CRCHUM
CENTRE DE RECHERCHE
Centre hospitalier
de l'Université de Montréal

CORE
FACILITIES

EXPAND YOUR LAB, DISCOVER MORE

Core
Facilities
EXPERTISE
DEDICATION
INFRASTRUCTURE
CRCHUM
CENTRE DE RECHERCHE

CORE FACILITIES

AT THE FOREFRONT

At Université de Montréal's affiliated hospital research centre, the CRCHUM, nearly 560 internationally renowned researchers are committed to transforming scientific advances into advances in human health.

To meet this challenge, their research teams can count on fast, convenient and affordable access to the best scientific core facilities.

There are 19 independently managed core facilities dedicated exclusively to research, seven of which are unique in Quebec (ATiM; CITADEL; Experimental imaging; Microfluidics; Partnership with the patients and the public in research; Small animal phenotyping and imaging).

The core facilities offer cutting-edge equipment, but above all the expertise and skills of the 150 people working within the core facilities, which makes it possible to support the scientific community on the path of discovery and to accelerate the research projects of internal or external teams, whether they be academic or industrial.

To date, the CRCHUM is the only research centre to offer, through their core facilities:

- An equipment replacement program, which ensures it provides the most advanced and high-performance technologies;
- A research and development program, which allows it to adapt to the emergence of new technologies and to improve the services offered or the quality of an existing service.

This brochure outlines the key facts about the core facilities that enable scientists, here and elsewhere, to achieve research excellence.

To discuss the options available to you, do not hesitate to contact our specialists.

CONTENTS

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CRCHUM
CENTRE DE RECHERCHE
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Core Facilities
EXPERTISE DEDICATION INFRASTRUCTURE
CRCHUM CENTRE DE RECHERCHE

FACTS AND FIGURES

19
specialized core facilities to accelerate your research

>150
Recognized experts and specialists to guide you and provide you with exemplary research services

2013
Serving research teams for over 10 years

WHY USE OUR PLATFORMS

EXPERTISE
Qualified and recognized managers and specialists

SPEED
Direct access to staff and cutting-edge instruments

PRICE
Subsidized and highly competitive CRCHUM rates

SUPPORT
Support for developing projects, writing your publications and funding applications

ANALYSIS & INTERPRETATION
Direct access to analysis software and help with interpreting your results

QUALITY
Maintenance and calibration of guaranteed, documented equipment

TRAINING
Basic or advanced training on techniques and instruments for your team members

MAJOR PARTNER RESEARCH ORGANIZATIONS

CHUM Centre hospitalier de l'Université de Montr
CHUM FONDATION
CRCHUM CENTRE DE RECHERCHE Centre hospitalier de l'Université de Montréal
INNOVATION.CA CANADA FOUNDATION FOR INNOVATION | FONDATION CANADIENNE POUR L'INNOVATION
INSTITUT TRANSMEDTECH MONTRÉAL LIVING LAB
Université de Montréal
FRQ
INSTITUT DU CANCER DE MONTRÉAL
Économie, Innovation et Énergie Québec
Centre de Recherche du Diabète de Montréal
Montreal Diabetes Research Center
Comprendre pour prévenir et guérir
Understand to Prevent and Cure
Santé et Services sociaux Québec

ANIMAL FACILITY

Dr. Maryse Boulay
Head of Scientific and Veterinary Services

Hélène Richard
Core Facility Manager

The animal facility is a leader in its field and provides technical support to research teams with cutting-edge equipment, and offers an educational component. Its modern facilities promote excellence in animal care.

Through their support, the 50 staff members offer their professional expertise on animal welfare, maintaining the integrity of the animal model and the acuity of experimental results.

The CRCHUM animal facility can house several animal species in specialized facilities for large species, rodents and fish.

The CRCHUM has earned a Certificate of Good Animal Practice from the Canadian Council on Animal Care (CCAC).

animalerie.cr.chum@ssss.gouv.qc.ca

SERVICES

Experienced technical and veterinary staff can advise and guide you in planning and developing your research project.

- **RODENT COLONY MAINTENANCE**
  Access to several specialists in livestock management and colony development. A turnkey service in partnership with the CRCHUM genetic engineering and animal modelling core facility. It supports you anywhere from creating your mouse to expanding your colony.
- **AXENIC AND GNOTOBIOTES MOUSE SECTOR**
  Hosting of axenic and gnotobiotic mice (germ-free) for short or long term studies.
- **ZEBRAFISH**
  Sector reserved for holding zebrafish.
- **LARGE ANIMALS**
  Expertise in anaesthesia and postoperative care for large species.
- Other services available on our website

RESEARCH IN ACTION

The creation of an Axenic sector within our platform took over a year to develop and validate the aseptic procedures required to house axenic mice free of any saprophytic or pathogenic germs. This sector opened in 2021 and has made it possible to carry out 12 gnotobiotic studies in the field of cancer for researchers at the CRCHUM and in private industry.

HIGHLIGHTS

The animal facility features:

1,195 square metres of accommodation

50+ people working in animal health and welfare

63 research teams and
7 private companies supported

85+ people trained each year

a **"large animal"** sector equipped for low greenhouse gas emission anaesthetics

a core facility committed to **reducing** its greenhouse gas **emissions**

Learn more about our services and rates

ATiM

Nicolas Luc
Core Facility Manager

ATiM (*Advanced Tissue Management*) is a biobank information management system (BIMS) developed by the Canadian Tissue Repository Network (CTRNet).

Provided under a GNU General Public License (v3) to biobanks, ATiM is a powerful solution that makes it possible to annotate samples with clinical and sampling data, while ensuring complete traceability of the samples, from signing off on consent to their use in research projects.

The ATiM software was developed by CTRNet to promote the quality of Canadian institutional biobanks and has been designed to ensure biobanks have a high level of security and data quality while allowing for simple and low-cost customization and deployment.

support.atim.chum@ssss.gouv.qc.ca

SERVICES

NEEDS ANALYSIS
- Identification of user needs
- Analysis of gaps between the main software and user needs
- Design of a customized ATiM version

CUSTOMIZATION
- Development of a customized ATiM version (back-end and front-end)

DATA MIGRATION
- Development of data migration scripts to import existing data into the customized ATiM database

INSTALLATION, MAINTENANCE AND UPDATES
- Configuration and updating of the web server (Apache or IIS) and of the PHP and MySql tools
- Installation and updating of the customized ATiM version on the dedicated server

USER TRAINING AND SUPPORT

RESEARCH IN ACTION

With the adoption of the ATiM software in 2008, the 14 biobanks of the CRCHUM cancer research theme acquired a powerful tool allowing them to reference and annotate more than one million biological samples from 190,000 consenting participants. This ensures complete and detailed traceability of the management of all these samples collected since 1990. Using an ATiM API that allows the automated annotation of samples from the CHUM tumour registry completes the architecture in place. It contributes significantly to the enhancement of the entire inventory of the research theme's biobanks.

HIGHLIGHTS

With the support of CTRNet's leading biobanks, our team offers institutions, networks and laboratories wanting to acquire ATiM software all its expertise acquired over the last 18 years in developing and installing custom ATiM instances.

Today, ATiM is, in summary:

20 institutions

68 instances deployed

77 biobanks and consortia supported

4 international facilities

over **3 million** biological samples referenced in ATiM instances

Learn more about our services and rates

BIOBANKS

Cécilia Vargas
Core Facility Manager

The core facility manages the CRCHUM's institutional biobank, which houses several repositories of human biological material for research (biobanks).

It also offers support for the creation of new biobanks and the use of samples from existing repositories.

Our mission is to ensure the traceability and safety of samples, in addition to guiding the community through regulatory requirements (financing approval, consent forms, etc.).

biobanque.cr.chum@ssss.gouv.qc.ca

SERVICES

ASSISTANCE SETTING UP AND MONITORING BIOBANKS

- Support getting new biobanks started (financing approval, repository storage information and consent form, required documents for scientific and ethical review)
- Support writing requests for samples via the material request form (FDM/MRF)
- Introduction to the CTRNet Biobank Certification Program
- Support for the use of space in the biobanks

SAMPLE MANAGEMENT

- Receipt and storage of samples and enter data in ATiM
- Return of samples to participating research repositories
- Handling of access requests for samples for use in research projects
- Rental of space (tablets or shelves) for blocks or slides
- Installation of research teams' -20 °C and -80 °C freezers
- Rental of pathology boxes for paraffin blocks (FFPE) or slides
- Transfer of samples in case of daytime emergencies
- Technical support and equipment maintenance

HIGHLIGHTS

With rigorous management and traceability standards for the samples in its repositories, our core facility boasts:

> 90 research projects supported per year

> 20 biobanks managed for **5** participating research themes

nearly **410,000** FFPE blocks stored

17 freezers, **2** of which are emergency freezers, all kept at -80 °C

RESEARCH IN ACTION

Thanks to optimal data management of the biological specimens in our care, our institution's biobank can efficiently distribute the samples it makes accessible to research teams. In partnership with the CHUM's Department of Pathology, we guarantee rapid access to hospital samples, which allows for the acceleration of scientific advancements and the discovery of potential treatments for illnesses.

Learn more about our services and rates

BIOSAFETY LEVEL 3 (BSL3)

Olfa Debbeche
Core Facility Manager

The biosafety level 3 (BSL3) core facility is one of the best scientific facilities of its kind in Canada. It provides a safe environment in which to handle and store infections biological agents belonging to risk group 3.

Accredited by the Public Health Agency of Canada and fully meeting the Canadian Biosafety Standards, our facility guarantees user safety and prevents the spread of pathogens to adjacent laboratories and the environment.

Our institutional permit for infectious biological agents belonging to risk group 3 was amended in 2020 to include the SARS-CoV-2 virus and bacteria of the *Mycobacterium tuberculosis* complex.

nc3.cr.chum@ssss.gouv.qc.ca

SERVICES

TRAINING ON THE SAFE USE OF FACILITIES AND EQUIPMENT

- Only duly trained individuals are allowed access to the core facility.

LUMINEX IMMUNOASSAY SERVICE

- Plate readings (assay determined by the user)
- Plate assays and readings

BIOSAFETY LEVEL 3 CELL SORTING

- Access to a FACSAria Fusion cytofluorometer built into a biological safety cabinet

For cell sorting at BSL3, please refer to the cytometry core facility section.

RESEARCH IN ACTION

With the onset of the pandemic in 2020, our core facility played a major role: it enabled research teams to address public health challenges by rapidly expanding the range of Risk Group 3 pathogens studied in our facility. Our team adapted our protocols and procedures to allow our users to safely handle and work with SARS-CoV-2.

HIGHLIGHTS

Our core facility gives users access to: eight culture rooms, one cytometry room, one cryopreservation room and one Luminex instrument (MagPix).

Since its beginning in 2014, our team has:

- supported **10** research **teams**
- trained and supervised over **150** users
- received over **50 mentions** in scientific publications

Learn more about our services and rates

CELLULAR IMAGING

Aurélie Cleret-Buhot
Core Facility Manager

The cellular imaging core facility offers a full range of equipment and services, from experimental design to image analysis, allowing you to carry out your optical microscopy experiments.

Our staff puts a great deal of effort into maintaining equipment performance, supporting users and developing new cellular imaging techniques.

imagerie.cellulaire.cr.chum@ssss.gouv.qc.ca

SERVICES

TRAINING

- Lecture-based microscopy training
- Practical training in basic and advanced techniques (two-photon intravital imaging, TIRF, Airyscan)

IMAGE ACQUISITION

- Turnkey projects for users
- Development of techniques on some of our instruments

DIGITAL IMAGE ANALYSIS

- Use of open-source image analysis software: FIJI, ImageJ, Cell Profiler, etc.
- Use of dedicated software: Imaris Full Spectrum, latest version with deconvolution module
- Consultations for assistance with image analysis

CONSULTATION AND TECHNICAL ASSISTANCE

- Sample preparation
- Selection of the appropriate imaging technique
- Support with publication

RESEARCH IN ACTION

Our core facility has specialized in renal intravital imaging in collaboration with Dr. Marie-Josée Hébert's laboratory, with whom we have published the results of our research in the *American Journal of Physiology — Renal Physiology* in 2021. Our core facility has also developed a live-cell imaging technique in collaboration with researcher Nathalie Arbour's laboratory to image the interactions between astrocytic and lymphocytic cells from patients diagnosed with multiple sclerosis. This approach was published in the journal *Frontiers in Immunology* in 2021.

HIGHLIGHTS

Since its beginning in 2014, our core facility has:

- contributed to more than **45 publications**
- trained more than **450 users**
- made available **9** acquisition and analysis **systems**
- implemented **4 quality** controls on its systems

Learn more about our services and rates

CELLULAR PHYSIOLOGY

Erik Joly
Core Facility Manager

Since 2013, the cellular physiology core facility has stood out for its expertise in biomarker analysis and quantitative imagery adapted to preclinical and clinical research.

Our team offers specialized services in the quantification of analytes—hormones, cytokines, etc.—thanks to ELISA, TR-FRET and AlphaLISA technologies. Our miniaturized protocols are developed for small sample volumes that are often necessary in preclinical studies.

Our services include high-definition morphometric imaging, allowing for detailed analysis of the size, distribution and frequency of cells, as well as quantifying cell masses by immunohistochemistry and high-definition scanning. We also offer phenotypic analysis of cells to study key processes such as apoptosis, proliferation and cell migration.

physio.cell.cr.chum@ssss.gouv.qc.ca

SERVICES

IMMUNOASSAYS AND BIOCHEMICAL ASSAYS FOR HUMAN AND RODENT SAMPLES

- Quantification of hormones, cytokines and peptides present in blood (plasma and serum) and in incubation
- Biochemical assays for human and rodent samples (miniaturized assays)
- Assay validation, including commercial ELISA assays

MORPHOMETRY AND QUANTIFICATION OF CELL MASSES

- Morphometry service (sizes, distribution) for adipocytes, islets of Langerhans and other cell types
- Quantification of the relative cell masses present in a tissue or cell proliferation (Ki-67) by immunohistochemistry

PHENOTYPIC ANALYSES

- Use of a high-throughput cell imager, the Revvity Operetta, for phenotypic analyses in microplates (96 or 384 wells)

RESEARCH IN ACTION

Our expertise in imaging and analysis has allowed us to help François Yu, CRCHUM researcher, and his team to generate images of spheroid cells and to quantify them with fluorescence. This collaborative project offers unique insights for life sciences research. For example, it allows for the rapid analysis of proliferation or apoptosis in cells, even inside the spheroids' 3D structures.

HIGHLIGHTS

Core facility personnel participate in the innovation of testing through miniaturization for small sample volumes in preclinical studies and offer advanced phenotypic cell analysis (e.g. use of spheroids). They also develop custom assays in partnership with the industry (e.g. glucagon assay), thus meeting the specific needs of research teams.

Since 2013, our staff has:

carried out **over 90,000** tests

developed **nearly 25** new assays

contributed to **more than 25** publications

Learn more about our services and rates

CITADEL

Romain Berti
Core Facility Manager

The Centre for the Integration and Analysis of Medical Data (CITADEL) core facility is a centre of expertise in data science with a data lake infrastructure that stores the CHUM's clinical, administrative and research data.

The CITADEL's mission is to promote data science innovation in the field of health.

CITADEL is made up of a team of highly qualified specialists (data architects, data scientists, bioinformaticians, biostatisticians, doctors) to support you in your research projects, and adheres to ISO 9001 certified procedures.

citadel.cr.chum@ssss.gouv.qc.ca

SERVICES

BIOSTATISTICS AND METHODOLOGY

- Methodological consultation
- Help writing articles and data management plans
- Sample size calculation and feasibility study
- Data analysis and interpretation of results
- Omic and bioinformatics analysis

DATA ACCESS AND ANALYSIS

- Management and storage of research data
- Extraction and preparation of data from the data lake
- Feasibility study in preparation for a research project
- Integration of variables and various data sources
- Algorithmic validation and advanced data analysis

GENOMICS

- Methodological consultation (e.g. choice of technologies, experimental design)
- Developing bioinformatics analysis pipelines
- Genomic/epigenetic data analyses and interpretation of results

ANALYTICS

- Predictive analytics
- Artificial intelligence
- Data visualization
- Heterogeneous data integration

HIGHLIGHTS

Since our launch in 2018, our team of 23 people:

supported **135 people** as part of the research component and has more than **1,400** REDCap **users**

relies on more than **30 integrated information systems**

has access to a data lake containing nearly **4 million** patient records and more than **20.5 million** episodes of care

RESEARCH IN ACTION

Thanks to CITADEL's support, Dr. Simon Turcotte's team was able to analyze complete tumour genomes and establish lists of priority neoantigens for patients as part of an adult cancer immunotherapy project. Our statistical specialists were involved in the design and specification of a study led by Dr. Daniel Von Renteln and helped secure major CIHR funding for his project to reduce neoplasia recurrences after endoscopic resection of large colorectal polyps. As part of the GEVIS study, our data specialists helped Dr. Nguyen Quoc Dinh characterize geriatric vital signs and develop new indicators optimized to predict clinical outcomes in the elderly.

Learn more about our services and rates

CYTOMETRY

Gaël Dulude
Core Facility Manager

The cytometry core facility offers a full range of cell analysis and sorting services.

The simultaneous analysis of functional parameters and surface markers makes it possible to identify and study cellular immunity and viral pathogenesis mechanisms.

High-throughput sorting is used to purify subsets of primary cells (peripheral blood or other tissues) or cell lines.

cytometrie.cr.chum@ssss.gouv.qc.ca

SERVICES

SELF-SERVE MULTIPARAMETER CELL ANALYSIS

- Use of standard or spectral cytometers equipped with four to six lasers
- Data analysis stations

MULTIPARAMETER CELL ANALYSIS WITH SERVICE

- Personalized multiparameter cell analysis or cell sorting services in standard, spectral and biosafety level 3 (BSL3) mode
- Cell sorting from one to four populations simultaneously
- Possibility of sorting on different supports, including plates of different formats, microscopy slides and 0.5 to 15 ml tubes

TRAINING

- Basics of cytometry, theory and practice. This training is required to use a self-service cytometer

RESEARCH IN ACTION

The recent acquisition of a Cytek Aurora spectral analyzer and Aurora CS high-throughput spectral cell sorter has enabled our core facility to be one of the first in Canada to offer research teams a high-throughput cell analysis and sorting service in spectral mode.

They can thus carry out analyses using more than 40 colours/parameters and retrieve these same individual cells in order to carry out their analyses.

HIGHLIGHTS

Our core facility is one of the few in Canada to offer a high-throughput cell sorting service in a biosafety level 3 (BSL3) zone, which allows us to sort the cells of people infected with HIV, HCV and SARS-CoV-2.

The cytometry platform in a nutshell:

33 research teams and **245** supported users

Over 140 cell sortings per year

334 hours of analysis on average performed on the analyzers per month

Learn more about our services and rates

CLINICAL IMMUNOMONITORING

Paméla Thébault
Core Facility Manager

The clinical immunomonitoring core facility's mission is to monitor and analyze the immune responses of patients in order to optimize personalized treatments. The facility makes it possible to better understand immune mechanisms, improve disease management and anticipate therapeutic effects.

The core facility therefore provides a wide range of services to answer the various immunology questions in preclinical and clinical studies.

pamela.thebault.chum@ssss.gouv.qc.ca

SERVICES

CONSULTATION AND SUPPORT FOR TEST DESIGN, REAGENT SELECTION AND DATA ANALYSIS

BIOLOGICAL SPECIMEN STORAGE

- Standardized processing and isolation of peripheral blood lymphocytes, serum or plasma from tubes or bags, from healthy donors or patients recruited in clinical trials

PHENOTYPIC AND FUNCTIONAL IMMUNOMONITORING

- Multicolour flow cytometric analysis (up to 27 colours)
- Intracellular cytokine staining to evaluate the immunophenotype and the activation status of different cell populations at the periphery or in tissues
- Use of phenotypic and immune activation markers to assess immune responses

MULTIPLEX CYTOKINE ANALYSIS

FUNCTIONAL ANALYSIS OF T CELLS BY ELISPOT

MULTIPLEX IMMUNOFLUORESCENCE TISSUE STAINING

SINGLE CELL RNA SEQUENCING

HIGHLIGHTS

Since its beginning in 2019, our core facility has:

- completed more than **30 projects**
- received **9 mentions** in scientific publications
- participated in **5** phase 1 and 2 **studies** funded by pharmaceutical companies

Our core facility also carried out pro bono analyses to try to quickly find a treatment for three patients who developed serious side effects following immunotherapy.

RESEARCH IN ACTION

The core facility participated in a phase 2 trial for patients with stage 3 or 4 unresectable melanoma. CRCHUM researcher Dr. Rahima Jamal's team showed that a pre-existing systemic inflammatory condition is strongly associated with poor patient outcomes, revealing potentially predictive circulating biomarkers. In another phase 1 multicentre clinical trial with 20 patients with advanced melanoma, the core facility collaborated with Dr. Bertrand Routy's team to show that fecal microbiota transplantation from healthy donors was safe and non-toxic as a first-line treatment. This research was published in the journal *Nature Medicine.*

Learn more about our services and rates

EXPERIMENTAL IMAGING

Jennifer Satterthwaite
Core Facility Manager

Combining biomedical engineering and medical expertise, the experimental imaging core facility offers high-tech medical imaging equipment and services dedicated entirely to animal and human research.

We also use ultra-modern clinical research facilities and those of the animal core facility (surgery and shelter for animals).

imagerie.experimentale.cr.chum@ssss.gouv.qc.ca

SERVICES

MAGNETIC RESONANCE IMAGING (MRI)

- 3 Tesla system with 70 cm open bore design (the largest on the market)
- MRI elastography (Resoundant device)
- Automatic injector for examinations with contrast injection
- MRI sequence development and optimization services

ANGIOGRAPHY

- X-Ray
- Fluoroscopy
- Angiography (cerebral, abdominal and peripheral)
- Subtraction imaging
- C-arm CT
- Image-guided intervention in animals

MAXILLOFACIAL IMAGING (CONE-BEAM CT)

- Bone structure and erosion
- Oral and maxillofacial
- ORL problems
- Cranial traumatism

FIBROSCAN

- Hepatic fibrosis/steatosis measurement through liver stiffness/elasticity assessment

QUANTITATIVE ULTRASOUND IMAGING

- Terason portable device: long-duration radio frequency ultrasounds
- Verasonics system: ultrasound imaging research and development
- Ultrasound image segmentation
- Elastography
- Tissue imaging by homodyned-K (HKD), Nakagami or ultrasound textural analysis
- Ultrasound backscatter and attenuation imaging

HIGHLIGHTS

Our team has access to:

a hybrid room, **the only one of its kind in Quebec,** which includes both angiography and magnetic resonance imaging (MRI), with a mobile table allowing patients to move from one room to the next

—

multi-purpose imaging rooms for animals and humans

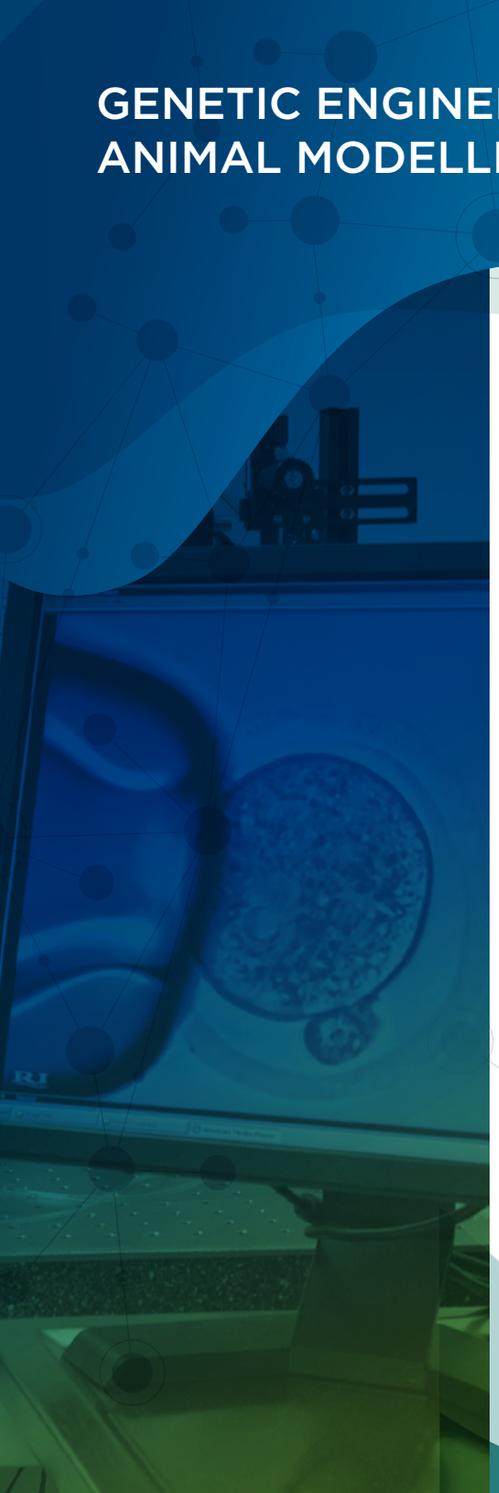
Our MRI machine comes equipped with a variety of antennas for brain, abdominal, musculoskeletal, vascular and cardiac imaging.

RESEARCH IN ACTION

The hybrid room, combining angiography and MRI, played a key role in a ground-breaking project focusing on in vivo, real-time navigation of magnetic beads guided by the MRI magnetic field. The 3D visualization capabilities of the Artis Q system's Cone-Beam CT enabled us to carry out a detailed analysis of the vascularization of the animal being studied. This approach could facilitate the treatment of liver tumours using magnetic microrobots guided in an MRI scanner. This research was published in the journal *Science Robotics.*

Learn more about our services and rates

GENETIC ENGINEERING AND ANIMAL MODELLING



Jean-François Schmouth
Core Facility Manager

The generation and use of reliable and adequate animal models are essential tools in biomedical research.

The genetic engineering and animal modelling core facility offers its academic and industrial partners several animal modelling services based in part on CRISPR-Cas9 technology, for which the facility acquired a licence to use from the Broad Institute in 2017 and from ERS Genomics in 2023.

genie.genetique.cr.chum@ssss.gouv.qc.ca

SERVICES

- **CRISPR-CAS9 AND MICROINJECTION SERVICES**
  Generation of new rodent models by CRISPR-Cas9, classical transgenesis (random transgene insertion)
- **CRISPR-CAS9 IN CELLS**
  Modifying immortalized cell lines
- **GENOTYPING SERVICES**
  Maintaining a colony or generating new rodent models
- **STRAIN CRYOPRESERVATION (RODENTS AND ZEBRAFISH)**
  Embryo production and cryopreservation, sperm cryopreservation
- **STRAIN REVIVAL**
  Embryo transfer procedure
- **REDERIVATION SERVICE**
  Embryo production, collection and transfer

RESEARCH IN ACTION

Using CRISPR-Cas9 technology, our core facility has developed an approach that enables the generation of various conditional KO models targeting complex loci. This approach was published in the journal *BMC Biology* in 2022. One of these generated models has also made it possible to develop a new antibody that recognizes the CLCF1 protein involved in the immune system function. This research was published in the journal *Scientific Reports* in 2024.

HIGHLIGHTS

Our core facility specializes in generating new rodent models with approaches in classical transgenesis, rederivation, cryopreservation, colony management and genotyping. We also use new technologies such as CRISPR-Cas9.

Since 2017, we have developed in-depth expertise through the generation of **36 new animal models**, including

- **12** classical KO models (mice and rats)
- **10** specific point mutations
- **11** conditional KOs (insertion of loxP sites—mice)

We have also completed **three immortalized cell projects.**

Learn more about our services and rates

METABOLOMICS

Julien Lamontagne
Core Facility Manager

Metabolomics is the study of all the small molecules of a cell, tissue, fluid or organism.

The metabolomics core facility specializes in the analysis of key metabolites (quantitative or semi-quantitative assays) for metabolic diseases.

Throughout the years, we have developed our expertise in the analysis of small quantities of material and in the study of the microbiome's metabolism.

metabolomique.cr.chum@ssss.gouv.qc.ca

SERVICES

METABOLITE ASSAYS

- Short-chain fatty acids (10 metabolites)
- Bile acids (13 metabolites)
- Central carbon metabolism (35 metabolites)
- Amino acids (23 metabolites)
- Neurotransmitters (10 metabolites)

DEVELOPMENT OF CUSTOMIZED METHODS

- For example, sphingosine-1-phosphate in islets of Langerhans; kainic acid in zebrafish embryos; dNTPs in sorted T-cells (FACS)

INSTRUMENT USE

- Self-service use of an HPLC system equipped with an absorbance detector (UV/Vis), a fluorescence detector and a fraction collector
- Self-service use of specialized sample preparation equipment

RESEARCH IN ACTION

In 2023 during a study on the role of the enzyme glycerol 3-phosphate phosphatase in healthy aging, we developed a method to extract metabolites from small quantities of *C. elegans* worms. This research was published in the journal *Nature Communications.* The diversity of the methods developed by our team allows us to rapidly respond to new needs, whether they be extracting metabolites from new matrices or quantifying new analytes.

HIGHLIGHTS

Since 2011, our team has developed **over fifteen targeted methods** for quantifying water-soluble and lipid metabolites.

Experience with numerous **experimental models**, including *Caenorhabditis elegans* and *Danio rerio*

Assays possible starting from 10 mg of tissue, 10 µL of plasma or 5 mg of stool

Citations in over **25 publications**

Learn more about our services and rates

MICROFLUIDICS

Benjamin Péant
Core Facility Co-Manager

Amélie St-Georges-Robillard
Core Facility Co-Manager

The microfluidics core facility specializes in the generation and culture of 3D cell models in microfluidic devices for ex vivo testing.

Microfluidic devices, also called lab-on-a-chip, offer excellent spatial-temporal control over biological samples and their microenvironments. For example, in tumorous explant cultures, they enable the ex vivo preservation of the viability and original tissue architecture for 15 days.

In oncology, microfluidics can be used to study the effects of chemotherapy and radiation therapy treatments on solid cancer and biopsy samples.

microfluidique.cr.chum@ssss.gouv.qc.ca

SERVICES

ENGINEERING

- Custom design of microfluidic devices for 3D culture: spheroids, organoids, and explants such as microdissected tissues (MDTs), islets of Langerhans
- 3D printing and CNC micromachining
- Fabrication of polydimethylsiloxane (PDMS) microfluidic devices

BIOLOGICAL

- Tissue chopping
- Generation, culture, and treatment of 3D cell models
- Precision paraffin embedding

TRAINING

- Fabrication of PDMS devices
- Generation and culture of spheroids/organoids in devices
- Culture and treatment of explants in devices
- Microdissection and loading of MDTs into devices
- Paraffin embedding of samples in devices

RESEARCH IN ACTION

Through the conception, design, and production of a new device for a research team, our core facility has been able to culture 3D explants of human and mouse adipose tissue. Originally, these tissues could not have been cultured in our standard devices. By also adapting the loading and culture techniques, we were able to pursue working with these complex tissues rich in immune cells.

HIGHLIGHTS

In 2023, over **42,500** microdissected tissues (MDTs) were generated to load onto over **1,000** chips.

Since its creation, the core facility staff have:

supported experiments conducted by over **60** students, postdoctoral fellows and researchers

collaborated with **23 research teams**

trained **65 specialists** from Canada, the United States and Europe

Learn more about our services and rates

MOLECULAR PATHOLOGY

Véronique Barrès
Core Facility Co-Manager

Liliane Meunier
Core Facility Co-Manager

The molecular pathology core facility offers services to support research teams in the histological and pathological aspects of their projects.

In addition to proficiency in standard histological analyses, our staff members have many years of experience in every step of the construction and analysis of tissue microarrays (TMA).

pathologie.moleculaire.cr.chum@ssss.gouv.qc.ca

SERVICES

Our highly qualified staff members and our core facility's specialized equipment allow us to offer services that meet the scientific community's various histological and molecular biology needs.

- SECTIONING AND STAINING (H&E)
- AUTOMATIZED IMMUNOHISTOCHEMISTRY AND IMMUNOFLUORESCENCE/STAINING OF SLIDES ON THE COMET
- MICROSCOPY AND SCANNING OF SLIDES IN BRIGHT FIELD AND FLUORESCENCE
- AUTOMATED IMAGE ANALYSIS USING VISIOPHARM'S VIS SOFTWARE
- DNA AND RNA EXTRACTION, ASSAY AND QUALITY CONTROL
- PARAFFIN EMBEDDING OF TISSUES AND CREATION OF BLOCKS OF CELL PELLETS
- TISSUE MICROARRAY (TMA) CONSTRUCTION
- HISTOLOGY CONSULTING
- INVESTIGATIVE HISTOPATHOLOGY

HIGHLIGHTS

Since 2013, our staff has:

digitized more than **10,000 slides** each year

supported over **40 user groups** monthly

offered over **15 services** to the scientific community

developed new services to keep up with new technologies

RESEARCH IN ACTION

The golden cohort of the Terry Fox Research Institute's Marathon of Hope is set to become a complete resource for clinical and genomic data from 15,000 Canadian patients diagnosed with cancer. Through this project, we receive tissues from various CRCHUM biobanks, which are then sectioned, stained, scanned on slides and revised by our research pathologist. DNA and RNA are then extracted from tissues that meet the criteria and controlled for quality. Since the project began in 2022, this sequence of experiments has allowed over 600 patients to be treated (1,800 samples from 11 biobanks).

Learn more about our services and rates

PARTNERSHIP WITH THE PATIENTS AND THE PUBLIC (PPP) IN RESEARCH

Geneviève David
Core Facility Manager

Christian Ruchon
Services Manager

The public patient partnership in research core facility supports teams in their projects in partnership with patients, their caregivers and the public.

Our team is always working toward innovation and has developed tools over the years to facilitate the projects in which these different partners can directly collaborate with each other.

Patients, caregivers and members of the public can actively participate in the governance, the determination of research priorities, the development of research questions and even the conduct certain aspects of the research. They can also popularize the results and communicate them to a variety of audiences.

plateformeppp.chum@ssss.gouv.qc.ca

SERVICES

STRATEGIC CONSULTING AND PERSONALIZED SUPPORT

- Strategic consulting for preparing grant applications involving patient partners
- Support in budget planning
- Guidance and support of research teams when implementing patient partnership

TRAINING

- Module 101: The Basic Concepts of Patient Partnership
- Module 201: Patient Partnership in Research
- Recruitment: Theory and Practices Informing the Skills of a Patient Partner
- Module 301: Practical Reflection Workshop

RECRUITMENT

- Support for the recruitment of patient partners in research

SUPPORT AND EVALUATION

- Support for evaluating the patient partnership

RESEARCH IN ACTION

In the context of a digital tool development project for conducting virtual clinical trials, a consulting group of citizen and patient partners was created to evaluate acceptability and accessibility. Through their experiences in care and research, this committee identified potential advantages and challenges, then put together a list of recommendations. The resulting optimization of procedures and approaches led to a patient partnership program finally seeing the light of day in their research institution.

HIGHLIGHTS

Relaying on the Montreal Model, our core facility contributes to the success of the CRCHUM and of partnerships at the provincial, national and international levels.

Our team:

helps around **65 research teams** each year

received **over 400** requests for services from more than **10 countries** in the last **4** years

participated in **more than 30** fields of research, care, management and health education, and most frequently in oncology, frontline care and mental health.

Learn more about our services and rates

PHARMACOKINETICS

Fleur Gaudette
Core Facility Manager

The pharmacokinetics core facility offers a wide range of services and a unique expertise in mass spectrometric quantification of xenobiotics and in the determination of drug metabolism.

Our cutting-edge instruments meet the diverse needs of drug discovery and development, life sciences, and both preclinical and clinical research.

pharmacocinetique.cr.chum@ssss.gouv.qc.ca

SERVICES

Our LC-MS instruments (liquid chromatography coupled with mass spectrometry) enable the quantitative analysis of drugs and metabolites in biological fluids and tissues, achieving attogram sensitivity while requiring only a minimal amount of sample.

DEVELOPMENT OF BIOANALYTICAL METHODS

- Small molecules (molecular weights below 1,500 daltons)
- Large molecules (peptides and proteins)

IN VITRO/IN VIVO METABOLISM

- In vitro metabolic stability assessment: S9 fraction, microsomes, hepatocytes
- Identification, characterization and quantification of in vivo metabolites

METHOD VALIDATION

- Partial or full validation of analytical methods based on the highest quality standards in the industry (ICH, FDA).

SAMPLE ANALYSIS

- Quantitative analysis of small molecules, peptides and proteins
- Analysis of xenobiotics and metabolites in support of PK/PD studies
- Analysis of preclinical and clinical samples

HIGHLIGHTS

Our team is made up of bioanalysis specialists with over 35 years' combined experience in mass spectrometry and drug analysis in biological matrices

Since its beginning in 2014, our core facility has:

- completed **90 projects**
- developed and validated **over 100 methods**
- extracted and analyzed over **47,000** samples
- contributed to more than **54 publications**

RESEARCH IN ACTION

The pharmacokinetics core facility has developed and validated a sensitive and robust LC-MS/MS method for the simultaneous determination of delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD) with their respective hydroxylated and carboxylated metabolites in human plasma. To date, we have analyzed over 2,500 samples. Quantified otherwise, we have performed 40 analytical sequences, 1,275 hours of instrumentation and 30,000 chromatographic peaks.

Learn more about our services and rates

RADIOCHEMISTRY AND CYCLOTRON

Vijay Gaja
Core Facility Manager

Our team specializes in producing radioactive isotopes and incorporating them into molecules to create radiotracers used in positron emission tomography (PET) medical imaging for diagnostic and monitoring diseases over time.

Our work significantly enhances the detection of diseases, treatment monitoring, and our understanding of the progression of conditions such as cancer, diabetes, neurodegenerative and cardiovascular diseases.

All clinical radiotracer production is conducted in a Good Manufacturing Practice (cGMP) environment. We use automated modules within shielded cells to safely handle radioactivity while protecting personnel from exposure. The facility currently features two laminar flow dispensing hot cells equipped with remote manipulators.

radiochimie.cyclotron.cr.chum@ssss.gouv.qc.ca

SERVICES

PRODUCTION OF RADIOTRACERS FOR CLINICAL STUDIES AND PRECLINICAL IMAGING

DEVELOPMENT OF NEW AND ESTABLISHED RADIOTRACERS

- Work done in collaboration with faculty researchers, graduate trainees and postdoctoral fellows.

QUALITY CONTROL TESTING

- Quantification of residual organic solvents using gas chromatography (GC)
- Evaluation of chemical purity of samples through liquid chromatography (HPLC)
- Endotoxin detection
- Filter integrity testing

TRAINING

- Radiation safety
- Working in controlled GMP environments (clean rooms) and utilizing aseptic techniques
- Quality control (release testing) for radiopharmaceuticals prepared for clinical use
- Developing and validating new analytical methods
- Developing, implementing, and managing standard operating procedures (SOPs)
- Aseptic handling of radiopharmaceutical
- Preparing dossiers for Clinical Trial Applications (CTA) for new radiopharmaceuticals

HIGHLIGHTS

Our core facility supports the clinical production of radiotracers, the development of novel and established tracers and their translation into clinical applications.

We routinely produce tracers in compliance with Good Manufacturing Practice standards: DCFPyl, Fluorocholine, Fluoropyridine-losartan, FTPP, FTHA, Ammonia, N-methyl-hydroxyfasudil.

—

Our facility features an IBA 18/9 MeV cyclotron, a clean room (GMP laboratory), a storage room, a research laboratory, a quality control lab, and a shipping room.

RESEARCH IN ACTION

Our team regularly produces radiotracers for clinical research studies and supply them to the CHUM, as well as other hospitals in Quebec. We are currently developing Ga-68 labelled molecules for PET imaging studies. Additionally, a new 7T PET/MRI system will be integrated into our platform, which will enhance preclinical studies and facilitate the clinical translation of new radiotracers.

Learn more about our services and rates

SMALL ANIMAL PHENOTYPING AND IMAGING

Khalil Bouyakdan
Core Facility Manager

The small animal phenotyping and imaging core facility offers a range of services unique in Canada for the study of carbohydrate and energy metabolism in rodents.

We perform routine tolerance tests (glucose, lipids, pyruvate, insulin) and indirect calorimetry in metabolic cages, as well as several imaging and telemetry services in rodents (temperature, blood pressure).

The core facility also has exceptional expertise in performing hyperglycemic and hyperinsulinemic clamps, which are more informative than tolerance tests.

phenotypage.cr.chum@ssss.gouv.qc.ca

SERVICES

ISOLATION OF PANCREATIC ISLETS

SURGICAL SERVICES

IN VIVO GLUCOSE HOMEOSTASIS

- Glucose tolerance test
- Insulin tolerance test
- Insulin secretion in hyperglycemic clamp
- Insulin sensitivity in euglycemic hyperinsulinemic clamp

IN VIVO ENERGY METABOLISM

- Metabolic cages
- Blood biochemistry
- Experimental models

TELEMETRY

IMAGING

- Fluorescence in vivo
- MicroCT
- Body composition

RESEARCH IN ACTION

Our core facility employs best practices and gold-standard methods for animal phenotyping. In diabetes research, the quality of our expertise and support for scientific teams is reflected in the guidelines for metabolic phenotyping in mice published in 2022 in the journal *Diabetologia* by CRCHUM researchers Thierry Alquier and Dr. Vincent Poitout.

HIGHLIGHTS

Our team is made up of phenotyping specialists with over 25 years' combined experience in surgery and imaging.

Since 2009, our core facility has:

offered over **20 services** to the scientific community

supported more than **30 teams**

contributed to more than **70 publications**

Learn more about our services and rates

UNIT FOR INNOVATIVE THERAPIES

Xavier Levac
Core Facility Manager

The Unit for Innovative Therapies (UIT) is a clinical core facility that allows research teams to conduct projects requiring monitoring of participants ranging from a few hours to several days.

It is a secure facility for the administration of cellular, genetic and biological therapies.

Its goal: to offer patients in therapeutic failure the most advanced treatment options in oncology, neurology, immunopathology and cardiometabolic, including therapies that are being administered to humans for the first time.

parc.chum@ssss.gouv.qc.ca

SERVICES

PHASE 1 CLINICAL TRIALS: TURNKEY SERVICE

- Complete management of clinical and administrative aspects of phase 1 clinical trials, from startup to closure.

PHASE 2 AND 3 CLINICAL TRIALS

- Project management services (non-exhaustive list): confidentiality agreement and feasibility process; selection visit; evaluation of institutional suitability; drafting and/or revising consent forms; negotiating budgets; sponsor visit; clinical data management
- When the project is initiated by a CHUM researcher, the following services are also offered: project startup and management; monitoring; clinical services and laboratory services

CONTINUING EDUCATION

- Basic Life Support (BLS)
- Advanced Cardiac Life Support (ACLS)

RESEARCH IN ACTION

In August 2022, a lung cancer patient was treated in a clinical trial of immunotherapy based on tumour infiltrating lymphocytes (TIL therapy).

The CHUM is the **1st hospital centre in Quebec** to have administered a patient's own tumour infiltrating lymphocyte T cells or "TILs" as part of a lung cancer clinical trial.

HIGHLIGHTS

Since June 2019, the UIT has been on the front lines of early clinical research and has followed the standards of a world-class clinical research centre.

Our **16-bed** secure unit is staffed by a team of **40 people** and is a major player in therapeutic innovation.

Since 2019, our core facility:

can rely on **57** investigators to conduct phase 1 and 2 clinical studies

hosted more than **110 clinical studies**, of which about ¾ were in collaboration with pharmaceutical companies

Learn more about our services and rates