

Annual report 2022-2023



CRCHUM
RESEARCH CENTRE

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Frédéric Leblond and Dr. Gilles Soulez
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**Dr. Simon Grandjean-Lapierre and
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(Immunopathology Research Theme)

Dr. Didier Jutras-Aswad and Nathalie Arbour
(Neuroscience Research Theme)

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Message from the Director

A Formidable Capacity for Outreach and Attraction

Living science. Always questioning. Reinventing ourselves every day. Searching even further. A motto? No, rather a reflection of the identity and uniqueness of our research centre, which inspires our community to surpass itself.

This year our achievements were considerable once again. I say this with pride. I'm sure you will share this feeling as you turn the pages of this annual report.

As you read on, you will see how our teams are succeeding in propelling the CRCHUM into the highest echelons of Canadian and global research ecosystems.

This global positioning enables us, among other things, to recruit top talent in our research themes on metabolic diseases, immunopathology, neuroscience, cancer, imaging and engineering and health innovation and evaluation.

The appeal of our teams and their research initiatives is also reflected by substantial funding from government and private funding agencies.

Such recognition clearly illustrates the expertise, competitiveness and influence of our research community.

As for making a difference in the lives of patients, we work on this every day by closely meshing our basic research teams with the CHUM clinical teams who work side by side in areas like improving detection and management of amyotrophic lateral sclerosis and colorectal cancer.

We can do so much together. We know that. So, let's follow this path even further.



Dr. Vincent Poitout
Director of Research at the CHUM
Scientific Director of the CRCHUM

Message from the CEO

Changing the World, from One Research Project to the Next

As a child, what did you dream of becoming? An artist, an athlete, a manager, a lawyer ... Or maybe you wanted to work in health research? That's the path chosen by the 2,120 people who, once again this year, have made significant scientific advancements at the CRCHUM.

The results are convincing, as this annual report demonstrates. On behalf of the patients who rely on the CRCHUM, thank you for all that has been accomplished this year!

With research project after research project, CRCHUM's teams, in close collaboration with the clinical teams, are changing the world. They are finding solutions to the health problems of today and tomorrow. They share these solutions with colleagues here and abroad, who in turn contribute to building a healthier future.

This quest for solutions is demanding. But it is necessary. As our population ages and health issues become increasingly complex, we need to step up our efforts. Reinforce investments. Continue to build partnerships.

Always push scientific curiosity, perseverance and interdisciplinary work that one step further.

We must also inspire young people to choose careers in science, so that they can take up the torch of our projects and begin new ones. Young people have the power to change the world. And we invite them to do so with us, within a prodigious infrastructure and with an exceptional team geared for success.



Frédéric Abergel
CEO of the CHUM

CRCHUM at a Glance

The Centre de recherche du Centre hospitalier de l'Université de Montréal (CRCHUM) is the Université de Montréal's major biomedical and health care research centre. It is one of the largest and most modern research facilities in Canada.

Located in the heart of Montreal, the CRCHUM is a hub of creation, knowledge generation and training. Under its roof, basic research, clinical research, and population health research coexist in harmony.

The Fonds de recherche du Québec—Santé, the provincial agency that funds research infrastructures, has confirmed the CRCHUM's position as one of Canada's leading research institutions by awarding it an "exceptional" rating as part of its 2020-2026 strategic plan.

Home to a scientific output of international renown, the CRCHUM anchors its research in its dynamic community and offers a diversified, equitable and inclusive environment for training scientists who will be making their mark on tomorrow's global research scene.

+ than **160** regular
researchers

+ than **325** investigators

Nearly **385**
graduate students

115
postdoctoral
fellows

15 Canada
Research
Chairs

+ than **260**
staff to support
research teams

Almost **875**
research staff

Nearly **1215**
peer-reviewed
publications

25 Philanthropic
Chairs

An Environment that Fosters Performance

The CRCHUM's proximity to the university hospital makes it an intellectually rich and stimulating environment, conducive to scientific collaboration and the emergence of internationally recognized achievements and discoveries.

This dynamic environment allows our research groups to flourish in emerging and translational niches, while at the same time attracting new talent.

In 2022-2023, seven regular researchers have joined the ranks of the CRCHUM: Sarah Kimmins and Dr. Robert Battat (Immunopathology); Valérie Mongrain (Neuroscience); Dr. Marie-Thérèse Lussier and Dr. Han Ting Wang (Health Innovation and Evaluation Hub); Dr. Laurent Létourneau-Guillon and Ali Ahmadi (Imaging and Engineering).

Integrated into all CHUM hospital activities, the research centre's teams draw on competitive infrastructures to improve the health of adult Quebecers.

This year, the hiring of more than 35 people, the acquisition of equipment (cytometry, cell imaging, cell physiology and molecular pathology) and the granting of a CRISPR-Cas9 license for transgenesis services to companies have enabled our platform teams to remain at the cutting edge of technology.

On a day-to-day basis, the CRCHUM can also count on the support of the Fondation du CHUM. The foundation contributes to the training of the next generation of scientists and to the transmission of the centre's unique knowledge, as well as help financing high-tech equipment.

20 core facilities
to support
research

Over
\$103 M
in research
revenues

Creating Positive Impacts for Our Patients

Contributing to the advancement of knowledge, being innovative and having the bravery to look deeper are all motivations that inspire those who work within the CRCHUM's rich and diverse community on a daily basis.

And while science progresses with small and large ideas, it is first and foremost the result of human collaborations with diverse horizons.

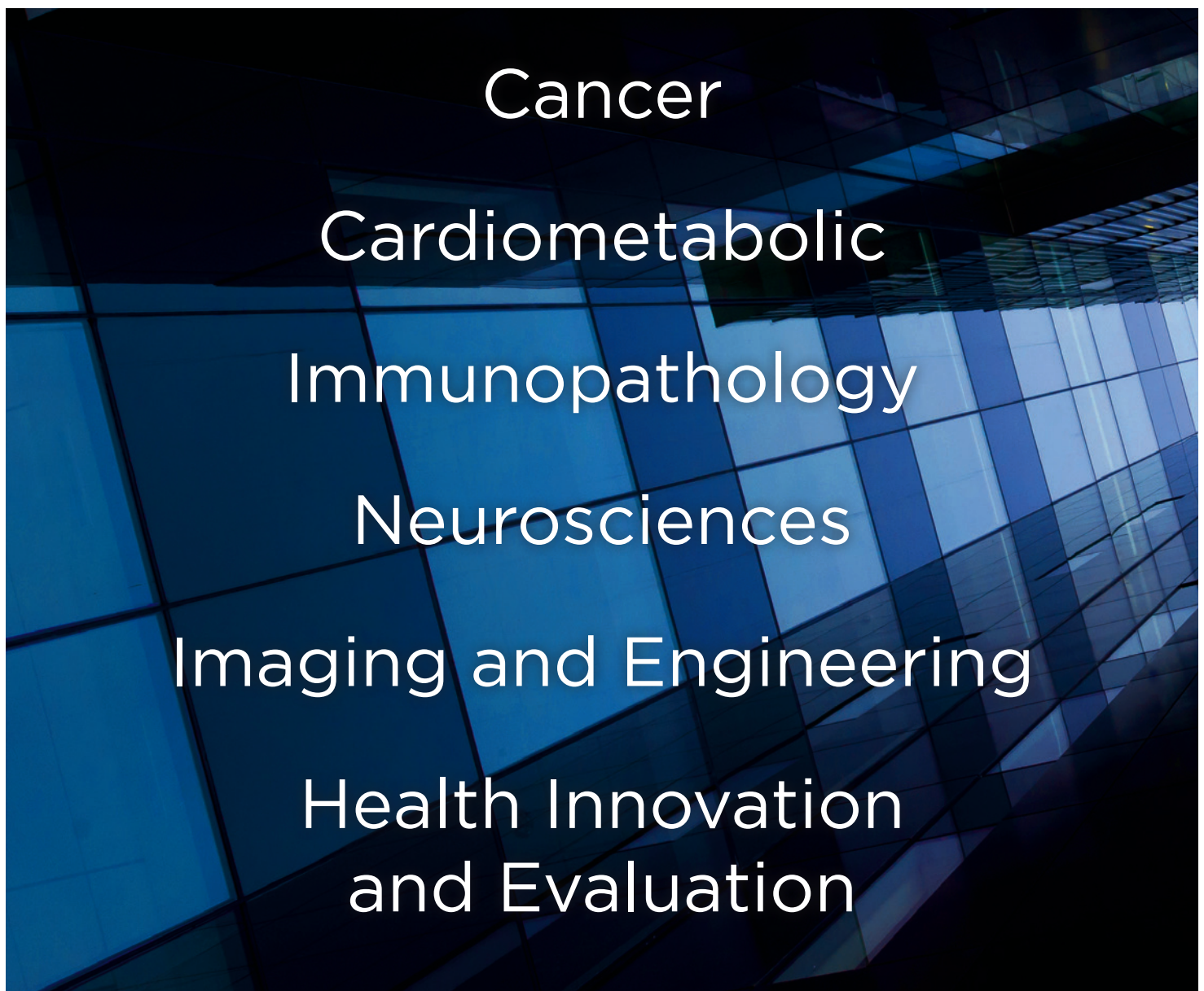
What's more, the research projects undertaken by our researchers are directly informed by public health issues or challenges faced by CHUM patients and clinical teams.

The new knowledge generated returns to patients' bedsides, and feeds into public policy.

Tomorrow's discoveries
are taking shape today
in our facilities.

Our Research: a six-faceted Face

As a world leader in the improvement of care, services and patient experience, the CRCHUM focuses on six research themes. The research conducted here offers solutions for care and intervention to the entire population.





Pioneering Clinical Research

With its Unit for Innovative Therapies, the CRCHUM is at the forefront of early clinical research. It aims to offer patients experiencing therapeutic failure the most advanced treatment options in oncology, neurology and immunopathology.

This 16-bed unit relies on a team of 35 people and over 70 investigators to conduct phase 1 and 2 clinical trials. Nearly 160 clinical trials have been conducted here since the unit opened in the fall of 2018, many of them in collaboration with pharmaceutical companies.



Research Training at the CRCHUM: a Springboard for the Future

As an internationally recognized and enriching training environment, the CRCHUM welcomes students and post-doctoral fellows every year, nearly 30% of whom come from outside the country. More than 20 languages are spoken in our facilities.

Learning at the CRCHUM means having access to cutting-edge technological platforms, taking part in stimulating transdisciplinary scientific activities, benefiting from skills development workshops and even getting involved in the life of the Centre.

For example, Kevin L'Espérance, a doctoral candidate in the Health Innovation and Evaluation Hub, has been appointed student representative on the Scientific Committee for a three-year term. He will sit alongside Sabri Ahmed Rial (Cardiometabolic Research Theme), a postdoctoral fellow representative since March 2021.

The CRCHUM Student, Postdoctoral Fellows and Resident Convention, an ideal opportunity to share knowledge within the research community through oral presentations and scientific posters, was attended by nearly 300 people.

Mobilizing Data, Enhancing Knowledge



With its Centre d'intégration et d'analyse des données médicales, also known as CITADEL, the CHUM and CRCHUM draw on unique expertise in health data science.

CITADEL's team of more than 20 highly qualified specialists (data architects, data scientists, bioinformaticians, biostatisticians, physicians) responds to around 150 requests for research projects a year and has already made it possible for more than 350 projects to improve the health of the population.

As part of a competition run by the Ministère de l'Économie, de l'Innovation et de l'Énergie, CITADEL's Scientific Director Dr. Michaël Chassé and his team have been awarded \$750,000 for their project entitled *Valorisation des données hospitalières, de première ligne et d'objets*

connectés pour l'optimisation de trajectoires patients en temps réel avec la plateforme provinciale d'analyse CODA [Leveraging hospital, front-line and connected object data to optimize patient trajectories in real time, using the CODA provincial analysis platform]. Neila Mezghani, Dr. Marie-Thérèse Lussier and Aude Motulsky are among the collaborators on this large-scale project.

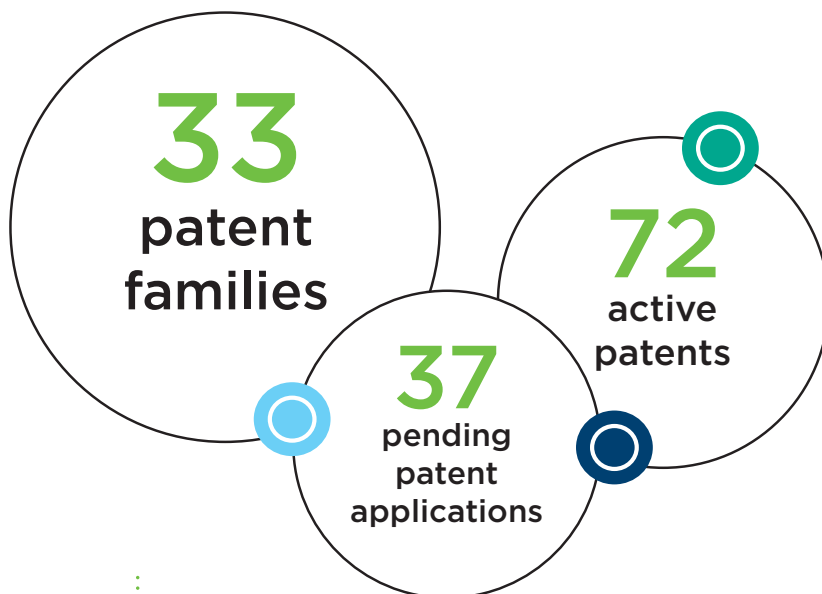
A \$250,000 grant was also awarded for a project in critical care precision medicine, as part of a competition organized by Génome Québec and IVADO.

For CRCHUM teams, valorizing knowledge is a priority. They mobilize this knowledge and identify research results that will translate into beneficial innovations for patients and the healthcare network.

16 spin-off businesses active mainly in the following fields

- **Digital health**
- **Contract research**
 - Rare diseases
 - Oncology
- **Molecule targeting**
 - Rare diseases
 - Oncology
 - Diabetes and metabolic diseases
 - Regenerative medicine and transplantation
- **Personalized medicine**
 - Type 2 diabetes
 - Oncology
- **Biomechanics**
- **Biomaterials**

+ than
90
active inventors



22

Active business agreements

Team Up with Patients

It is fortunate for the CRCHUM that Dr. Rahima Jamal left her studies in Communications behind after realizing that scientific dissemination wasn't the right fit for her. Now a hemato-oncologist, researcher and medical director at the Unit for Innovative Therapies (UIT), her long journey has led to her applying her vast knowledge and empathy to the development of innovative treatments for melanoma.

Originally from India, Dr. Jamal arrived in Quebec at the age of 12 and fell in love with Montreal. As an adult, she studied journalism, before branching out into molecular biology and then medicine. Her residency in oncology allowed her to discover her true vocation: clinical cancer studies.

Her specialization in drug development at Queen's University, Kingston, finally led her to the CHUM in November 2011. There, she convinced Carole Jabet, then CHUM's Associate Director of Research, to use the available infrastructure to create a clinical research centre specializing in phase 1 and 2 studies.



Dr. Rahima Jamal
Cancer Research Theme

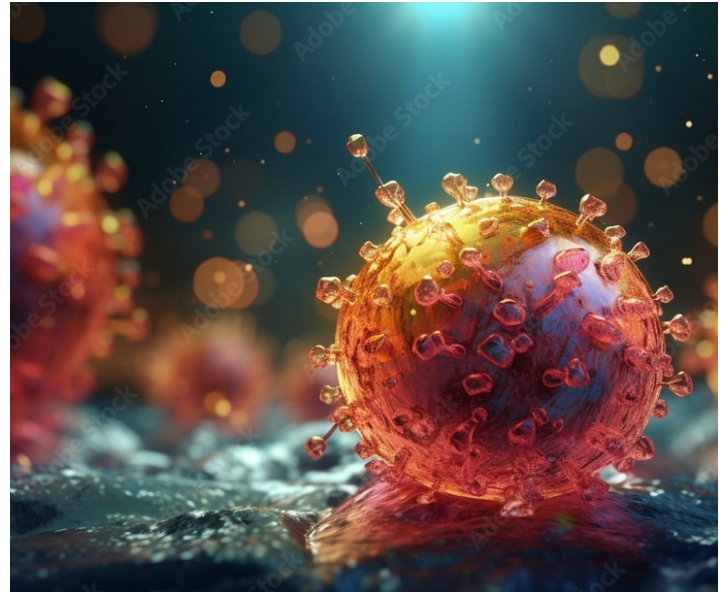
Pioneering Infrastructure

Dr. Jamal then worked to set up the UIT, where she has served as medical director since its inception in the fall of 2018. This innovative clinical platform enables researchers to carry out projects that require close monitoring of participants.

“Thanks to this platform, we can offer Quebec patients world-class treatments to which they would not otherwise have access. It’s a great asset for Quebec,” she asserts.

Together, she and her team are carrying out phase 1 and 2 clinical trials on melanoma patients who have received every standard treatment without any improvement in the prognosis of their disease.

For example, they are developing molecules that remove the brakes on T lymphocytes, an immune cell essential for tumor elimination, or oncolytic viruses that enter the tumor to cause it to disintegrate and release a molecule recognized by the immune system.



Microorganisms as Backup

In collaboration with the multidisciplinary team at the Centre du microbiote, which includes Dr. Bertrand Routy, Director of the CRCHUM’s Laboratory of Immunotherapy and Oncomicrobiome, Dr. Jamal is also conducting phase 1 and 2 studies on the benefits of fecal transplants in the treatment of melanoma and lung cancer.

An initial study carried out at UIT with twenty Stage 4 melanoma patients showed that fecal transplantation increased the efficacy of melanoma treatment by 20%—a very promising result.

This is the first study to demonstrate that the response to immunotherapy can be modified. Studies are also underway to determine the most effective strains of bacteria, the ideal quantity, combinations of strains and the possibility of recreating the microbiota *in vivo*.

“

We have made impressive advances in the last ten years, but sometimes patients don't respond to treatment. In such cases, our role is one of support and guidance. A partnership is created between doctor and patient to change the course of the disease. It's a special relationship, because the patients are just as invested as the doctors; they are often fighting for their lives, and we offer them a new chance to heal.

”

— *Dr. Rahima Jamal*

Highlights of the Year

August 2022

Gerardo Ferbeyre received a \$879,750 grant from the Canadian Institutes of Health Research for his work on the restoration of tumor suppression through senescence.

September 2022

A first in Quebec: a lung cancer patient is treated in an immunotherapy clinical trial based on tumor-infiltrating lymphocytes (TIL therapy). Led by the Unit for Innovative Therapies and Dr. Simon Turcotte, the trial involved almost 40 people from the CHUM and CRCHUM.

An international team led by CHUM researcher John Stagg is awarded a \$2.5 million TRANSCAN-3 grant to improve the treatment of triple-negative breast cancer, adding to the \$100,545 received from the FRQS in June.

The research associate Meriem Messaoudene received \$200,000 from the Seerave Foundation to continue their work on the benefits of castalagin in cancer immunotherapy.

November 2022

Dr. Bertrand Routy, a CRCHUM hemato-oncologist studying the efficacy of immunotherapy in cancer treatment, receives the Relève scientifique award from the government of Quebec.

December 2022

In a study published in *Gut*, a team made up of immunologist Manuela Santos, Dr. Carole Richard and Dr. Roy Hajjar demonstrate that modifying intestinal flora could reduce postoperative complications in colorectal cancer patients.

March 2023

In the phase 3 clinical trials of PROpel, aimed at improving the treatment of patients with castration-resistant metastatic prostate cancer, the team led by Dr. Fred Saad, researcher and head of the urology department at the CHUM, demonstrated an improvement in survival by 7.4 months.



Réjean Lapointe
Cancer Research Theme Leader

Discovering Regularity in Heterogeneity



Dr. Nadine Taleb
Cardiometabolic Research Theme

“I’m where I’ve always wanted to be!” This sentence perfectly sums up Dr. Nadine Taleb’s passion for her research on forms of diabetes with atypical phenotypes, which she conducts at the CHUM’s Centre d’expertise en diabète. This start-of-the-art resource aims to help prevent this disease and improve care for those who suffer from it.

After studying medicine, Dr. Taleb specialised in endocrinology at the American University of Beirut in her home country of Lebanon. Deeply interested in research, it was the epidemiology of diabetes that piqued her curiosity because of its complexity and heterogeneity.

“I love hormones, I’m fascinated by the fact that they travel all over the body and affect several organs,” she summarized.

Her aspirations led her and her husband to Quebec, where she met Dr. Constantin Polychronakos, a paediatric endocrinologist and researcher at the MUHC, with whom she did a fellowship leading to the discovery of a gene linked to diabetes. Realizing that she preferred clinical research, she later completed a PhD at the IRCM on the role of technology in the management of diabetes and hypoglycaemia.

Rare Shapes under the Microscope

Dr. Taleb's extensive career path led to her being appointed as a clinical researcher at the CRCHUM in May 2022. She is a member of the Diabetes Expertise Centre along with Dr. Ariane Godbout, Dr. Vincent Poitout, Thierry Alquier and Guy Rutter.

Her research focuses on the heterogeneity of diabetes, in particular the atypical forms that present characteristics that fall between those of type 1 and type 2, such as *latent autoimmune diabetes in adults* (LADA).

As its name suggests, this form of diabetes occurs in adulthood and worsens over time as the autoimmune process involved destroys the pancreatic beta cells responsible for insulin production. She estimates that LADA could account for up to 10% of all cases of diabetes.

“I like heterogeneity and rare cases, because they help us to understand other forms of diabetes,” she explains.

Her goal is to learn more about LADA in order to diagnose it more accurately, demystify its slow progression, identify the factors that trigger it and draw up an appropriate treatment plan to improve patients' quality of life.



There are currently no clear guidelines for the treatment of LADA, but immunomodulatory molecules that prevent the destruction of beta cells are proving to be a promising avenue. The clinical aspect of the research programme also includes optimizing the organization of care and the patient's trajectory.

Improving Quality of Life

Dr. Taleb is also a co-investigator in the BETTER project, which uses a registry of 3,500 people with type 1 diabetes (the first registry of its kind in Canada) to advance research into improving the quality of life and clinical practices associated with this disease.

Analysis of the data collected will also enable her to build up a cohort of LADA patients in order to gain a better understanding of the disease's onset and ultimately carry out randomised studies to assess the effectiveness of treatments.



Always keeping her patients in mind, she and a multidisciplinary team have also set up a clinic for young adults with diabetes (aged 18-25) who need support in taking over disease management from their parents.

Highlights of the Year

June 2022

Dr. André Lacroix received the Prix de l'endocrinologue émérite 2022 from the Association des médecins endocrinologues du Québec and the Prix de l'Œuvre scientifique from Médecins francophones du Canada in 2022 for his scientific contributions related to pituitary-adrenal pathologies and Cushing's syndrome.

April 2022

A study by Gareth Lim's group published in *JCI Insight* indicated that the 14-3-3 protein plays a role in regulating insulin secretion.

August 2022

The Canadian Institutes of Health Research awarded funding to Marc Prentki (\$933,300), Gareth Lim (\$1,032,750), Ciaran Murphy-Royal (\$841,500) and John Chan (\$100,000).

November 2022

A study by Dr. Vincent Poitout's group published in *JCI Insight* demonstrated the role of serotonin in the function and plasticity of pancreatic beta cells during puberty and its contribution to the development of diabetes in adults.

January 2023

As part of the CRCHUM's 2022 Awards of Excellence, Dr. André Lacroix received the Career Award, and Dr. Isabelle Bourdeau, an endocrinologist at the CHUM, won the Scientific Contribution of the Year Award.



Thierry Alquier
Cardiometabolic Research Theme Leader

Engaging Young People Through Technology



Shalini Lal
Health innovation and evaluation hub Research Theme

Creative, empathetic and passionate about healthcare, Shalini Lal has succeeded in combining her skills and interests by becoming an occupational therapist. Her practice has led to her working in mental health rehabilitation with young people. The gaps she sees in the field have prompted her to specialize in psychiatry and youth mental health through graduate and postdoctoral studies.

It was during her doctorate, when she realized the dominant role played by technology in the lives of adolescents, that she defined one of her missions: to change the lives of young people struggling with a mental health problem while making the most of technology. She studied this subject in depth as a postdoctoral fellow before embarking on her career at the CHUM.

Now the holder of the Canada Research Chair in Innovation and Technology for Youth Mental Health Services, she and her team work in the CRCHUM's Youth Mental Health and Technology Laboratory (SMJ-techno), with the goal of improving the quality of services this clientele receives.

Her research focuses on three elements, availability, access and acceptability of care, approached from an inter- and transdisciplinary perspective.

Shalini Lal emphasizes that “No one has all the solutions, and it takes the perspective of several people to establish innovative practices.”

Promising Projects

One of the projects developed in her laboratory, “Télépsy.CHUM”, seeks to determine the feasibility and acceptability of online videoconferencing technologies (React) in providing mental health services in an urban context to young people experiencing their first episode of psychosis.

Launched in 2016—long before platforms such as Zoom and Teams became part of our daily lives—the project has been a great success with patients and has helped establish telehealth as a viable option.

The YEMHR JeParle [*I Speak*] project focuses on the experience of young Canadians aged 17 to 30 regarding the referral process for access to mental health services and uses anonymous online surveys.

“We ask them, for example, if they followed the steps, if it was easy. This helps us understand young peoples’ situations and guides the innovations we implement,” explains Shalini Lal.

The SMJ-techno laboratory is also working on the Horyzons-Canada online support platform. Phase 3, which is currently under way, will see it implemented and evaluated with around 150 patients aged 18 to 50 receiving services for schizophrenia and other psychotic disorders.

When Science and Politics Go Hand in Hand

Because she believes we can do better at integrating technology into mental health care, Shalini Lal did not hesitate to renew her application to join the delegation brought together by the Canadian Science Policy Centre's annual *Science Meets Parliament* programme.

She is delighted to have been selected in the Tier II Canada Research Chairs category of the Canadian Institutes of Health Research.

Her role will be to learn how to help politicians tackle science-related issues and also to communicate her research findings more effectively to politicians and the media. We know that she will do an excellent job representing!

Highlights of the Year

May 2022

Dr. Julie Bruneau is named a Knight of the Order of Montreal, receives the AFMC-Gold Humanism Award from the Association of Faculties of Medicine of Canada and is elected to the Canadian Academy of Health Sciences for her contribution to promoting health.

June 2022

Aude Motulsky (\$255,947), Dr. Quoc Dinh Nguyen (\$148,772) and Dr. William Beaubien-Souigny (\$148,772) received funding from the Fonds de recherche du Québec—Santé.

Marie-Pierre Sylvestre and Jennifer O’Loughlin received over \$500,000 from the MSSS to study the impact of the health crisis on health promoting initiatives in primary and secondary schools

July 2022

Dr. Julie Bruneau’s team was awarded \$2.4 million by the Canadian Institutes of Health Research (CIHR) to help people with substance use disorders.

Dr. François Martin Carrier becomes Héma-Québec-Bayer Foundation Research Chair in Transfusion Medicine” at Université de Montréal.

August 2022

CIHR awarded grants to Dr. François-Martin Carrier (\$348,075) in partnership with Dr. Michael Chassé (CRCHUM) and Dean A. Ferguson (Ottawa Hospital Research Institute), to Jean-Louis Denis (\$141,013) in collaboration with Pierre-Gerlier Forest (INSPQ) and Dr. John N. Lavis (McMaster University) and to Dr. Emmanuelle Duceppe (\$100,000).

November 2022

Isabelle Doré’s team and the Fondation Virage won an award from the Programme québécois de cancérologie [Quebec Cancer Programme] for the iACTIF preadaptation programme.

January 2023

Drs. Emmanuelle Duceppe and Laura Drudi, and Dr. François-Martin Carrier and Manon Choinière took part in the pan-Canadian *Accelerating Research through Clinical Trials* consortium, funded at \$39 million by the CIHR.

March 2023

Manon Choinière received the *Distinguished Career Award* from the *Canadian Pain Society* for her pain-related research.

The Éval-IN^{CHUM} platform for healthcare start-ups and SMEs was launched and two specialists, Alexis Métral and David Nguyen-Tri, were recruited.



Lise Gauvin
Health innovation and evaluation hub
Research Theme Leader

Images Worth Their Weight in Gold



Frédéric Leblond
Imaging and Engineering Research Theme

Frédéric Leblond could have made a career out of studying string theory, a subject that fascinates him, but he instead decided to put his PhD in physics to more practical use. After working for an optical medical imaging technology company in Montreal, he landed a position as Assistant Professor of Biomedical Engineering at Dartmouth College, a prestigious American university. At Dartmouth, he had the opportunity to take a few courses in medicine. His career in medical imaging was born!

Five years later he was recruited by Polytechnique Montréal as an assistant professor, and later a professor. When Gilles Soulez, Director of the Department of Radiology, Radiation Oncology and Nuclear Medicine, told him about the CRCHUM's Imaging and Engineering Theme, he was delighted to join the team.

“

I chose the CHUM because its orientations were in line with my fields of research, i.e. biophotonics

”

— *Frédéric Leblond*

Now Director of Polytechnique Montréal's Optical Radiology Laboratory (LRO), which is celebrating its 10th anniversary this year, he works with a multidisciplinary team on developing techniques to improve the accuracy of medical diagnoses. He also designs medical instruments that use light to characterize biological tissues, thereby increasing the precision and safety of surgical interventions.

Optics against Cancer

Among other things, this fruitful collaboration between the LRO and the CRCHUM has led to the development of a technique to improve the diagnosis of the most aggressive forms of prostate cancer and help identify at risk patients.

To achieve this, Mr. Leblond first determined the molecular signature of tissue samples from 483 patients with the disease, using Raman microspectroscopy imaging, a technique based on the vibration of molecules following exposure to light to characterize their chemical bonds. The data collected can then be used to train an algorithm and classify the signatures in order to recognize the cancer.

This breakthrough earned him, along with pathologist Dominique Trudel, the Prix d'excellence 2020— Scientific Contribution of the Year.

Frédéric Leblond's team has also developed an optical biopsy needle that detects tumor margins (i.e. the limits of cancerous tissue) with great precision during brain cancer surgery, once again employing Raman spectroscopy. This makes it possible to avoid sample collection during the procedure, the removal of healthy tissue and, above all, the need to return to surgery.

The instrument, which is undergoing FDA approval, could also prove useful for breast and prostate cancer. Its launch by Reveal Surgical, a company co-founded by Frédéric Leblond, should be possible within the next few years.

Unlocking the Mysteries of Saliva

Another project, initiated during the pandemic, combines Raman spectroscopy with biofluid diagnostics to produce a rapid, reliable COVID-19 test using saliva.

Mr. Leblond is currently adapting this principle to the detection of cancer or the probable recurrence of prostate cancer by urine.

“Biofluids contain molecules that we don't always detect. The spectrophotometer analyzes them and gives us with their profile in the form of a series of peaks associated with proteins, amino acids, etc.. The molecular profile is interpreted according to its signature, which tells us whether we are in the presence of a virus, or the likelihood of cancer. We're not aiming for a universal cancer screening test, but rather a cancer probability indicator,” adds Frédéric Leblond.

Highlights of the Year

June 2022

François Yu (\$303,086), Dr. Laurent Létourneau-Guillon (\$162,868), and Dr. Daniel von Renteln (\$73,007) received grants from the Fonds de recherche du Québec—Santé for their research work.

February 2023

Thanks to a collaboration with the Jewish General Hospital and StarPax Medical, a grant of nearly \$400,000 was awarded by the MEIE (*Programme de soutien aux organismes de recherche et d'innovation*, a support program for research and innovation organizations) to improve research MRI equipment, particularly for tumor characterization.

March 2023

A research core facility in quantitative ultrasonography is created to offer researchers services for quantitative analysis of ultrasound images in various fields (abdominal, musculoskeletal, vascular, pulmonary).

This now independent core facility, headed by Guy Cloutier, can offer its services to other research centers.



Dr. Gilles Soulez
Imaging and Engineering Research Theme Leader

Preventing Tuberculosis Outbreaks



Dr. Simon Grandjean Lapierre
Immunopathology Research Theme

What do drones, computers and bacteriological sequencing have in common? They're all tools used by Dr. Simon Grandjean Lapierre as part of his research into tuberculosis. In collaboration with the Institut Pasteur de Madagascar and the McGill International TB Centre, he and his team are fighting the disease on several fronts.

After training in medicine at the Université de Sherbrooke, Simon Grandjean Lapierre obtained a certificate in International Health, followed by a fellowship in Internal Medicine, Infectious Disease, and Medical Microbiology at the Université de Montréal.

He soon developed a keen interest in *Mycobacterium tuberculosis*, the bacterium that causes tuberculosis, not only because it is an internationally neglected disease, but also because its study combines field work and laboratory research. This led him to complete Master's degree in Genomics applied to mycobacteria at Aix-Marseille University.



Discovering a Vocation

A grant from Stony Brook University to carry out postdoctoral studies on tuberculosis prompted him to fly to Madagascar. This grant enabled him to fulfil a life-long dream: to discover sub-Saharan Africa.

For a year and a half, he studied the impact of new technologies and sequencing on the control of tuberculosis.

“My medical training was very oriented towards clinical and laboratory diagnosis,” he says. “It wasn’t clear at first that I wanted to make a career out of it. It was when I went to Madagascar and saw that new technologies and translational research were being used that I thought of becoming a clinician-researcher.”

A Fruitful Collaboration Overseas

Simon Grandjean Lapierre then became an affiliated researcher at the Institut Pasteur in Madagascar and a clinician-researcher at the CRCHUM, before continuing his translational research work focused on tuberculosis control in Canada and abroad, particularly in Madagascar.

His work covers two main areas: the first involves next-generation sequencing of the bacterial genome to determine the infectivity of different strains of tuberculosis, and the second involves transmitting this information to the relevant health bodies so that they can contain and prevent the disease.

This progress made in epidemiological surveillance will certainly serve as a basis for controlling future pandemics.

Democratizing Healthcare

The second area targets new health technologies, in particular the transport of medical supplies by drone to treat tuberculosis in rural areas more quickly.

In collaboration with the team at the McGill International TB Centre, he is also developing a precise triage tool based on digital recordings of coughs to detect the presence of tuberculosis. Using a database, programmers use acoustic recognition to classify sounds according to the likelihood of infection. This is known as *acoustic epidemiology*.

“The aim is not to replace laboratory tests, but to design a tool that comes close to the United Nations targets for screening and that can be integrated early in the diagnostic cascade to direct patients to the right resources. I hope that when I retire this technique will be available to all patients in Quebec and Canada,” concludes Dr. Grandjean Lapierre.

And his work looks promising: earlier this year, he won the *Early Career Investigator Award from the International Union Against Tuberculosis and Lung Disease*.

Highlights of the Year

May 2022

Researcher Andrés Finzi won an Étoile Effervescence award for his work on targeted immunotherapy for the treatment of COVID-19.

August 2022

Dr. Cécile Tremblay was elected to the Canadian Academy of Health Sciences for her contribution to promoting health.

CRCHUM immunopathology researchers Sabrina Hoa (\$346,640), Marie-Josée Hébert and Héloïse Cardinal (\$734,400 for the duo) were awarded grants as part of the Canadian Institutes of Health Research (CIHR) Spring 2022 project competition.

September 2022

Dr. Marie-Josée Hébert, Vice-Rectorate of Research, Discovery, Creation and Innovation at the Université de Montréal and researcher at the CRCHUM, was appointed to head the CIHR's Governing Council.

January 2023

The CRCHUM presented a 2022 Award of Excellence to Dr. Madeleine Durand, a researcher in the Health Innovation and Evaluation hub since 2013, for her key role in the CIHR Canadian HIV Trials Network.

February 2023

L'équipe Nicolas Chomont's team published a study in the journal *Immunity* that showed that HIV can form reservoirs from the very first days of infection to hide in, thus evading tritherapies.

March 2023

Nathalie Grandvaux's team, in collaboration with the Université Laval, succeeded in isolating viral infectious particles from hospital aerosols; their results are published in *Clinical Microbiology and Infection*.

The Fonds de recherche du Québec—Santé awarded a \$600,000 grant to Sophie Petropoulos' team for their work on the impact of chronic cannabidiol consumption on fertility, gametes and offspring, carried out in collaboration with her CRCHUM colleague Sarah Kimmins.



Emmanuelle Brochiero
Immunopathology Research Theme Leader



Dr. Didier Jutras-Aswad
Neuroscience Research Theme

Mental Health and Addiction: a Light at the End of the Tunnel

Having known people with mental health problems, Dr. Didier Jutras-Aswad decided to devote his life to research in this field. During his postdoctoral training at the CHUM, he was exposed to an urban clientele that sometimes struggled with drug addiction in addition to mental health disorders. This ignited a spark in him. His goal: to prevent cases such as these from falling through the cracks.

He therefore completed a fellowship at New York's Mount Sinai School of Medicine with Yasmin Hurd, whose research focuses on psychotoxicomania, the neurobiological features underlying addiction disorders and related psychiatric illnesses.

“

There's a lot of catching up to do to support people struggling with addiction because the healthcare network has not been conceived with their reality in mind, and there are many disorders for which there is no treatment

”

— *Dr. Didier Jutras-Aswad*

Today, as head of the Department of Psychiatry and a psychiatrist in the Addiction Psychiatry Service at the CHUM, he and his research team are fully committed to improving treatment options for people with mental health disorders who also struggle with addiction. His goal is to raise public awareness of the need to use cannabis responsibly.

Towards Better Management

In the summer of 2022, his research group received nearly \$5 million in funding over four years from the Canadian Institutes of Health Research to conduct clinical trials on the management of methamphetamine use disorder.

“Methamphetamine is a highly addictive substance, associated with numerous mental health problems. Its effects are devastating, both for the individual and those around them,” notes Dr. Jutras-Aswad.

This pan-Canadian study of over 400 patients will evaluate the addition of a high-dose stimulant and contingency approach, alone and in combination, to the psychosocial interventions usually offered for methamphetamine use disorder.

Dr. Jutras-Aswad and his team are also interested in cannabis and are studying it on two levels. On the one hand, they are developing a mobile application that can be used to carry out interventions to combat cannabis dependence.

On the other, they are investigating the psychological and biological impact of cannabis on humans in the laboratory,

for example, by carrying out standardized cognitive tests and taking blood samples from supervised users. The data collected will help public health authorities in their decision and policy making.

Greater Flexibility in Providing Care

The summer of 2022 was a particularly prolific one for Dr. Jutras-Aswad and his team. During this time, they also unveiled the first results of OPTIMA, a pan-Canadian study comparing the efficacy of two models of care to treat opioid dependence, which leads to intoxication or death.

A cohort of 270 volunteers in seven Canadian hospitals was divided into two groups and monitored over 24 weeks. The first group received methadone, which is taken under pharmacy supervision, and the second took the drug Suboxone, which can be done at home.

“We have shown that the more flexible approach is just as effective and requires fewer resources. It seems safe and useful. It provides another option for people with opioid use disorders,” says Dr. Jutras-Aswad.

Highlights of the Year

June 2022

Éric Samarut (\$277,526), Dr. Catherine Laroche (\$153,982) and Dr. Didier Jutras-Aswad (\$126,557) obtained funding for their research work from the Fonds de recherche du Québec—Santé (FRQS).

August 2022

Dr. Dang Khoa Nguyen received a \$661,725 grant from the Canadian Institutes of Health Research for his work on using close infrared spectroscopy to monitor the brains of critically ill patients. The grant will be shared with his collaborators: Dr. Michael Chassé (CRCHUM), Anne Gallagher (Centre de recherche du CHU Sainte-Justine) and Frédéric Lesage (Polytechnique Montréal).

October 2022

Martine Tétreault won the Dr. David Green—Emerging Clinician/Researcher Award from Muscular Dystrophy Canada.

The Brain Canada Foundation recognized Élie Bou Assi as one of Canada's 20 Future Leaders in Brain Research, an honour enhanced by a \$100,000 grant.

December 2022

Alex Parker's team identified a promising probiotic in a study of amyotrophic lateral sclerosis published in *Communications Biology*.

February 2023

The teams of Dr. Dang Khoa Nguyen and Dr. Didier Jutras-Aswad each received \$600,000 from the FRQS for their cannabis-related research projects.

March 2023

Christine Vande Velde and Alex Parker received Discovery Grants (\$125,000 and \$300,000 respectively) from the ALS Society of Canada and the Brain Canada Foundation to advance research on amyotrophic lateral sclerosis.

Adriana Di Polo was awarded a US \$200,000 grant from BrightFocus Foundation—National Glaucoma Research and a US \$250,000 grant from the Alcon Research Institute in an international competition on neurodegeneration.



Nathalie Arbour
Neuroscience Research Theme Leader



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