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# ***METRO MONTREAL : EXCELLENCE IN MEDICAL TECHNOLOGIES RESEARCH***

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# MEDICAL TECHNOLOGY INDUSTRY

## THE SCOPE OF THE INDUSTRY AND AREAS OF EXCELLENCE

Medical technologies represent a booming industry in the province of Quebec with more than 600 companies and 15,000 jobs. More than 75% of this industry is concentrated in the Montreal Metropolitan area.

Of those 600 companies, more than 50% are highly innovative corporations.

All research and development activities are segmented in **five areas** of excellence:

- Assistive Devices
- Information Technology
- Imaging
- Biomaterials
- Diagnostic and Therapeutic Devices

In a **broad spectrum of applications** including: radiology, cardiology, orthopaedics, oncology, obstetrics, clinical decision assistance, dentistry and remote surgery.

## CONVERGING OPPORTUNITIES

Metro Montreal's medical technology industry is enjoying an unprecedented momentum, thanks to a converging set of opportunities.

- Leading edge infrastructures: Building of two world-class teaching hospitals (MUHC and CHUM), involving a \$2.6 billion investment budget and modernization of an important children dedicated hospital (St. Justine Hospital).
- Strong public commitment: Proven governmental commitment through significant and growing investments in research and development.
- Health care system: Publicly funded health system with buying power and high quality standardized care.
- Foreign venture investment: An increasing number of foreign venture capital for the Quebec Life Sciences industry.
- A growing cluster: dynamic with foreign companies and university spin-offs.
- An expanding pool of highly qualified workforce: fuelled by a network of prestigious universities and life sciences companies.

## DID YOU KNOW?

The pacemaker was developed in Canada!

*During the 1940's Dr. Jack Hopps developed the first cardiac pacemaker, a live-saving device that has been used widely ever since. The pacemaker not only starts a stopped heart, it also regulates the heart, by supplying a gentle electric stimulus to the organ muscle.*

## AIMS

Strategy and leadership

The Association of Health Technologies Industries (AIMS) groups more than 110 member organizations. The membership includes medical device manufacturers, academic and research organizations, healthcare services and consulting companies of all sizes. AIMS stimulates the development of the health technologies industry and promotes its economic and social value. It is also a gathering frame for partners exchange on domestic and foreign markets. Many meetings and conferences take place each year in Montreal.

([www.aims.ca](http://www.aims.ca)).

# RESEARCH ASSETS

## University of Montreal

[www.umontreal.ca](http://www.umontreal.ca)

Founded in 1878, University of Montreal is one of Canada's leading universities. With 13 faculties, it is the largest institution of higher education in Quebec, the second largest in Canada, and among the most active in North America with CAN\$ 394 million in research funding in 2003 alone.

[www.chumontreal.qc.ca](http://www.chumontreal.qc.ca)

The University of Montreal Hospital Center (CHUM) is associated with the University of Montreal. The Centre is a network composed of four teaching hospitals : Hôtel-Dieu, Hôpital Notre-Dame du CHUM, Hôpital Saint-Luc du CHUM, and Hôpital Sainte-Justine.

## École Polytechnique de Montréal

[www.polymtl.ca](http://www.polymtl.ca)

Created in 1873, École Polytechnique de Montréal is one of Canada's leading engineering institutions, both in teaching and research. It is affiliated with University of Montréal. Its student population (around 6,000) makes it the largest engineering school in Québec while also sustaining the widest scope of research in the province. Within École Polytechnique, we find the Institute of Biomedical Engineering whose mission is to advance knowledge in the use of physical and engineering sciences in the healthcare field. École Polytechnique provides instruction in 11 engineering specialties and employs 220 professors.

## École de technologie supérieure

[www.etsmtl.ca](http://www.etsmtl.ca)

Established in 1974, l'École de technologie supérieure (ÉTS) is affiliated with the network of Québec universities. Specialized in engineering and technology, the ETS focuses its activities on cooperative education and targets particularly the development of new technologies and their transfer to industry. The School regroups about 20 % of all students registered in engineering in Quebec, and ranks second among the establishments offering this training. ETS also offers programs of 2nd and 3rd university cycles.

## McGill University

[www.mcgill.ca](http://www.mcgill.ca)

A member of the American Association of Universities, McGill ranks high both in Canada and North America as a research-intensive university. Historically, Medicine was the very first faculty and its leading role in McGill research never wavered.

[www.muhc.ca](http://www.muhc.ca)

The Research Institute of the McGill University Health Center (MUHC) is a world-renowned biomedical and health-care hospital research centre. The institute supports over 500 researchers, nearly 1,000 graduate and postdoctoral students and operates more than 300 laboratories devoted to a broad spectrum of fundamental and clinical research. Many of them concentrate their efforts on improving their practice with the introduction of innovative technologies. The MUHC comprises five teaching hospitals — The Montreal Children's Hospital, The Montreal General Hospital, The Royal Victoria Hospital, The Montreal Neurological Hospital and The Montreal Chest Institute.

### ART

[www.art.ca](http://www.art.ca)

**Area:** Imaging

**Application:** Oncology

**Alliance:** General Electric

Advanced Research Technologies Inc. develops and manufactures optical molecular imaging products for the healthcare and pharmaceutical industries.

### Biosynthec [www.biosynthec.com](http://www.biosynthec.com)

**Area :** Biomaterials

**Application :** Tissue repair

**Alliance :** Kuhnil Pharma Co. NPIL

Biosynthec discovers, develops, manufactures and commercializes innovative biotherapeutic thermogels for regenerative medicine (tissue repair) and therapeutic delivery.

### Moxxi

[www.moxxi.mcgill.ca](http://www.moxxi.mcgill.ca)

**Area:** Information Technology

**Application:** Healthcare services

Moxxi Medical develops and markets an integrated electronic prescription system for the management of prescription drugs by linking medical doctors, pharmacists, public and private insurance programs along with their respective patients.

## Top research at a glance

Establishments and affiliated research centers		Area of expertise
<b>U of Montreal and Polytechnique</b>		
LBUM – Biorheology & Ultrasonic Laboratory Biomedical Engineering Institute		Imaging Biomedical
GRSTB - Biomedical Science and Technologies Research Group		Biomedical
Canada Chair in Cartilage Tissue Engineering IRCM (biomedical laboratory)		Biomedical Therapeutics devices
Polystim		Neurotechnology
ICM, Montreal Cardiovascular Institute		Cardiology
LIAB, Innovation and Bio-performance analyses Laboratory		Medical devices
Research Group on Musculo-Skeletal Deformations Laboratory: LIS-3D, LMBCAO		Biomedical
<b>ETS</b>		
LIO, Imaging and Orthopedics Laboratory		Imaging & orthopedics
LIVIA, Laboratory for Imagery, Vision and Artificial Intelligence		Imaging
LAMSI, Intelligent System & Alloy Laboratory		Biomaterials
<b>McGill</b>		
MNI, Montreal Neurological Institute		Neurology
McConnell Brain Imaging Centre		Imaging
ICBB, International Center of Biosensors and Biochips		Biomaterials
CVE, CardioVascular Engineering Lab		Cardiovascular
ORL, Orthopedic Research Laboratory		Orthopedic
REPRIC		Medical imaging
The Centre for Bone and Periodontal Research		Biomaterials
Biomedical Technology and Cell Therapy Research Lab		Medical devices engineering
<b>Other Establishments and consortiums</b>		<b>Area of expertise</b>
Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal (CRIR) <a href="http://www.crir.ca/en/000/">www.crir.ca/en/000/</a>	Research and training Association of six rehabilitation institutions	Rehabilitation
IMI (Industrial Materials Institute) – NRC PARI <a href="http://www.imi.cnrc-nrc.gc.ca">www.imi.cnrc-nrc.gc.ca</a>	Research, Equipment and space	Biomaterials
INRS - Micro and nanomanufacturing laboratory <a href="http://www.inrs.uquebec.ca">www.inrs.uquebec.ca</a>	Research and training	Nanotechnology
IIT, International Institute of Telecommunications <a href="http://www.iitelecom.com">http://www.iitelecom.com</a>	Pre-competitive industrial research consortium	Telecom

## SNAPSHOTS OF SUCCESS

### Haemacure Corporation

[www.haemacure.com](http://www.haemacure.com)

**Area:** Biomaterials

**Application:** Surgery

Haemacure is specializing in the development of innovative biological adhesives, biomaterials and surgical devices for the acute surgical wound care market.

### LMS Medical Systems

[www.lmsmedical.com](http://www.lmsmedical.com)

**Area:** Information Technology

**Application:** Obstetrics

**Alliance:** McKesson

LMS develops innovative tools for Obstetrical Decision Support, Risk Management and Clinical Information Systems.

Showcase at St. Justine Hospital

“A spin-off of world-class research in obstetrics performed at McGill University, LMS Medical Systems leverages local assets - multi-disciplinary high-end skills and know-how, innovative technology and next generation healthcare implementations - to launch its international market strategies. LMS’ human, intellectual and market capital: made in Montreal!”

Diane Côté, CEO

## AN INNOVATIVE INDUSTRY

The winning combination of the finest research and best transfer practices has led to a vibrant, financially successful and innovative medical technologies industry in Metro Montreal. Plenty of innovative companies create value-added products with health benefits for today and tomorrow population needs.

*"The values underlying the Canadian healthcare system buying decisions are so patient wellbeing oriented, that once you've got your technology accepted here, you can be sure it will be well received everywhere. This matter-of-fact, added to the overall fostering business environment, makes Metro Montreal the best place to test innovative technologies."*

*Tony Falco  
Founder and Chief Technology Officer  
Resonant Medical*

### WORLD CLASS SERVICES

A good example:

**Conceptis:** [www.conceptis.com](http://www.conceptis.com)

With offices in Montreal and New Jersey, Conceptis provides services to many of the world's largest pharmaceutical and medical devices companies. Conceptis was born out of the conviction that the Internet represented a unique opportunity to remedy many of the communication challenges encountered in sales of pharmaceutical and medical devices. From this stemmed the concept of therapeutic communities leading to the development of medical channels, including [theheart.org](http://theheart.org), [www.jointandbone.org](http://www.jointandbone.org) and our other online communities.

### NUMEROUS SUCCESSES IN RESEARCH COMMERCIALIZATION

A good example:

**Cardianove Inc.**

**Area:** Therapeutic Devices

**Application:** cardiology

Using advanced software from IBM and Dassault Systems that shaving two years off the normal development schedule, Cardianove Inc. has designed the smallest life-saving heart numn.

### Noveko Echograph

[www.noveko.com](http://www.noveko.com)

**Area :** Diagnostic device

**Application :** Ultrasound

Noveko specializes in the design, manufacture and marketing of portable real-time ultrasound scanners for use in veterinary medicine and animal breeding, as well as in human medicine.

### Orthosoft

[www.orthosoft.ca](http://www.orthosoft.ca)

**Area :** Diagnostic Devices

**Application:** Surgery

Orthosoft develops and markets medical navigation software that helps orthopedic surgeons improve the outcome of complex surgeries.

### Resonant Medical

[www.resonantmedical.com](http://www.resonantmedical.com)

**Area:** Imaging

**Application:** Oncology

**Alliance:** Toshiba

Resonant Medical develops, manufactures and commercializes 3D ultrasound image-guided adaptive radiotherapy products.

### Cryocath

[www.cryocath.com](http://www.cryocath.com)

**Area:** Therapeutic Devices

**Application:** Cardiology

Cryocath creates catheter and probe-based CryoTherapy products for cardiovascular diseases treatment.

# HUMAN CAPITAL

## Educated future

With its 11 institutions of higher learning, including four major universities (two French language and two of English language), several colleges and many private and public schools, the Montreal metropolitan area is a fantastic reservoir of highly skilled human resources.

Montreal has 160,000 students and the largest number of foreign students in Canada (17,000). Nearly 40,000 students earned a university degree in 2003 and close to 40% of the total population earns a college or university degree.

The student population per capita among leading North American cities makes Montreal second after Boston, (MA, USA)

More than half of the population of Metro Montreal is bilingual (French and English) and nearly 9,000 students are currently enrolled in a program related to life sciences. Over 2,000 university degrees are awarded each year in life sciences.

## Scientists and managers

Montreal ranks eight in North America for life sciences jobs.

The life sciences industry employs over 37,000 highly skilled people including 9,125 research specialists in 125 public research organizations.

With more than 500 private companies, the Metro Montreal life sciences industry offers a reservoir of trained and skilled professionals and managers.

### Medical Technologies Related Training Programs

Establishment	Programs	Specialties
University of Montreal and École Polytechnique of Montreal	Certificate  Diploma of Superior Studies Master Ph.D.	Biomedical engineering, electrocardiology, biomedical imaging, biomedical instrumentation, Biomechanics, biomaterials, rehabilitation, Biomedical modelling
McGill University	Ph.D. Master	Biomedical Engineering, signal analysis; systems analysis, orthopedic and auditory biomechanics, biomaterials artificial cells and organs, medical imaging and image processing; Bioinformatics, computers in medical education
École de technologie supérieure (ETS)	Certificate Master	Health technology diploma in orthopedy, Traumatology, imaging.
Montmorency College <a href="http://www.cmontmorency.qc.ca">www.cmontmorency.qc.ca</a>	Technical career	Prosthetic and orthopaedics technique
Dawson College <a href="http://www.dawsoncollege.qc.ca">www.dawsoncollege.qc.ca</a>	Technical career	Radiotherapy, diagnostic imaging
Ahuntsic College <a href="http://www.collegeahuntsic.qc.ca">www.collegeahuntsic.qc.ca</a>	Technical career	Medical electrophysiology, radio-diagnostic, nuclear medicine, radiotherapy
Other training available	Programs	Specialties
CRIM <a href="http://www.crim.ca">www.crim.ca</a>	Continuing training	Regulation, evaluation, commercialisation, etc.
AITS <a href="http://www.aits.ca">www.aits.ca</a>	Continuing training	Management, regulatory, etc.
CRIQ <a href="http://www.criq.qc.ca">www.criq.qc.ca</a>	Continuing training	Designing medical equipment and systems for Compliance to the International Safety Standard IEC 60601
HEC <a href="http://www.hec.ca">www.hec.ca</a>	Continuing training and current programs	Management, commercialization, etc.

<b>Average Annual Salary Comparison (in US\$)</b>					
<i>Position</i>	<i>Montreal</i>	<i>Seattle</i>	<i>Boston</i>	<i>San Francisco</i>	<i>San Diego</i>
Medical Laboratory Technician	\$32,294	\$38,310	\$38,260	\$40,604	\$36,116
Scientific Researcher	\$54,317	\$62,842	\$63,563	\$66 401	\$60,711
Biochemist	\$67,370	\$76,363	\$77,416	\$80,722	\$74,332
Medical Laboratory Manager	\$60,399	\$74,006	\$74,941	\$79,120	\$71,920
Operations Manager	\$72,251	\$93,977	\$93,564	\$97,277	\$89,226

*Source: ERI Economic Research Institute, January 1, 2005*

## RECENT INITIATIVES AND UPCOMING PROJECTS

Local commitments to innovation has given birth to several stimulating initiatives. These projects support and boost the whole health industry and its technologies.

### **The McGill Medical Skills Centre and the McGill Medical simulation centre**

The McGill Medical Skills Centre is a very important step forward in clinical and surgical skills training. The Centre – the largest and most important facility of its kind in Canada – combines training techniques for high-risk professions in aviation and emergency using the latest medical simulation technologies. Fully integrated to McGill University’s professional programs, the Centre provides the next generation of doctors, nurses and physiotherapists with hands-on training in difficult and potentially dangerous procedures without risk to patients. It promotes the importance of teamwork in health care delivery. The end result is a culture that is committed to professional accountability, critical assessment and life-long learning.

Coming in 2006, [www.medicine.mcgill.ca/simcentre](http://www.medicine.mcgill.ca/simcentre)  
Contact: [simcentre.med@mcgill.ca](mailto:simcentre.med@mcgill.ca)

### **The Medical Technologies Development Centre**

Its mission will be to facilitate and accelerate the development of the Quebec innovative medical technologies. It will be a converging centre of international reach in research, training, development, incubation, evaluation and marketing of medical technologies. The Centre will provide a strong expertise to companies for the acceleration of their development and to increase collaboration between actors of different realm (small and medium size companies, world class companies, governments, etc.).

Coming in 2007, [www.citebiotech.com](http://www.citebiotech.com)  
Contact: [info@citebiotech.com](mailto:info@citebiotech.com)

### **Jewish Hospital Operating Room of the future**

Montreal Robotic Research Centre is a centre for developing and testing invasive surgical and interventional technologies, including robotics. The Center will regroup interdisciplinary project teams from different research institutions in Québec and will offer collaborative research programs from McGill University and the Montreal Jewish Hospital, its affiliated hospital. This Center is the first interdisciplinary research and training facility in Québec to bring together practitioners, students and researchers in surgery, engineering, imaging, robotics, information technology and business.

Coming in 2007, [www.jgh.ca/index.html](http://www.jgh.ca/index.html)  
Contact: [jcorcos@uro.jgh.mcgill.ca](mailto:jcorcos@uro.jgh.mcgill.ca)



# A FOSTERING BUSINESS ENVIRONMENT

## R&D INCENTIVES

In Quebec, all eligible R&D expenses are deductible. Governments allow current and capital expenditures to be deducted in the current year or later. The net cost of an eligible \$100 R&D expenditure ranged from \$23 to \$43 in 2005.

## TAX HOLIDAY FOR FOREIGN WORKERS

Foreign researchers and other experts enjoy a five year holiday from provincial income tax when they move to Quebec to engage in R&D work for a company.

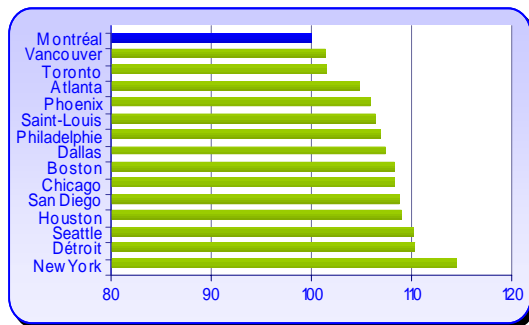
YEAR	1	2	3	4	5	6+
Rate (%)	100	100	75	50	25	0

### Other tax incentives

- Strategic investment support program by the provincial government.
- PASI program

## COST OF OPERATIONS

Montreal enjoys one of the most competitive operating costs.



Source: KPMG, 2004

## ACCESS TO THE NORTH AMERICAN MARKET

Metro Montreal is a gateway to the North American market of more than 425 million consumers thanks to NAFTA. It also represents a potential of 200 million consumers within a 600-mile (1,000-km) radius.

Its international airport received 10 million passengers in 2004 and major cities like Boston, New York, Philadelphia are reached within 90 minutes.

## EVALUATION AND REGULATION

Institutions provide assessment services to innovative medical technologies:

- **Agence d'évaluation des technologies et des modes d'intervention en santé (AETMIS)**

[www.aetmis.gouv.qc.ca/fr/](http://www.aetmis.gouv.qc.ca/fr/)

Reporting to the Minister of Health and Social Services, the Agency has as its mission to advise and support, by means of assessments, policymakers in the health-care system with regard to the introduction, acquisition and utilization of health technologies and intervention modalities.

- **Canadian Coordinating Office for Health Technology Assessment (CCOHTA)**

[www.ccohta.ca](http://www.ccohta.ca)

CCOHTA is a primary source for unbiased, evidence-based information on drugs, devices, health care systems and best practices. Canadian health care decision makers rely on CCOHTA to help them make well-informed health technology choices.

- **CRIM**

<http://www.crim.ca/fr/accueil-msss.html>

Partner of the Ministry of Health and Social services (MSSS) for the certification of all application transiting the RTSS (the health and social telecommunication network).

- **HEALTH CANADA**

[www.hc-sc.gc.ca/dhp-mps/md-im/index\\_e.html](http://www.hc-sc.gc.ca/dhp-mps/md-im/index_e.html)

Reviews medical devices to assess their safety, effectiveness and quality before being authorized for sale in Canada. More information about laws in Canada at <http://laws.justice.gc.ca/en/F-27/SOR-98-282/index.html>

## FINANCING

Several entities offer a wide range of financing for companies at different stages:

Early stages: MSBI

Late stages: Desjardins capital de risque, SGF, Fonds de solidarité du Québec, CDP, Proquest and many private investors.

# INFRASTRUCTURES AND SERVICES

## BUILDING INTELLECTUAL PROPERTY IN MONTREAL

There are important legal advantages in creating intellectual property in Montreal:

Companies based in Canada are not obligated to file patent applications here before seeking patent authorization in other countries.

The relative lack of export control in comparison to the United States can greatly simplify collaborative research within an international company between a Montreal R&D unit and units in other countries outside of the USA. Furthermore, inventions made in Canada are granted a date of invention for the purposes of establishing priority rights under US patent law, just as if the invention had been made in the United States.

Canada is a member of the Patent Cooperation Treaty (PCT) under which Canadian companies have access to an efficient mechanism to seek patent protection in many foreign countries. Canadian patent law complies with World Trade Organisation intellectual property provisions, and affords patent protection essentially on an equal basis with other leading industrialized countries.

## RESEARCH COMMERCIALIZATION

Over the past decade both the Quebec and Canadian governments have put in place measures to generate better returns on public money invested in research. The result has been very positive for Montreal's Universities.

### UNIVALOR

[www.univalor.ca](http://www.univalor.ca) — CEO: Marc Leroux

### VALCHUM INC.

[www.groupecrea.com](http://www.groupecrea.com) — CEO: Robert Dubé

### MCGILL OFFICE OF TECHNOLOGY TRANSFER

[www.techtransfer.mcgill.ca](http://www.techtransfer.mcgill.ca) —

The [Blue Book](#) is a database that facilitates research relationships with industry and other institutions while improving access to McGill's expertise and commercializable technologies.

### INNOVACOR

[www.icm-mhi.org/en/valorisation-recherche](http://www.icm-mhi.org/en/valorisation-recherche) — CEO: Jacques Oliva Bélair

### VALEO MANAGEMENT L.P.

[www.gestionvaleo.com](http://www.gestionvaleo.com) — CEO: Jean-Marc Proulx

## REAL ESTATE

Metro Montreal hosts several incubators and scientific parks for high tech companies.

One of the Montreal key strengths is the relatively low cost of laboratory and commercial space when compared to other cities.

- Space and services
  - Biotech City  
[www.citebiotech.com](http://www.citebiotech.com)
  - The Industrial Materials Institute (IMI)  
[www.imi.cnrc-nrc.gc.ca](http://www.imi.cnrc-nrc.gc.ca)
  - Technoparc Saint-Laurent  
[www.technoparc.com](http://www.technoparc.com)
  - Technopole Angus  
[www.technopoleangus.com](http://www.technopoleangus.com)
- Incubator
  - Quebec Biotechnology Innovation Center (CQIB)  
[www.cqib.org](http://www.cqib.org)
  - CEIM  
[www.ceim.com](http://www.ceim.com)

## RELATED MT NETWORKS IN METRO MONTREAL

APIBQ: [www.apibq.org](http://www.apibq.org)

Quebec physicists and biomedical engineers Association

AFISQ: Health Industry Suppliers Association of Quebec [afisq@admitec.ca](mailto:afisq@admitec.ca)

AHQ: [www.ahq.org/english](http://www.ahq.org/english)

Quebec Hospital Association

INNOVITECH: Strategic brokers in innovation

[www.innovitech.com](http://www.innovitech.com) — CEO: Camille Gagnon