributors.

Core Facilities

supported by or affiliated* with the RI-MUHC

Biostatistics

The Biostatistics Core Facility (BCF) was created to provide statistical support to clinical and translational investigators and to enhance statistical education at the RI-MUHC. RI researchers can use the BCF for assistance in the preparation of grant proposals, in their ongoing research and in manuscript revision. The BCF can also assist investigators in planning the statistical approach to their research. Investigators and their trainees are urged to contact the BCF prior to the start of the research program. Doing so will promote optimal data collection, database design and data analysis that will ultimately result in funded grants, peer-reviewed publications and presentations at professional meetings.
Directors: Dr. Robert Platt (pediatrics), Jose Correa (adult)

Cancer Research*

The Rosalind and Morris Goodman Cancer Centre (GCC) and the McGill Life Science Complex offer the services of several in-house core facilities. These facilities provide the GCC members and the McGill research community access to advanced technical expertise with state-of-the-art equipment. Facility services are also available to the outside scientific community in order to enhance collaborative research. These facilities include the Transgenic Mouse Core Facility, Histology Core Facility, Hybridoma Core Facility, Imaging Core Facility, Mouse Phenotyping, Dissection Microscopy, Fluorescence Imaging and Flow Cytometry. A Veterinary Pathology service is also available through the Animal Resources Centre. For more information: cancercentre.mcgill.ca/research

Clinical Research Cord Blood Bank*

The MUHC Clinical Research Cord Blood Bank opened its doors in October 2007. The facility specializes in storing cord blood units too small for public banks but adequate for other clinical applications that require a low volume of stem cells. It provides isolation of hematopoietic stem cells or other components from the umbilical cord blood at a low price. In a structured program of quality and standardized manufacturing processes, it meets the standards of good laboratory practice and the requirements of Health Canada. This unique bank in Canada contains cord blood units that can be used safely in clinical research projects. A detailed research project and a consent form must accompany all applications. A research ethics committee recognized by the Unit for Ethics of the Government of Québec or by the Panel on Research Ethics of the Canadian Government must approve projects.

Endocrinology

The Molecular Imaging Core Facility (Royal Victoria Hospital) provides access to confocal microscopes with high-resolution immunofluorescent analyses on fixed samples and tissue and for live cell imaging.
Director: Dr. Stéphane A. Laporte

Genomics
Genomics at the McGill University and Génome Québec Innovation Centre, originally established at the MUHC, provides DNA sequencing, genotyping, microarray, and informatics technologies for over 700 scientists each year. The Centre provides access to the latest genomics technologies so that researchers may discover causes and therapies for common diseases and access core facilities that are essential for large research projects in human health.

Histopathology
The Histopathology Core Facility is now offering histology procedures to the community. Services include the embedding and processing of tissues, sectioning (paraffin and frozen) and various histochemical stainings.
Directors: Dr. Qutayba Hamid and Dr. Carolyn Baglole

Immunophenotyping
We are proud to announce the opening of the RI-MUHC Immunophenotyping Platform, the first of its kind at the MUHC, and cornerstone for the future Glen Yard Hospital campus. Located on the 11th floor of the Livingston wing of the Montreal General Hospital, the Platform offers a variety of multi-parametric flow cytometry and cell sorting services and training to all MUHC researchers and clinicians, as well as researchers from other affiliations.

The Platform is currently equipped with a BD FACSAria II (high-speed cell sorter), BD FACSCanto II (3 lasers), a more powerful 5-laser Fortessa (17 fluorochromes) flow cytometer, and required computer-based analysis workstations. The Platform offers flow cytometric analysis, cell sorting services and a range of analytical tools and training sessions on a fee-for-service basis. In addition, standard operating procedures will also be made available for researchers for various fundamental and clinical applications. The Platform will be undergoing substantial infrastructure growth in the near future in order to better accommodate various translational and clinical studies.
Director. Dr. Ciriaco A. Piccirillo

Infection and Immunity
The Infection and Immunity Core Facility offers a variety of services including automated sequencing, confocal imaging, SELDI-ToF mass spectroscopy, access to Levels 2 and 3 biosafety labs and animal facilities, and microarray technologies. Moreover, the Infection and Immunity Axis now benefits from a state-of-the-art, immune phenotyping platform which provides researchers and clinicians with access to training and use of multi-parametric flow cytometry and cell sorting.

Molecular Imaging
The Molecular Imaging Core offers access to confocal microscopes that allow high-resolution immunofluorescent analysis of fixed samples and tissues, as well as live cell imaging. One of the primary goals of the core is to train investigators, their students and staff to use confocal microscopy to its fullest advantage in their research programs.
Director: Dr. Stéphane Laporte

Musculoskeletal
Services for X-ray and micro CT imaging, histologic and histomorphometric analyses of mineralized tissues and for the analysis of a variety of cytokines and growth factors relevant to skeletal health and disease are available through the Centre for Bone and Periodontal Research. Consultation in small animal models, biomaterials, stem cells and devices for bone tissue engineering is available to members of the research community and private sector partners through members of the Musculoskeletal Axis.

Neuroscience*
The new Brain Imaging Centre (BIC) at the Montreal Neurological Institute (MNI) will facilitate the development of new techniques for imaging humans and animals, and for creating new ways to unite molecular biology and brain-imaging confocal microscopes. The world-class BIC facilities include some of the most advanced MR, PET and MEG imaging devices available. In addition to scanners used for human and primate studies, the BIC has high-tech scanners designed specifically for use with small animals. Image processing and other processor intensive tasks are completed using the BIC's first-class computing system. For more information: www.mni.mcgill.ca

Procure Quebec Prostate Cancer Biobank*
This Biobank is a long-term collaborative study between Procure Alliance, a not-for-profit prostate cancer organization, and Québec's four universities with teaching hospitals, namely Université de Montréal, McGill University, Université Laval and Université de Sherbrooke. The goal is to collect and store research-grade human tissues and associated data from men with prostate cancer, and those at risk, for research purposes. Materials and data are stored in the research institutes of participating university hospitals and made available to researchers. To date, the Biobank has collected samples and data from over 1,000 men with prostate cancer.

Proteomic Services
The Proteomics Core offers state-of-the-art mass spectrometry–based proteomic services to researchers at the RI-MUHC, McGill University and beyond on a fee-for-service basis.
Director: Dr. Tommy Nilsson

Respiratory Health
Core services in the following areas are available: molecular pathology, tissue culture, animal physiology, molecular cloning and imaging facility. A tissue bank, situated at the Montreal Chest Institute research site, contains tissues and samples from asthmatics and subjects with COPD or cystic fibrosis, as well as from healthy subjects.

Sheldon Biotechnology Centre*
Located in the Duff Medical Building, the Sheldon Biotechnology Centre provides life science researchers with core technologies to analyze biomolecules. Services and training include: multiplex, surface plasmon resonance; peptide synthesis; protein sequencing; and mass spectrometry. For more information: www.mcgill.ca/sheldon

Funding by Source

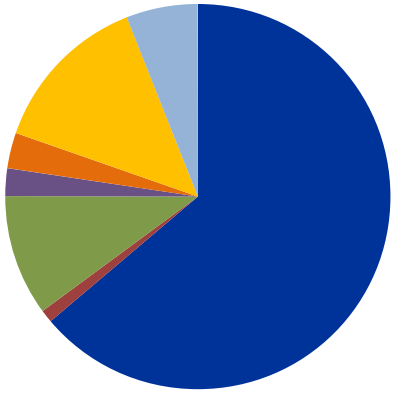
Institutional Grants	All Funding 2011-12
Canada Foundation for Innovation - Research Hospital Fund	$43,527,632
Fonds de recherche du Québec - Santé (FRQS) - CIM	$571,917
INESSS	$1,776,006
Institute of Human Development, Child and Youth Health (IHDCYH)	$762,625

Granting Agencies	All Funding 2011-12
Canadian Institutes of Health Research (CIHR)	$51,562,903
Industry	$15,746,649
Internal Funds (McGill/MUHC/The RI-MUHC)	$12,927,970
Other (various granting agencies)	$10,739,248
Canadian Foundation for Innovation (CFI)	$6,560,535
Fonds de recherche du Québec - Santé (FRQS)	$5,130,401
National Institutes of Health (NIH)	$3,391,327
Canada Research Chairs	$3,163,491
Multiple Sclerosis Society	$2,972,316
Natural Sciences and Engineering Research Council of Canada	$2,674,404
Canadian Cancer Society	$1,820,393
National Centres of Excellence	$1,413,543
Réseaux — Fonds de recherche du Québec - Santé	$1 301 285
Ministère de la Santé et des Services sociaux du Québec	$1,203,328
Génome Québec / Genome Canada	$1,109,714
Canadian International Development Agency	$981,599
Cystic Fibrosis Canada	$835,527
Public Health Agency of Canada	$773,999
Ministère du Dével. économique, de l'Innovation et de l'Exportation	$670,598
Federal Agencies	$597,551
National Cancer Institute of Canada (NCI)	$594,029
US Department of Defence	$479,253
Consortium québécois sur la découverte du médicament	$451,053
Cancer Research Society	$440,382
Susan G. Komen for the Cure Foundation	$412,275
Richard and Edith Strauss Canada Foundation	$389,305
Juvenile Diabetes Research Foundation International	$345,449
Grand Challenges Canada	$339,000
Total	**$175,665,707**

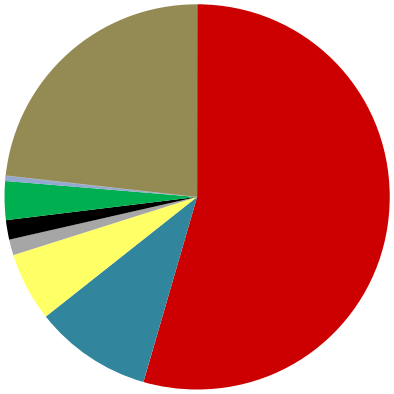
FINANCIALS – QUICK STATS

Statement of operations year ended March 31, 2012

	Operations & Grants Combined Total 2012 (Millions $)
Revenues	
Peer review grants	$112,095,742
Non peer review grants w/o overhead	$1,902,798
Non peer review grants with overhead	$17,828,927
Federal grants—indirect costs (McGill U.)	$4,080,941
FRQS support	$5,251,928
Foundation, donations	$23,940,405
Income from cash, investments and other overhead	$10,564,965
Total revenue	**$175,665,707**



Expenditures	
Salaries and fringe benefits	$98,868,844
Laboratory and office supplies	$17,872,476
Animal board and purchases, minor equipment, travel and other	$10,474,286
Amortization expense—equipment	$2,378,949
Building occupancy, renovations and support	$2,952,003
Transfer to partner institutions, net recoveries	$5,898,861
Telecommunications	$838,654
Redevelopment	$42,129,450
Total expenditures	**$181,413,523**
(Deficiency) excess of revenue over expenditures	**($5,747,816)**



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Research Institute of the McGill University Health Centre (RI-MUHC) is a world-renowned biomedical and healthcare hospital research centre. Located in Montréal, Québec, Canada, the Institute is the research arm of the McGill University Health Centre affiliated with the Faculty of Medicine at McGill University. The Institute supports over 600 researchers and close to 1,200 graduate students and students and post-doctoral fellows devoted to a broad spectrum of fundamental and clinical research. Over 1,800 clinical research studies are conducted within our hospitals each year. The RI-MUHC is supported in part by the Fonds de recherche du Québec - Santé (FRQS).

www.muhc.ca/research/

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Many members of the Research Institute's team have contributed their time and talents to the preparation of this year's annual report. Thanks to all of them. A special thank you to Alison Burch, André Simard and Judith Horrell.

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