Combining Strengths, Maximizing Impact

The Québec-Ontario Life Sciences Corridor

Report compiled by PwC, in conjunction with the Ministère du Développement économique, de l'Innovation et de l'Exportation, and the Ontario Ministry of Research and Innovation

Québec

ONTARIO CANADA

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Letters from the Ministers

I am pleased to present the report entitled *Combining Strengths, Maximizing Impact*, which clearly reveals a vital centre of innovation in the Life Sciences Corridor between Québec and Ontario.

Our two provinces are acknowledged the world over as leaders in the realm of the life sciences. Combining Québec's and Ontario's capacities in this field enables us to engage in promising collaboration to compete with other world centres.

The Life Sciences Corridor between Québec and Ontario is one of the biggest industrial clusters in this field in North America and the world.

This interprovincial economic space is especially well equipped to satisfy the needs of life sciences firms. It offers talent, research infrastructure and financial tools, in a word, a business environment geared to major projects.

Québec's creativity is also apparent in the public policies implemented to support the life sciences. Mention should be made of the *Québec Biopharmaceutical Strategy*, announced in October 2009, which recognizes the biopharmaceutical industry as a key sector for the development of the Québec economy. The *Québec Research and Innovation Strategy* and the *Politique du médicament* are also convincing examples of the importance that Québec attaches to its knowledge-based economy.

By relying on their strengths, Québec and Ontario represent North America's fourth largest economic zone, thereby enhancing their competitiveness to develop the life sciences in order to enhance health solutions for the well-being of their respective populations.

This report reflects a shared determination to collaborate between Québec and Ontario in the wake of the signing of the *Ontario-Québec Trade and Cooperation Agreement* in 2009. I am convinced that other similar initiatives will bolster our economic space and broaden scientific collaboration.

Clément Gignac
Minister of Economic Development, Innovation and Export Trade

Ensuring the future prosperity of our province is my government's top priority. We know that places that invest in innovation and turn discoveries into commercial products are home to the most rewarding jobs, strongest economies and the best quality of life. We believe in science and the power of research to transform lives and our economy.

A key focus of our Ontario Innovation Agenda is the life sciences. That is why we launched a *Life Sciences Commercialization Strategy*, which helps position our province as one of the best places in the world to re-locate, collaborate or grow an innovative life sciences company.

Ontario is home to a thriving life sciences economy – one that attracts researchers, investors and scientists from all over the world. Ontario's research excellence in the areas of oncology, neuroscience and stem cells is a reflection of the world-class expertise we possess, and our ability to push the boundaries of knowledge and develop new technologies and therapies.

Combining our strong support with that of our neighbour's will ensure even more investment, jobs and ground-breaking healthcare discoveries are made in the Québec-Ontario corridor.

This report outlines the shared strengths and assets of our two provinces, and demonstrates why together we form the ideal place to invest in life sciences.

Many multi-national companies have already discovered that both Ontario and Québec offer a highly competitive growth environment for life sciences companies—a critical mass of companies, world-renowned talent, easy access to top research centres and academic institutions, and a highly educated workforce. This report will help ensure our future success by building on the reputation of the life sciences industries in Canada's two largest provinces.

I am pleased to share *Combining Strengths, Maximizing Impact*, and look forward to our provinces' continued contribution to cutting-edge breakthroughs that enhance quality of life for all.

Glen Murray
Ontario Minister of Research and Innovation

Executive Summary

The Québec-Ontario Life Sciences Corridor: A world-class biocluster

On June 27th, 2011, the Ontario and Quebec governments established the Québec-Ontario Life Sciences Corridor (the "Corridor"), enabling the two provinces to become one of the largest bioclusters not only in North America, but also in the world. The Corridor offers world-class investment opportunities for global businesses that can leverage the unique strengths and assets of the two largest provinces in Canada.

Under the Ontario-Québec Trade and Cooperation Agreement, the two provinces are focused on establishing a common business space that will reduce barriers to trade and improve long-term economic prosperity. The Corridor is a key initiative under this agreement and directly supports this objective.

The path to a globally competitive life sciences cluster

The Corridor is paving the way for new and unique opportunities for investment, partnership and collaboration by building on solid reputations for world-class excellence in life sciences research, innovation and commercialization. It operates on a scale that rivals and frequently exceeds other large-scale bioclusters around the world. The Corridor plays a major role in the advancement of life sciences discovery and its translation into products and medicines that will improve the health and quality of life for populations worldwide.

With the establishment of the Corridor, the life sciences research, business and investment communities—together with government partners—will enhance opportunities to achieve world-class innovative discoveries and successful commercialization.

A leader in the life sciences industry

Québec and Ontario are internationally renowned for their leading edge life sciences industries and have a legacy of innovation and new discoveries that have been increasingly translated into clinical application and commercial products (e.g., in stem cells). Their strengths attest to similar overall objectives as well as complementary areas, including research. The Corridor is home to significant breakthroughs, such as the drug 3TC (Lamivudine), insulin, stem cells, the artificial kidney, SINGULAIR® and catheter-based cryabalation for the treatment of cardiac arrhythmias. More recently, genes for cystic fibrosis, epilepsy, breast cancer and Alzheimer's disease were all discovered in the Corridor.

Québec and Ontario are uniquely equipped to meet the needs of life sciences companies. They have the expertise, the research infrastructure and the financial structure — all in a stable business environment.

The life sciences industry within the Corridor:

- comprises about 1,139 companies;
- employs almost 66,000 people;
- contains 143 biotechnology companies;
- produces the majority of Canadian sales and exports;
- generates discoveries in internationally recognized and world-class research institutes;
- has access to 490 undergraduate and graduate programs in biological and biomedical sciences, some which are ranked among the best in the world;
- has access to the majority of Canadian venture capital;
- has access to numerous sources of public financing supported by the federal and provincial governments; and
- is supported by Québec's Biopharmaceutical Strategy, Research and Innovation Strategy and Ontario's Life Sciences Commercialization Strategy.

A leading international life sciences cluster

The Québec-Ontario Life Sciences Corridor strengthens the value proposition of doing business in this region by creating one of the largest life sciences clusters in North America and the world:

- **No. 1** country among OECD countries in percentage of population with a post-secondary education[1]
- **Lowest** in business-environment costs among nine countries, including the G7 countries[2]
- **No. 3** in North America in number of life science employees
- **No. 4 (Montréal)** and **No. 5 (Toronto)** among 41 major international cities in providing favourable tax environment and **No. 2 (Montréal)** and **No. 7 (Toronto)** when considering the tax environment for Research and Development[3]
- **No. 4** worldwide, according to the OECD, in revealed technological advantage[4]
- **Fifth** largest area of of venture capital financing in North America[5]
- One of the **top five** life sciences clusters in North America[6]

A strategic location to leverage Canada's economic and cultural strengths

The Corridor offers access to the majority of total Canadian venture capital and benefits from billions of dollars in federal and provincial funding programs. It has one of the most favourable tax environments in the world for innovation partnerships, and provides easy access to major U.S. markets.

It also has an ethnically and culturally diverse population. The Corridor is home to people with more than 200 different ethnic backgrounds who speak more than 100 different languages. As well, it has two official languages (English and French) and an extensive infrastructure, including six international airports and a network of regional airports, major road, rail and marine border-crossings provide access to the U.S. market.

Finally, Canada has demonstrated a track record of corporate social responsibility, specifically in the life sciences industry, and for supporting developing countries around the world.

Québec's Biopharmaceutical Strategy

Québec's Biopharmaceutical Strategy, launched in 2009, recognizes the importance of the biopharmaceutical industry for Québec. It includes measures and commitments to support the industry's growth and performance and ensure an attractive business environment for investors.

The Québec Biopharmaceutical Strategy centres on five key guidelines:

1. support the development of centres of excellence in clinical research in research centres;
2. support the development of biotechnology firms;
3. support the development of big pharmaceutical firms;
4. maintain a labor force able to meet the industry's needs; and
5. globally promote Québec's image as a biopharmaceutical hub.

As part of this strategy, the Québec government plans to invest $122.77 million over a three-year period, to help Québec be recognized around the world as a place for global biopharmaceutical investments, whether because of its highly qualified labor force, the efficiency of its technology innovation system, its R&D know-how, or the availability of capital.

Ontario's Life Sciences Commercialization Strategy

Ontario's $161 million Life Sciences Commercialization Strategy (LSCS) combines existing and new Ontario life sciences initiatives into a comprehensive and coordinated plan. The LSCS invests in advanced health technologies and biopharmaceutical research and manufacturing, to support strategic opportunities where large-scale global market opportunities exist. These are targeted areas of strength for Ontario, as identified in the Ontario Innovation Agenda.

Ontario's Life Sciences Commercialization Strategy has four key pillars:

1. attract and nurture scientific talent;
2. facilitate greater collaboration;
3. address financing challenges; and
4. strengthen international marketing and promotion.

Key components of the LSCS include support for early-stage Ontario biotech firms ($7 million); new infrastructure for clinical trials ($17 million); support for Ontario's medical devices and assistive technologies sector ($21 million); and the $114 million Global Leadership Round in Genomic & Life Sciences to deliver on the promise of personalized medicine.

To obtain a full version of *Québec's Biopharmaceutical Strategy*, please visit **www.mdeie.gouv.qc.ca**

To obtain a full version of *Ontario's Life Sciences Commercialization Strategy*, please visit **www.ontario.ca/innovation**

1. Introduction

Québec and Ontario's vibrant life sciences sector is integral to the growth of a knowledge-based economy and for the creation of economic wealth, high-paying jobs and improvements in healthcare.

With a concentration of life sciences firms, research centres and a highly educated workforce, Québec and Ontario are among world-class leaders in this field. Nonetheless, global competition for talent and funding is increasing, which calls for new mechanisms and strategies to ensure that the robust and agile life sciences sector in both provinces is sustained and continues to grow.

The Québec Ministère du Développement économique, de l'Innovation et de l'Exportation (MDEIE) and the Ontario Ministry of Research and Innovation (MRI) have partnered to facilitate the creation of the **Québec-Ontario Life Sciences Corridor** (the "Corridor"), which is among the largest bioclusters worldwide.

This report demonstrates (based on the data outlined) that, as the global life sciences industry becomes more competitive, the Corridor will continue to create significant synergistic opportunities to foster growth and provide the critical mass in strengths and assets to compete with leading life sciences clusters internationally. (See Appendix A for the summarized contextual background to this report.)

"Québec and Ontario are working together to build a prosperous regional economy that will attract business, workers and investment from around the world. Our goal is to create a common economic space in central Canada that will allow companies in Québec and Ontario to compete and prosper in the global economy."

Dalton McGuinty, Premier of Ontario

"Québec and Ontario share an important historic relationship of cooperation that has led to great achievements in the past. This relationship must not only be preserved but reinforced in order for our two governments to better face their many new challenges."

Jean Charest, Premier of Québec

2. The Québec-Ontario Life Sciences Corridor: Where we are

Québec and Ontario are the two largest provinces in Canada and are part of the US $16-trillion NAFTA marketplace.[7] Combined, they account for more than 60% of Canada's total population, the majority of which live in the metropolitan areas in and around Montréal and Toronto. The country has two official languages (English and French). As well, both Québec and Ontario have culturally and ethnically diverse populations.

The Corridor is broadly defined as the area from Windsor, Ontario, in the west, along the backbone of Highway 401 and Autoroute 20 through major cities in both provinces — including Toronto, Ottawa, Montréal, and Québec City — to Rimouski, in the east. Virtually all of the Québec and Ontario life sciences companies are concentrated along the Corridor.

Both provinces, Québec and Ontario, border the U.S., creating quick and easy access to major markets there, facilitating efficient trade and boosting cross-border tourism. The transportation and telecommunications infrastructures are extensive, sophisticated and integrated with U.S. and global systems. Together, Québec and Ontario have the largest concentration of manufacturing industries in Canada, which accounts for 60% of the country's gross domestic product (GDP), and many industries — including life sciences, automobile, aerospace, electronic and agri-food, among others — have integrated their operations on both sides of the border.

	Québec	Ontario	Canada	Québec & Ontario as a percentage of Canada
Population (2010)	7,907,375	13,210,667	34,108,752	*61.9%*
GDP, Expenditure Based (CDN $ millions)	$314,663	$595,515	$1,609,100	*56.6%*

Sources
Statistics Canada-Quarterly Demographic Estimates (September 2010)
Statistics Canada, 2010: Quarter 2
Ontario Ministry of Finance 2010: Quarter 2
Institut de la statistique Québec 2010: Quarter 2


Québec
Ontario
Québec City
Rimouski
St. Lawrence River
Saint-Hyacinthe
Sherbrooke
Laval
Montréal
Ottawa
Kingston
Lake Huron
Markham
Toronto
Lake Ontario
Guelph
Kitchener/
Waterloo
Mississauga
London
Hamilton
Windsor
Lake Erie
Boston
New York
Philadelphia
United States

3. Leaders in Life Sciences

Québec and Ontario are uniquely equipped to meet the needs of life sciences companies. They have the talent, the research infrastructure and the financial structure — all in a stable environment.

Internationally renowned for their innovative life sciences industries, both provinces have a legacy of innovation and groundbreaking discoveries in this field, which have been increasingly translated into clinical applications and commercial products.

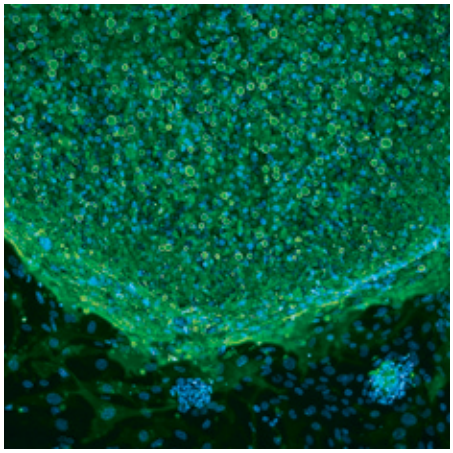
They are globally recognized for research excellence in genomics, cancer treatment, regenerative medicine, clinical trials, bioinformatics, medical imaging and infectious-disease prevention and control. They have solid reputations in this field as a result of making breakthroughs in key areas — neurology, oncology, cardiology, immunology and proteomics — as well as hosting research centres that specialize in bacterial diseases, genetics, stroke research and stem cells. The strengths of Québec and Ontario attest to their similar overall objectives in life sciences and in complementary areas such as research (e.g., in stem cells).

The Corridor has a high concentration of companies, employs a large number of people, attracts and retains top talent, has access to world-class research centres and academic institutions, and a highly educated workforce from dedicated programs at world-class universities. The Corridor is home to more Forbes 500 companies than MassBio.[8]

3.1 A legacy of innovation and new discoveries

Québec and Ontario both have a long history of leadership in medical research. As a result, the Corridor is at the forefront of genomic and proteomic research and has long been recognized as a leading global medical research hub, being home to key research centres for multinational pharmaceutical companies. Moreover, the Corridor has a solid record for having made significant breakthroughs, such as the drug 3TC (Lamivudine), insulin, the artificial kidney, SINGULAIR® and catheter-based cryoablation products for the treatment of cardiac arrhythmias. More recently, genes for cystic fibrosis, epilepsy, breast cancer and Alzheimer's disease were discovered in the Corridor.[9]

In 2005, the University of Toronto's Ernest McCulloch and James Till won the prestigious Lasker Prize for their discovery of haematopoietic (blood forming) stem cells enabling bone marrow transplants. This discovery, made 50 years ago gave rise to the international field of stem cell research and bone marrow transplantation. It is hallmark of and dedication to scientific excellence has created opportunities for the Corridor to become a leader in international initiatives.



Colony of induced pluripotent stem cells (iPSCs) derived from skin fibroblasts of a patient with Ehlers-Danlos syndrome. Image courtesy of Kamal Garcha (W.L. Stanford Lab, Toronto, Ontario) and the Ontario Human iPS Cell Facility.

"Québec and Ontario are true leaders in regenerative medicine and stem cell research. If the combined provinces were a country, they would be considered a powerhouse of stem cell research."

Michael Rudnicki, Senior Scientist, Director, Regenerative Medicine Program and Sprott Centre for Stem Cell Research, Ottawa Hospital Research Institute

Also in 2005, Dr. Michel G. Bergeron won the Wilder Penfield Award (for the biomedical sciences), the highest honour bestowed by the Government of Québec on a scientist in recognition of his lifetime contributions. Dr. Michel G. Bergeron, a professor at the Université Laval in Québec City, is the director and founder of the university's Infectious Diseases Research Centre as well as the director of the Division of Microbiology. With his team, Dr. Bergeron developed the first rapid, real-time tests to detect certain disease-causing microbes in less than one hour, instead of the 48 hours usually required. He has created two diagnostic companies based on his research, Infectio Diagnostic Research Inc (bought by Becton Dickison in 2006) and GenePOC.

In 2008, Nahum Sonenberg, a biochemistry professor at Montréal's McGill University, garnered the prestigious Gairdner International Award, often referred to as a "mini-Nobel," which is awarded to the world's best medical scientists.[10] The award recognized Sonenberg's groundbreaking work in protein synthesis. He discovered important mechanisms that control the synthesis of proteins in human cells. This led to the possibility of developing cures for diseases such as cancer, obesity, memory impairment and virus infections.

The Ontario Institute for Cancer Research (OICR) co-founded the International Cancer Genome Consortium (ICGC), a global effort with initiatives in 12 countries in Asia, Australia, Europe and North America. OICR is hosting the ICGC's Data Coordination Centre and the Secretariat. One of the most ambitious projects since the Human Genome Project, the ICGC is conducting large-scale genomic studies of 50 different types of cancer. The results will provide a foundation for personalized medicine and its promise to refine diagnosis, guide optimum treatment and avoid unnecessary side effects.[11]

Over the past decade, Québec and Ontario have generated numerous scientific discoveries, which have opened up new possibilities for understanding and treating diseases.

3.2 A formidable life sciences competitor

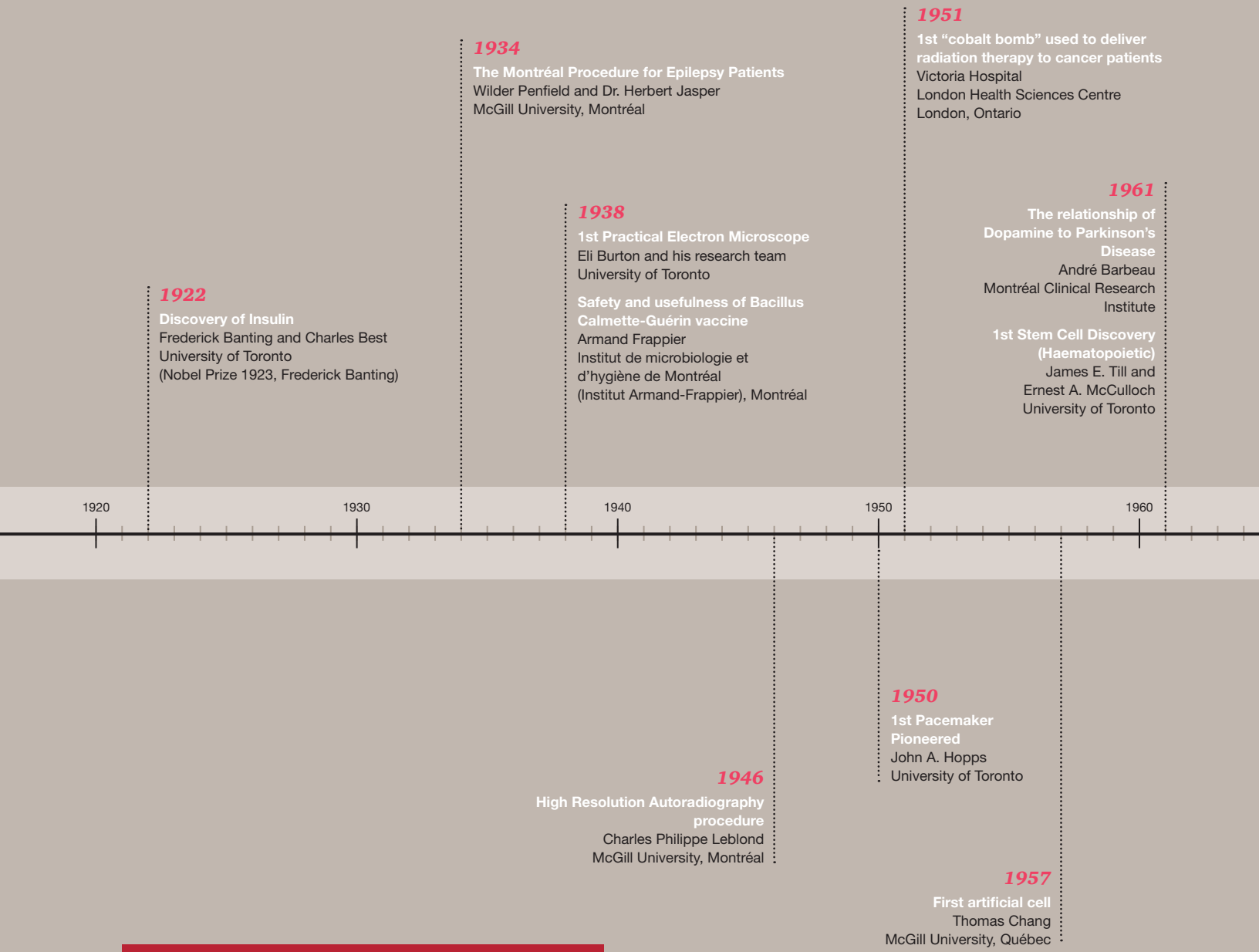
In addition to this legacy of innovation and new discoveries, the combined strengths and assets of the Corridor are highly competitive with other life sciences clusters around the world. The following are the Corridor's key competitive strengths:

1. existing critical mass of companies;
2. Canada's largest life sciences cluster;
3. leading North American and global life sciences cluster;
4. substantial R&D investments in the life sciences industry;
5. leading jurisdiction for life sciences patents;
6. leader in training and developing world-class talent;
7. leader in large-scale research and discovery;
8. advanced manufacturing powerhouse; and
9. completes the majority of R&D in Canada

3.2.1 An existing and growing critical mass

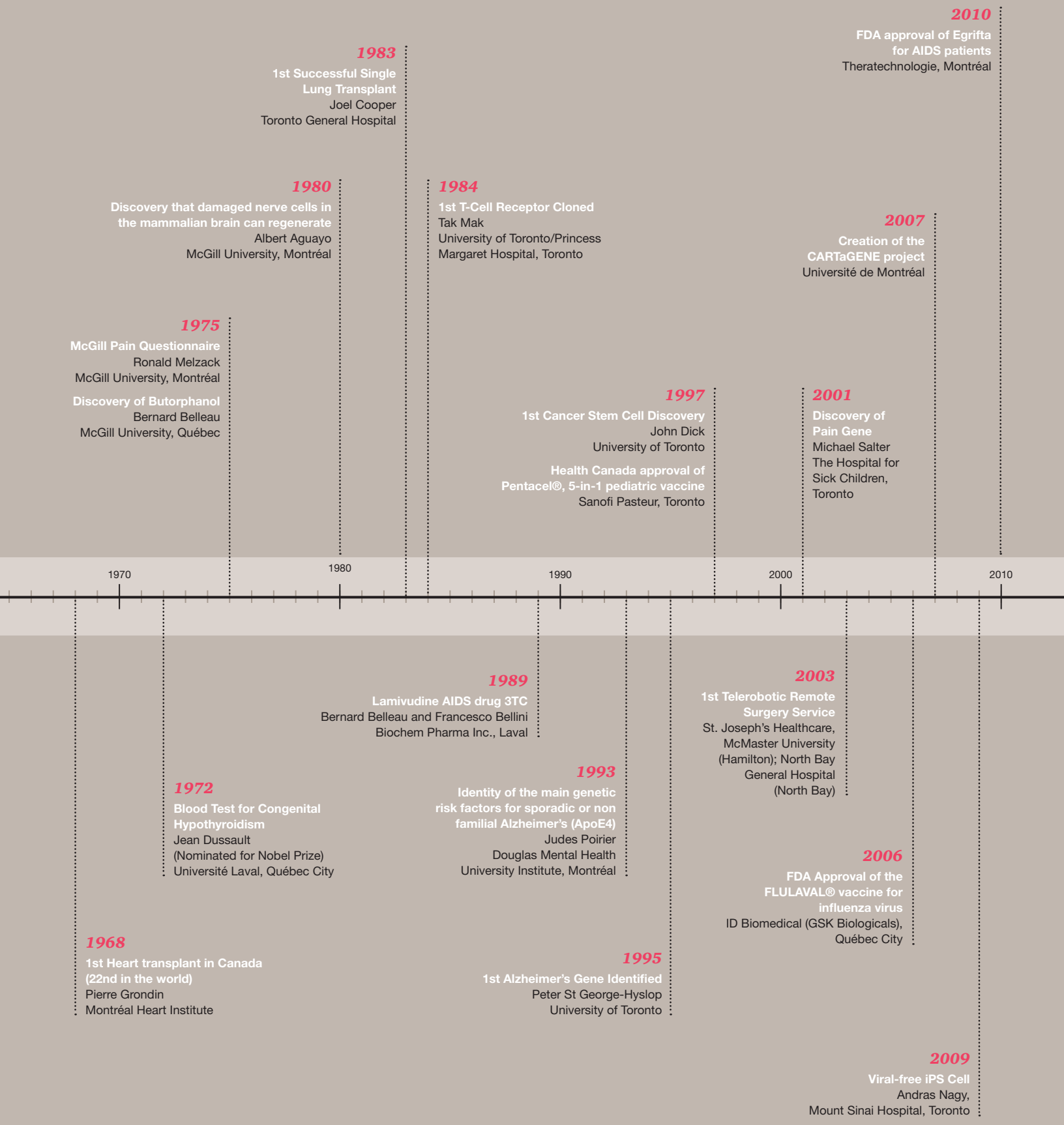
Québec and Ontario employ approximately 66,000 people from roughly 1,139 life sciences companies, a critical mass of companies and talent demonstrating a thriving life sciences industry on a scale comparable to other major bioclusters around the world.

A history of discovery and innovation



Discoveries within the corridor include insulin, stem cells, butorphanol and 3TC ®, and pioneering innovations include the first pacemaker and the first artificial cell.

Dr. Penfield first mapped the brain at McGill University and Dr. St George-Hyslop identified the first Alzheimer's gene at the University of Toronto.


2010
FDA approval of Egrifta for AIDS patients
Theratechnologie, Montréal
1983
1st Successful Single Lung Transplant
Joel Cooper
Toronto General Hospital
1980
Discovery that damaged nerve cells in the mammalian brain can regenerate
Albert Aguayo
McGill University, Montréal
1984
1st T-Cell Receptor Cloned
Tak Mak
University of Toronto/Princess Margaret Hospital, Toronto
2007
Creation of the CARTaGENE project
Université de Montréal
1975
McGill Pain Questionnaire
Ronald Melzack
McGill University, Montréal
Discovery of Butorphanol
Bernard Belleau
McGill University, Québec
1997
1st Cancer Stem Cell Discovery
John Dick
University of Toronto
Health Canada approval of Pentacel®, 5-in-1 pediatric vaccine
Sanofi Pasteur, Toronto
2001
Discovery of Pain Gene
Michael Salter
The Hospital for Sick Children, Toronto
1970
1980
1990
2000
2010
1989
Lamivudine AIDS drug 3TC
Bernard Belleau and Francesco Bellini
Biochem Pharma Inc., Laval
2003
1st Telerobotic Remote Surgery Service
St. Joseph's Healthcare, McMaster University (Hamilton); North Bay General Hospital (North Bay)
1993
Identity of the main genetic risk factors for sporadic or non familial Alzheimer's (ApoE4)
Judes Poirier
Douglas Mental Health University Institute, Montréal
1972
Blood Test for Congenital Hypothyroidism
Jean Dussault
(Nominated for Nobel Prize)
Université Laval, Québec City
2006
FDA Approval of the FLULAVAL® vaccine for influenza virus
ID Biomedical (GSK Biologicals), Québec City
1968
1st Heart transplant in Canada (22nd in the world)
Pierre Grondin
Montréal Heart Institute
1995
1st Alzheimer's Gene Identified
Peter St George-Hyslop
University of Toronto
2009
Viral-free iPS Cell
Andras Nagy,
Mount Sinai Hospital, Toronto

GlaxoSmithKline Inc.

GlaxoSmithKline (GSK) is a leading research-based pharmaceutical company with a challenging and inspiring mission: to improve the quality of human life by enabling people to do more, feel better, and live longer.

This mission gives GSK the purpose to develop innovative medicines, vaccines and healthcare solutions that help millions of people. GSK is consistently recognized as one of the 50 best employers in Canada and is a top 15 investor in Canadian research and development, contributing more than $147 million in 2009 alone. With a proud tradition of charitable and community support, GSK is designated a Caring Company by Imagine Canada.

GSK has a strong presence in biologicals, pharmaceuticals and vaccines, with a product portfolio that extends across a variety of therapeutic areas and diseases including: respiratory illness, diabetes, infections·, central nervous system disorders, urology, cardiovascular, HIV/AIDS, dermatology, vaccines, antivirals, and oncology.

GSK has a strong presence in the Corridor; the company maintains divisional headquarters in Mississauga, Oakville and Laval, with regional offices in Québec City, Montréal, Ottawa and Toronto. GSK's Laval site also conducts leading vaccine research and development. In 2009, GSK invested close to $38 million in clinical trials in Canada, conducting more than 90 trials and enrolling over 4,000 patients. This represents approximately four per cent of the company's worldwide clinical trial program. GSK employs approximately 2,700 people across Canada who work to discover, develop, manufacture and market medicines, vaccines and healthcare solutions in Canada.

Source: http://www.gsk.ca

Sanofi Pasteur Limited

Sanofi Pasteur Limited is Canada's oldest and only full-scale vaccine company, and the vaccine division of sanofi-aventis Group. Founded in 1914 as Connaught Laboratories, sanofi pasteur researches, develops and manufactures vaccines in Canada for export around the world.

Sanofi Pasteur helped eliminate diphtheria in Canada, commercialized insulin in the 1920's, and played a key role in producing the Salk polio vaccine for the North American field trials in the 1950's. The company worked with the World Health Organization to eradicate smallpox, and researched and developed the world's leading acellular pertussis (whooping cough) vaccine right here in Canada. Since 1997, Pentacel vaccine and a fully-liquid version called Pediacel—which protect against Haemophilus influenzae Type b, pertussis, diphtheria, tetanus and polio—have been the cornerstone of Canada's childhood vaccination program. Pentacel and Pediacel, Adacel and Adacel-Polio, along with other pertussis-containing vaccines, are manufactured in Canada for global markets.

Each year, sanofi pasteur invests approximately $100 million in Canadian vaccine research and development. The company has invested over $450 million since 2000 in capital expansion at its Connaught campus in north Toronto, where it employs over 1100 people in highly-skilled positions to research, develop and manufacture vaccines.

Together with sanofi-aventis, the pharmaceutical division with Canadian headquarters in Laval, Québec, the sanofi-aventis Group employs 2000 people in Canada, and is the country's leading investor in biopharmaceutical research and development. In 2009, the Group invested over $180 million, making it the top investor in Canada in the innovative pharmaceutical industry, and the 12th largest private sector overall. Globally in 2009, sanofi aventis Group devoted approximately €4.6 billion to R&D.

Source: http://www.sanofipasteur.ca

3.2.2 Canada's largest life sciences cluster

Canada's life sciences companies are predominantly located in cities within the Corridor. Québec and Ontario are the leading Canadian provinces in terms of sales and exports in the pharmaceutical, biotechnology and medical devices industries in Canada, as shown below:

- Québec and Ontario accounted for nearly 77% of total Canadian biotechnology revenues.[12]
- In 2007, biotechnology sales in Québec and Ontario generated 78% (CDN $3.3 billion) of total biotechnology sales in Canada.[13]
- The medical devices industry in Canada had approximately CDN $6.0 billion in sales, with 89% of those sales in Québec and Ontario.[14]
- Notable medical technology companies in Québec and Ontario include Abbott Laboratories, Agfa HealthCare, Baxter Corporation, BD Diagnostic Geneohm, Covidien, GE Healthcare, Medtronic Cryocath, Nordion Inc., Roche Diagnostics and Trudell Medical International.
- In 2009, the total pharmaceutical exports from the two provinces constituted 93% of total exports of the Canada-wide industry (CDN $7.7 billion).[15] The pharmaceutical and medical devices industries are substantial and supported by a steady historical growth in both provinces over the past five years.
- In addition to pharmaceuticals, Québec and Ontario contributed 85% of total Canadian exports of medical devices in 2009. [16]

Figure 1: Number of employees in the life sciences industry in Québec and Ontario

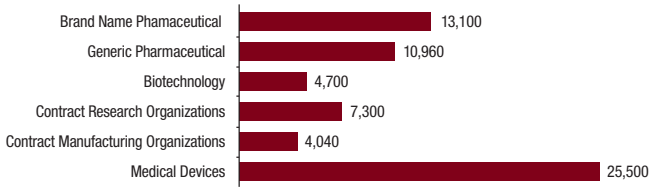
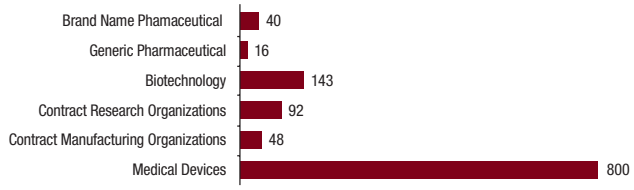


Figure 2: Number of companies in the life sciences industry in Québec and Ontario



Sources:
Rx&D website
CGPA website
E&Y Beyond Borders, 2009
Contact Canada Directory and best estimate
BIOTECanada
HTX, MEDEC, Scott's Directory and COACH
MDEIE, 2010
PwC Analysis

Figure 3: Pharmaceutical exports, Québec and Ontario, 2004-2009

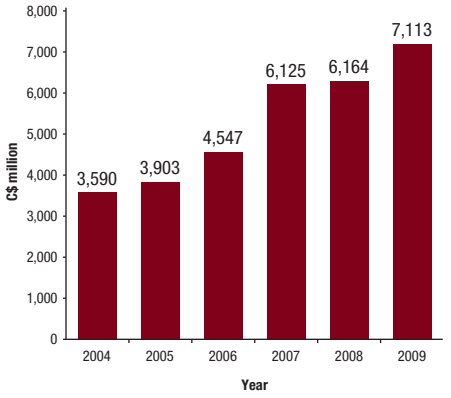
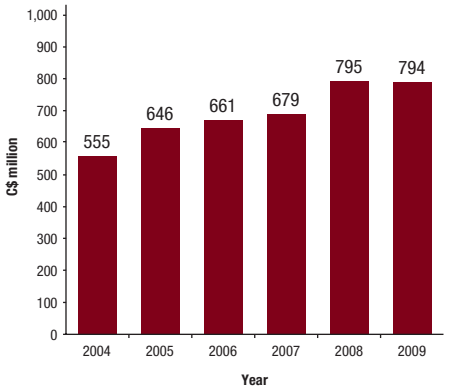


Figure 4: Medical equipment exports, Québec and Ontario, 2004-2009



Sources:
Statistics Canada, Pharmaceutical and Medicine Manufacturing, NAICS 325410
Statistics Canada, Medical Equipment and Supplies Manufacturing, NAICS 339110

Montréal InVivo

MONTRÉAL InVIVO
METRO MONTRÉAL'S LIFE SCIENCES AND HEALTH TECHNOLOGIES CLUSTER

Montréal InVivo, ACTOR of Innovation ACTOR of Growth

Montréal InVivo is the brand name for the life sciences and health technologies cluster of the Montréal metropolitan area. More than 620 organizations, including 150 research organizations and 80 subsidiaries of foreign companies populate this fertile breeding ground for innovation and creativity. In combination with a readily-available and highly-skilled workforce, this network of research facilities makes Metro Montréal one of the few places in the world capable of carrying out every phase of product development, from the initial research stage to the final product launch.

With its eleven institutions of higher education, including four major universities, Montréal is second only to Boston, Massachusetts, in terms of the proportion of university students per capita.

For more than a century, Montréal has hosted significant pharmaceutical research. Both Canadian and foreign-owned multinational pharmaceutical corporations have established R&D activities or their Canadian headquarters here, due to the presence of research universities and large public hospitals. In addition. Montréal InVivo hosts over 50 biotechnology firms that result from university spin offs or that were attracted following venture capital financing. Finally, Canada has the highest concentration of contractual research organizations (CROs) per capita in the world. Montréal is the active heart of this vital sub sector employing more than 4,000 people. The cluster includes companies such as Charles River Laboratories, Quintiles Canada, PharmaNet Canada Inc. and Algorithme Pharma.

Source: http://www.montreal-invivo.com/en/miv/in_brief.php

Mississauga

MISSISSAUGA
Leading today for tomorrow

Mississauga, a leading Canadian life sciences centre

Mississauga is home to the third-largest life sciences centre in Canada, with more than 153 companies. What is locally referred to as "pill hill," an area in Mississauga where a number of life sciences companies are located, this sector is a strong, vibrant and leading component of the Mississauga business community.

Skilled Workforce – Mississauga has demonstrated the capability to attract, train and retain skilled workers in the life sciences sector. The city is surrounded by some of Ontario's finest post-secondary institutions, offering a wide variety of educational opportunities. Mississauga, specifically, is home to the University of Toronto Mississauga, which is an internationally-renowned, research-based university offering one of the few Masters of Biotechnology programs in Canada in addition to a Masters of Innovation Management and an Academy of Medicine.

Location – Mississauga offers life sciences companies many advantages including a strategic location in the heart of a major air, road and rail network with a solid infrastructure making it a cost-competitive base for business. The city is home to Canada's largest international airport and within a day's drive are North America's richest markets with access to 164 million consumers.

More than 100 Fortune 500 companies have facilities in Mississauga.

Source: City of Mississauga.
http://www.mississauga.ca/business

3.2.3 A leading North American and global life sciences cluster

With a critical mass of companies and access to key talent, the Corridor competes on a global scale with other life sciences clusters in North America and worldwide.

The Corridor is home to 1,139 life sciences companies including the Canadian headquarters for global leaders such as Pfizer, sanofi-aventis, Novartis, GlaxoSmithKline, Roche, AstraZeneca, Merck, Johnson & Johnson, Eli Lilly, Bristol-Myers Squibb.[17]

Dominant presence of pharmaceutical companies and strong support from contract research and manufacturing organizations.

The pharmaceutical industry has a dominant presence within the Corridor, hosting key operations of global pharmaceutical leaders. Three research centres for multinational pharmaceutical companies are located in Québec: AstraZeneca, Boehringer Ingelheim, and GSK Biologicals. The Greater Toronto Area (GTA) has one of the most concentrated generic pharmaceutical industry clusters in the world.[18]

Biotechnology and pharmaceutical companies located in the Corridor also have strong support from contract research organizations (CROs).[19] Approximately 92 CROs – including Algorithme Pharma, Alphora Research Inc., PharmaNet Canada Inc., Cato Recherche Canada, Charles River Laboratories, Icon Clinical Research (Canada), Gamma Dynacare Medical Laboratories, Kendle, Maxxam Analytics, Nucro-Technics, Piramal Healthcare Torcan (Toronto) and Quintiles Canada – are located in the Corridor with access to a concentrated population of ethnic diversity. Contract manufacturing organizations include Patheon, Therapure Biopharma, Draxis Pharma, Therapex (E-Z-EM Canada), Confab Laboratories, Dalton Pharma Services, and Accucaps Industries Limited.

Other life sciences industry leading indicators in North America and beyond.

In terms of number of life sciences companies, the Corridor exceeds Massachusetts, BioValley and Medicon Valley, as shown in Figure 5 and 7.

The Corridor has the environment and infrastructure to conduct clinical trials efficiently and effectively, including: a centrally managed healthcare system to help streamline patient recruitment and tracking, well-established contract research organizations that manage Canadian and international trials, and strong networks of high quality clinical sites with staff trained in Good Clinical Practices (GCP).

Founded in 1999, the Population Health Research Institute (PHRI) located at Hamilton Health Sciences and McMaster University in Hamilton, Ontario, has conducted more than 50 global trials and epidemiological studies in more than 1,500 centres in 83 countries, involving over 500,000 patients. PHRI's research programs explore the causes and prevention of cardiovascular disease, diabetes, obesity and societal influences on health, perioperative vascular complications, and stroke. The institute is involved in researching risk factors for heart disease and stroke in urban and rural populations, developing countries, and throughout the stages of life, with specific emphasis on variations by ethnicity and geographic region. PHRI also plays an active role in the education of individual researchers, and in building capacity internationally for the development of global research programs.

Founded in 1954, the Montréal Heart Institute has the reputation of providing quality care that rivals what is provided by leading facilities around the world. Given the reputation the Institute has earned in clinical and basic research, it is often called upon to work in partnership with private business.

With the Montréal Heart Institute Coordinating Center the facility provides clinical research services to the pharmaceutical and biotechnology industries as well as to government-sponsored trials.

Figure 5: Number of life sciences companies in North America's leading centres

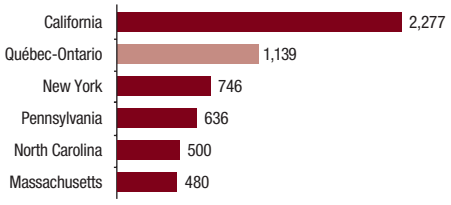


Figure 6: Number of employees in selected global leading life sciences clusters

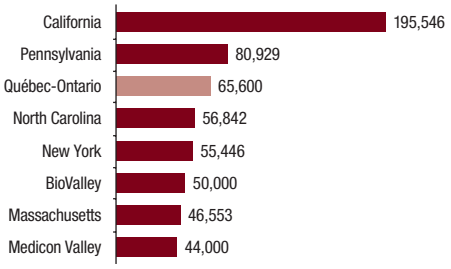
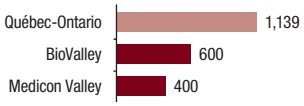


Figure 7: Number of companies in selected global leading life sciences clusters



Sources (Fig. 5-7):
http://www.califescience.org/california.html
http://www.nyba.org/WYSIWYGImage/file/NY_Bio_Industry_Report_FINAL.pdf
http://www.pennsylvaniabio.org/sites/default/files/industryfactsheet_2010.pdf
http://www.ncbiotech.org/biotech-basics/growing-the-economy
http://www.massbio.org/writable/editor_files/industry_snapshot_8.23.10_copy1.pdf
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http://www.baybio.org/about/about-biotech/northern-california-history/
http://www.biovalley.com/content.cfm?nav=3&content=13
http://www.mediconvalley.com/media/1033_895.pdf
http://www.phri.ca

3.2.4 Substantial R&D investments in the life sciences industry

The life sciences industry is among the most research-intensive sectors in the Canadian economy. Research and development (R&D) assets are widely recognized as the pipeline of technological innovation, and levels of R&D expenditures are widely accepted as reliable indicators of innovation capacities.

Within the innovation pillar of the World Economic Forum's Global Competitiveness Index, Canada ranked 11th in quality of scientific research institutions out of 133 countries.[20]

Research and development expenditures, patents, scientific breakthroughs and centres of excellence all attest to the combined Québec-Ontario history of successful innovation capabilities. Companies in the Corridor continue to make significant investments in R&D.

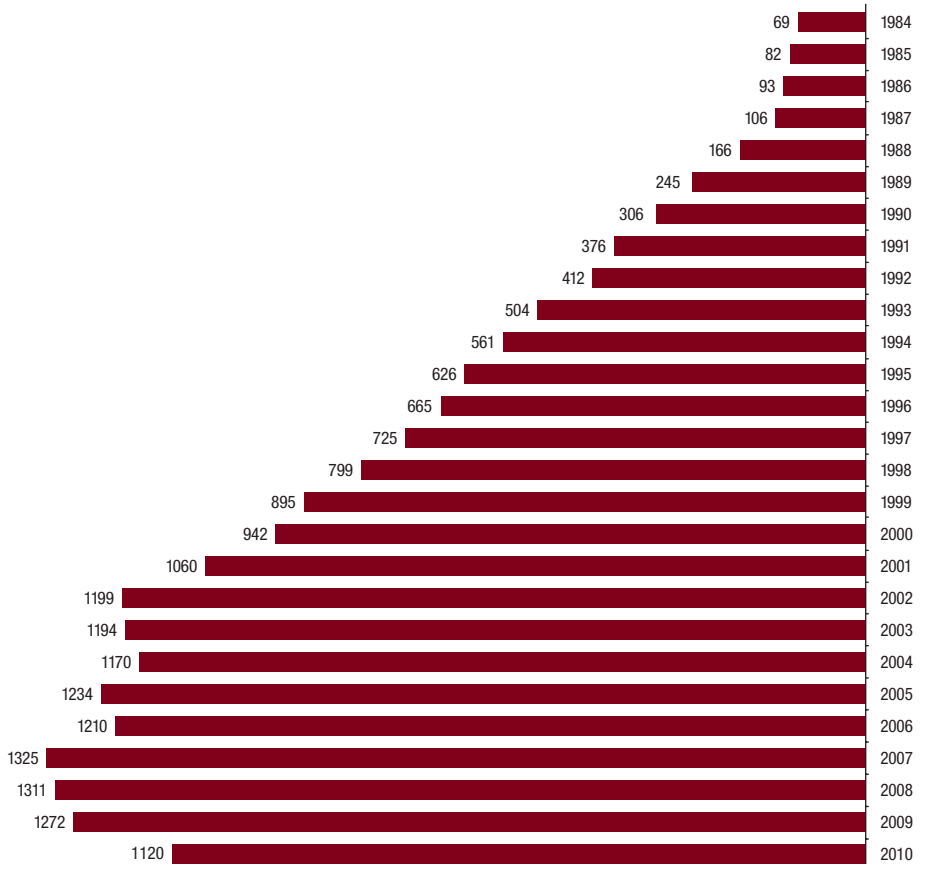
The Canadian biotechnology industry demonstrated its commitment to R&D by investing CDN $1.1 billion.[21] Québec and Ontario accounted for nearly CDN $1.0 billion, or 86%, of that amount.

The R&D expenditure in the brand-name pharmaceutical industry is also heavily concentrated in Québec and Ontario. In 2010, these provinces accounted for 86% (CDN $0.8 billion) of total R&D expenditure in Canada (CDN $0.95 billion).[22] The location of R&D facilities is strongly influenced by the location of major bioscience clusters affiliated with Canada's world-class universities, hospitals, and research institutes that are supported by government funding, largely clustered in the metropolitan areas of Montréal and Toronto.

The investments in R&D are not only substantial, they are also growing. This increase in R&D spending in the pharmaceutical industry is illustrated by the Figure 8, which shows the investments made by Rx&D[23] members in Canada over the last 23 years.

A list of Canada's top 100 corporate R&D spenders in 2009 also attests to the importance of R&D for the pharmaceutical and biotechnology industry[24] with 31 of the top 100 R&D spenders in Canada being pharmaceutical, biotechnology or medical devices companies.

Figure 8: Brand-name pharmaceutical R&D expenditures in Canada (C$ Millions)



Source: Patented Medicine Price Review Board – Annual Report 2010.

Québec Consortium for Drug Discovery (CQDM)

Unique public-private partnership

The CQDM is a non-for-profit organization that responds to the needs of the pharmaceutical industry by contributing to accelerating drug discovery and developing safer and more effective drugs.

The CQDM is a meeting ground for reflection and analysis by all stakeholders in the drug industry. Its mission is to identify, finance and support research projects carried out in partnership between the academic and hospital milieus in the public and the private sectors.

Initial financing for the CQDM's operation is mainly provided by a grant awarded by the Governement of Québec as well as investments from Pfizer Canada, AstraZeneca Canada and Merck.

In 2011, Boehringer Ingelheim, GlaxoSmithKline and Eli Lilly Canada have joined CQDM together with the three founding industrial members, to strengthen innovative research in Québec. With the arrival of the new partners, the CQDM has launched the Explore Program, a new initiative aimed at testing new unconventional and highly innovative research projects that may strongly impact the drug discovery process.

Source: http://www.cqdm.org

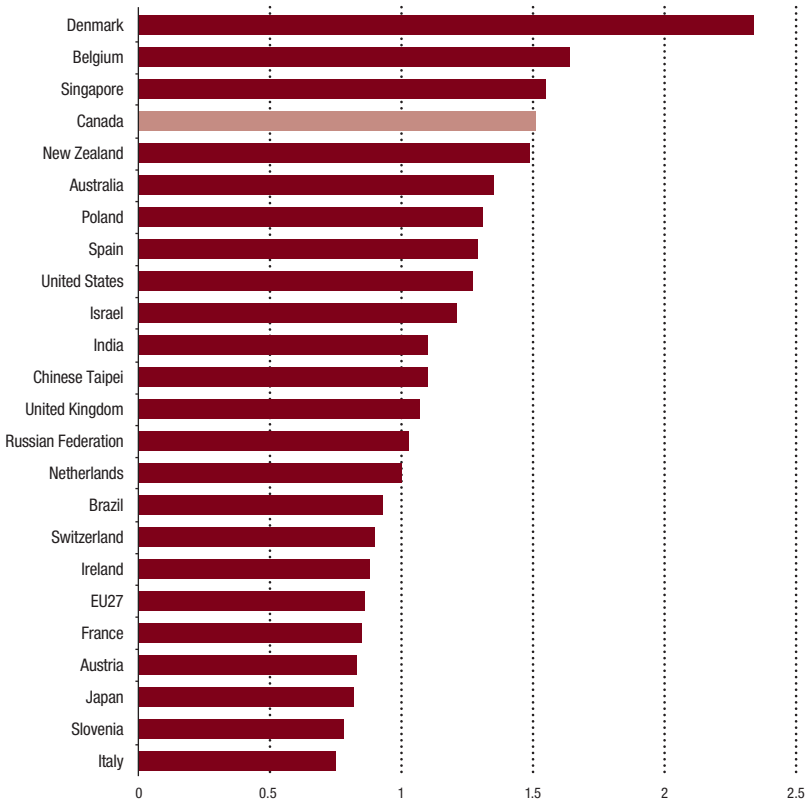
3.2.5 A leading territory for life sciences patents

Patent-based statistics reflect the inventive performance of countries, regions and firms, as well as other aspects of the dynamics of the innovation process (e.g., co-operation in innovation or technology paths).

Canada ranks fourth worldwide in terms of "revealed technological advantage in biotechnology."

The Organisation for Economic Co-operation and Development (OECD) has developed a metric to demonstrate the importance of an industry to a country based on technological performance. It considers the number of patents in a specific area on a national basis. The metric for the biotechnology sector, the "revealed technological advantage in biotechnology," is calculated as the share of biotechnology in the country's patents relative to the share of biotechnology in total patents. Specifically, the more biotechnology-related patents registered in a country relative to its total number of patents, the higher a country scores in this index and the more important that industry is for that country. In this listing, Canada ranks fourth worldwide where the Corridor is investing the majority of R&D in Canada's life sciences industry. This illustrates Canada's position as a leader in technological innovation in the biotechnology industry.

Figure 9: Revealed technological advantage in biotechnology, 2004-2006



Source: OECD Patent Database, 2009.

3.2.6 Leader in training and developing world-class talent

Canada has a deep pool of talent and a highly skilled labour force. According to a recent OECD report, Canada ranks number one in the percentage of people with a post-secondary education, as illustrated in Figure 10.

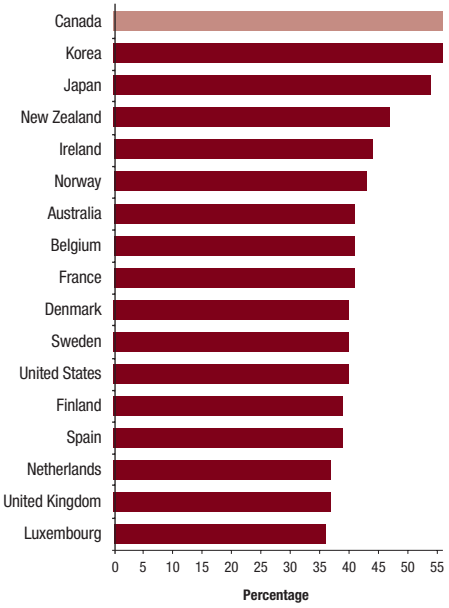
In 2007, 48% of 25-to-64-year-olds in Canada have a post-secondary qualification, higher than the average of the OECD countries (28%) and G7 countries[25] (32%). In Canada, progress is evident from the fact that while 39% of 55-to-64-year-olds have attained a post-secondary qualification, the rate is now 56% among 25-to-34-year-olds (OECD average, 34%).[26] The Corridor has an even higher rate of people with a post-secondary qualification, with an average of 52% in Ontario and Québec[27], thereby leading the Canadian average, the OECD average and the G7 average.

Access to a highly educated workforce is crucial in building a successful life sciences cluster. The innovative life sciences companies in the Corridor take full advantage of the world-class training programs offered by universities and colleges in the Corridor.

The human capital and creativity in both provinces offers an enormous capacity for innovation and growth potential supported by the strong education sector.

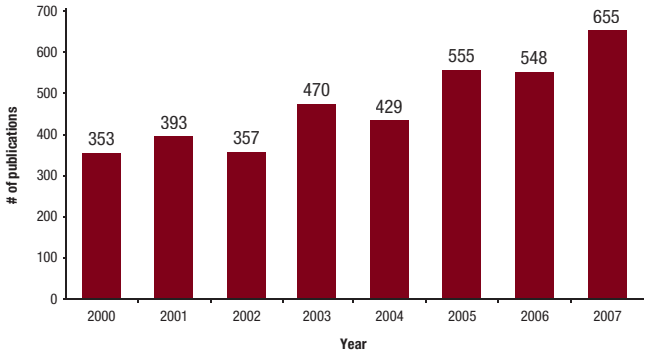
Universities are working together on a continuous and increasing basis in co-publishing scientific articles, as demonstrated in Figure 11.

Figure 10: Percentage of the population in OECD countries with a post-secondary qualification



Source: Education at a Glance 2009, OECD.

Figure 11: Number of scientific publications in life sciences that are realized by the Québec-Ontario collaboration



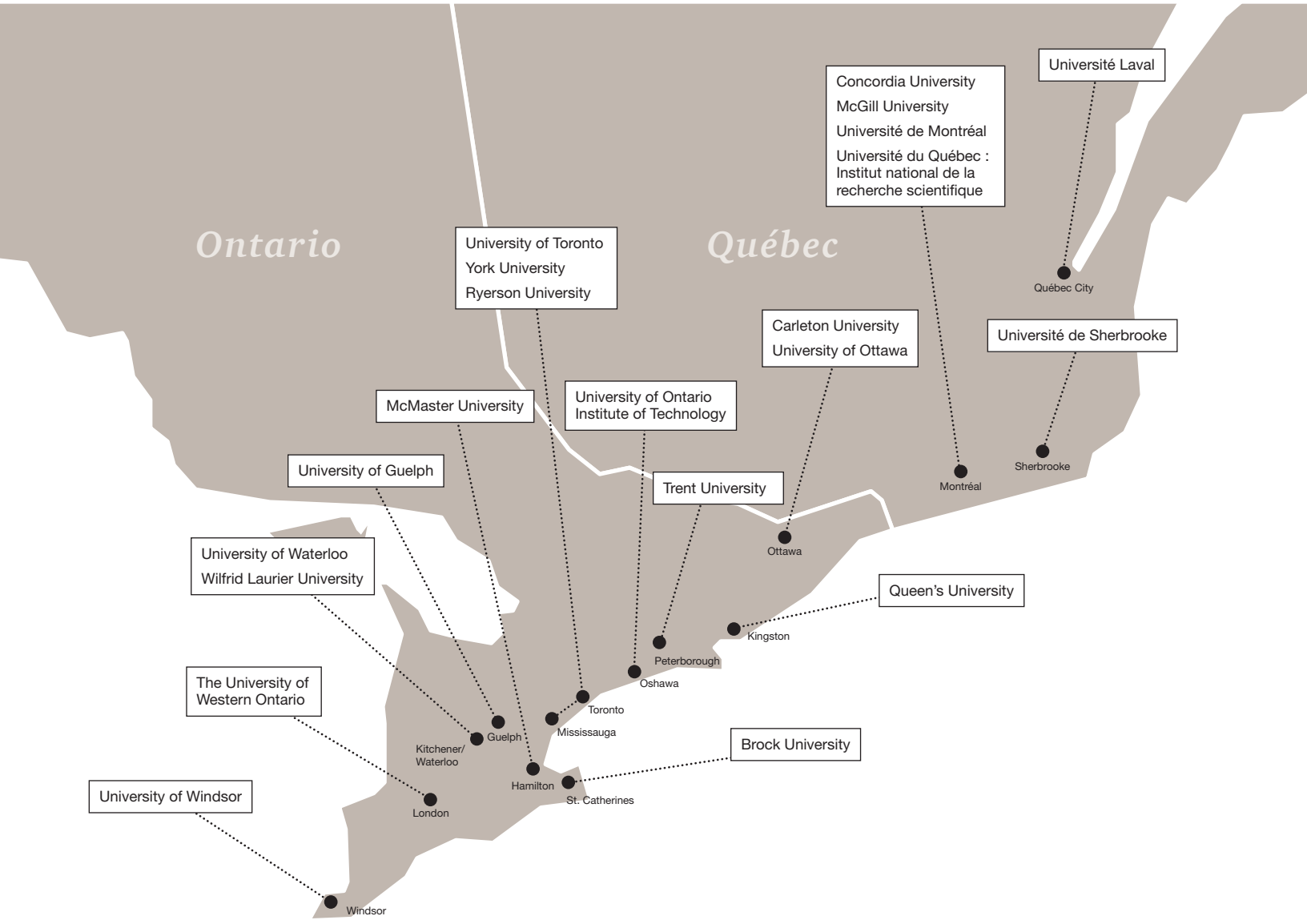
Source: ErQ / BDBQ (OST-UQAM) / Thomson Reuters. 2009.

490 undergraduate and graduate programs in biological and biomedical sciences.

The 21 leading universities in the Corridor offer more than 490 undergraduate and graduate programs in biological and biomedical sciences. In metropolitan Montréal alone, there are four institutions of higher learning that offer 35 specialized programs in life sciences.[28] Several universities, such as the University of Toronto and University of Waterloo, offer combined graduate programs in biotechnology and business administration. Université Laval offers an MBA program specialized in Pharmaceutical Management.

The Corridor's leading universities rate among the world's best.

- Two universities in the Corridor (McGill University and the University of Toronto) were ranked by the annual publication QS World University Rankings among the 30 best universities in the world, with McGill University holding the 18th position, and Toronto 29th.[29]
- Life sciences and biomedicine programs at three universities in the Corridor are rated among the top 100 programs in the world. The University of Toronto is ranked 16th, with McGill University placing 22nd, and McMaster University in Hamilton in 82nd place.[30]



Institute for Research in Immunology and Cancer

Opened in 2004, the Institute for Research in Immunology and Cancer (IRIC) brings together more than 350 researchers working in 24 laboratories led by world-renowned scientists from Canada, Europe and the United States.

IRIC also operates 12 state-of-the-art research platforms that contribute to a multidisciplinary research approach located in a six storey, 208,000 square foot research facility is located on the University of Montréal campus. IRIC distinguishes itself as a leading in systems biology, where chemistry, computer science, medicine, biophysics, engineering, and mathematics are combined with cellular and molecular biology to better understand complex living systems.

A first in North America: IRIC creates a Drug Discovery University-based Unit

IRIC and the University Research Group on Drug Discovery (GRUM) have combined their expertise with the Maisonneuve-Rosemont Hospital Research Centre to establish a Drug Discovery Unit at the Université de Montréal, a collaborative model that is the first of its kind in North America. The unit concluded agreement with Bristol Myers Squibb Company to identify new therapeutic agents.

Promising discoveries

IRIC has already developed several novel therapies currently at the clinical trial level, specifically, a new non-toxic chemotherapy treatment for leukemia and a new approach to increase the efficiency of blood transplantation in treating certain cancers.

Ontario Institute for Cancer Research

Ontario Institute for Cancer Research

The Ontario Institute for Cancer Research (OICR) is a centre of excellence that is moving the province to the forefront of discovery and innovation in cancer research. In its first five years, OICR has distinguished itself by taking on significant challenges in cancer research with multi-disciplinary, multi-institutional teams to tackle the incidence, diagnosis, management, and morbidity and mortality of cancer. OICR has invested significantly in translational research that will move new discoveries in prevention, detection and treatment of cancer directly from the bench to practical applications in patients.

OICR has more than 500 scientific staff (located at its headquarters and in research institutes and academia across the Province of Ontario) and an operating budget in 2011-2012 of over $110 million. It has key research efforts underway in small molecules, biologics, stem cells, imaging, genomics, informatics and bio-computing, from early stage research to Phase III clinical trials.

OICR has established major partnerships with public organizations: in Ontario, e.g., Cancer Care Ontario: in Canada, e.g., the Terry Fox Research Institute and five federal agencies: and internationally, with the world's foremost cancer and genome research funding agencies in Asia, Australia, Europe and North America. Major corporate partners include international companies such as Pfizer Global Research and GE Health Care, and discussions are ongoing with other commercial organizations.

OICR's Intellectual Property Development and Commercialization Fund has made 16 investments to advance Ontario discoveries to market and create high-value jobs. OICR's strengthening of Ontario's cancer clinical trials infrastructure has continued to attract significant biopharmaceutical investment in what has become one of the highest recruitment jurisdictions in North America for cancer clinical research.

In 2008 the international cancer research community established the International Cancer Genome Consortium (ICGC) to coordinate global efforts and cancer. The ICGC has 38 projects in 13 jurisdictions. Its goal is to produce the first database of genetic mutations involved in the major types of cancer. It is a 10-year initiative which will generate comprehensive catalogues of genomic data in over 50 different tumour types. OICR committed C$30 million to this project to study pancreatic cancer and C$5 million to study prostate cancer, with a further C$10 million in funding announced by the Government of Ontario in 2008. OICR was chosen by the ICGC to house the Data Coordination Centre for the Consortium and to host the ICGC's international secretariat.

Source: http://www.oicr.on.ca

3.2.7 A leader in large-scale research and discovery

The leading universities in both provinces are not only supporting higher education, but also act as world-class centres of research and innovation.

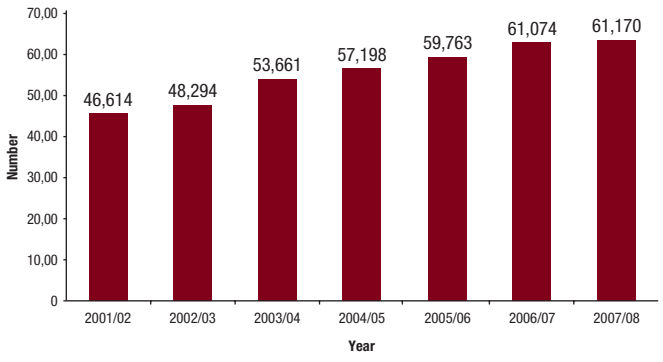
The Corridor has major and top-rated private and hospital research centres, such as McGill University Health Centre (MUHC), Centre hospitalier de l'Université de Montréal (CHUM), the University Health Network (UHN) in Toronto, Ontario, Centre Hospitalier Universitaire de Sherbrooke (CHUS), Centre hospitalier universitaire de Québec (CHUQ), the Ottawa Hospital Research Institute (OHRI), Lawson Health Research Institute at the London Health Sciences Centre (LHSC) and Robarts Research Institute (London, Ontario). Baycrest Research Centre for Aging and the Brain (Toronto, Ontario), Sunnybrook Research Institute at Sunnybrook Health Sciences Centre (Toronto, Ontario), Samuel Lunenfeld Research Institute of Mount Sinai Hospital (Toronto, Ontario), The Hospital for Sick Children (SickKids) Research Institute (Toronto, Ontario).

In 2008 the Research Institute of the MUHC and McGill University were awarded nearly CDN $100 million in federal funding by the Canada Foundation for Innovation (CFI), the largest infrastructure investment the CFI has ever made. The funding will be used to create and equip a new, state-of-the-art medical research centre as part of the MUHC's new facilities on Glen Campus in Montréal.[31] In addition, with 17,000 researchers, the University of Toronto (U of T) alone invests more than CDN $400 million annually in bio-medical research.[32] The U of T places second in the world in terms of embryonic stem cell research publications, behind only Harvard, but ahead of the Massachusetts Institute of Technology; Baylor University in Waco, Texas; and the University of California, San Francisco.

In November 2010, the Ontario Brain Institute (OBI) was established to become an internationally recognized centre of excellence in brain research, translation and innovation. The OBI will achieve its vision by initiating, funding, promoting and stimulating brain research, education and training.

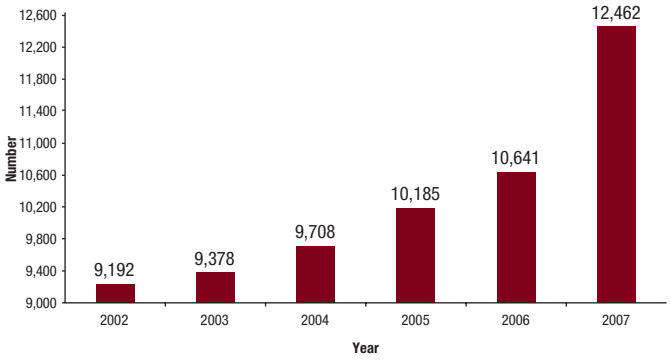
The research outcomes will be translated into clinical applications and commercialization opportunities related to the prevention, early diagnosis, treatment and management of brain diseases and disorders.

Figure 12: Québec and Ontario university enrollments, physical and life sciences and technologies, academic years 2001/02-2007/08



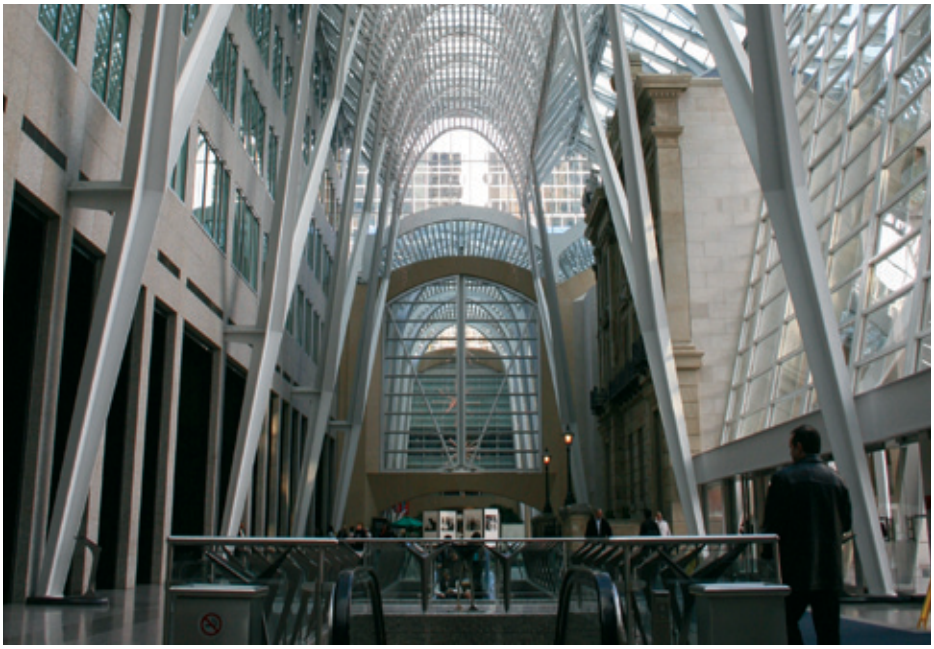
Source: Statistics Canada

Figure 13: University degrees, diplomas and certificates granted in Québec and Ontario in physical and life sciences and technologies, 2002-2007



Source: Statistics Canada

4. A Great Place to do Business



The Corridor further strengthens the value proposition of doing business in this region by creating one of the largest life sciences clusters in North America.

The Corridor is one of the most favourable tax environments in the world for innovation partnerships and provides access to numerous federal and provincial funding programs, as well as the majority of total Canadian venture capital. Moreover, the Corridor's advantageous geographic position offers easy access to major U.S. markets and the doorway to Europe markets. It also features an ethnically and culturally diverse population, two official languages and a well-developed infrastructure that includes six international airports and highways conveniently linked to numerous U.S.-Canada border crossings. Canada was one of the first G7 nations to return both GDP and employment to pre-recession levels. Finally, Canada has a demonstrated track record for committing to corporate social responsibility, specifically in the life sciences industry, and for supporting less-privileged countries around the world.

4.1 A favourable tax environment

Companies directly benefit from numerous tax incentives provided in Québec and Ontario and aimed at encouraging economic growth, many of these specifically established for businesses undertaking R&D and pursuing innovation.

The Corridor is home to one of the most favourable R&D tax environments in the world. The provincial and federal tax credits can cut the after-tax cost of an R&D expenditure in the Corridor by 50 to 60% or more.[33]

A recent study[34] demonstrated this favourable tax environment where Canada compared very favourably with other countries. In fact, Montréal and Toronto placed second and seventh respectively among 35 major international cities (with estimated metro-area populations of at least two million) in terms of favourable tax costs for conducting R&D research. Moreover, with regard to different types of business operations (manufacturing, services and R&D), Montréal and Toronto are continuously ranked within the top 10 favourable tax environments in the world.

Canada, partly as a result of this favourable tax environment, ranks second in business competitiveness among 10 countries including the G7 countries and three NAFTA countries.[35] It offers a lower overall business-cost environment for pharmaceutical companies, medical device companies and biotech companies compared to the U.S., U.K., France, Germany, Italy, the Netherlands and Japan.

The Ontario Business Research Institute (OBRI) tax credit and Québec Biotechnology Development Centres are just two examples of how provincial tax incentives support the life sciences sector in the Corridor.

The Government of Québec identified designated Biotechnology Development Centres (CDBs), in which companies involved in biotechnology innovation are eligible for refundable tax credits. The tax credits for companies within the CDBs (Laval, Sherbrooke, Saint-Hyacinthe or Lévis) cover (30% of) the wages of eligible employees, the cost of acquiring or renting specialized material, and eligible rental fees for specialized facilities.

OBRI tax credits aim to foster world-class research institutions in Ontario and to promote partnerships between business and Ontario non-profit research institutions. This is facilitated through refundable tax credits by the Ontario government to corporations for scientific research and experimental development expenditures (SR&ED) incurred in Ontario.

In addition, in March 2010, the Canadian government announced that significant bureaucratic hurdles for international investors will be eliminated. This change to section 116 of the Income Tax Act means non-Canadian residents will no longer have to obtain clearance certificates or pay withholding tax on the sale of shares in a Canadian life science corporation.

"This Corridor has enormous potential due to the diversity of its population, the quality of its universities and its access to a talented workforce with university degrees. It is truly an exciting and dynamic region uniquely positioned to build innovative industries and enhance research."

Robert A. Phillips, Former Deputy Director, Ontario Institute for Cancer Research

The Ontario Institute for Cancer Research's Cancer Genomics Platform is equipped with the latest next-generation sequencing technologies. OICR researchers work closely with the companies that develop sequencers to continually improve the equipment and increase their capacity. (Photo: CP Images/S. Lake)

4.2 Access to numerous sources of public funding

In the Corridor, funding, both private and public, is well established. The Corridor enables access to numerous sources of public funding supported by the federal and provincial governments. Some of these programs are specifically designed to support the life sciences industry; others are established for broader purposes, such as R&D and commercialization in general.

At a provincial level, there are already a considerable number of initiatives and policies currently in place to provide companies and institutes in the industry with funding. In fact, the industry is a major focus, as evidenced by the 2009 budget announcements in both provinces. Ontario announced that the Ontario Emerging Technologies Fund (OETF) would invest CDN $250 million over the next five years together with qualified venture-capital funds and private sector investors. The OETF targets, among other high-tech businesses, the life sciences industry. Similarly, Québec announced that life sciences, through the AmorChem Fund, is one of the targeted sectors when providing CDN $125 million to create seed funding. Moreover, Québec government, in partnership with institutional and private investors, created in April 2009, the Teralys Capital Fund. This $825 million fund finances private venture capital funds that invest in technology companies in sectors that include life sciences.[36]

An overview of key Corridor funding-related programs that support life sciences is provided in Appendix C.

Following are some examples of how public funding has been effectively used.

2011 (year announced)

The Strategic Support for Investment Program (PASI) provided funding of $3.5 million for an expansion of **Pharmascience's** manufacturing operation in Montréal. The $38 million project allowed Pharmascience to modernize and expand its drug manufacturing plant and continues to be a Canadian leader in the manufacturing of generics.

2010 (year announced)

Mississauga, Ontario-based **Therapure Biopharma** provides its clients and partners with customized solutions for the development and manufacture of highly complex biological therapeutic products. Therapure Biopharma will receive a CDN $4.19 million grant through the Biopharmaceutical Investment Program to support a CDN $27.9 million expansion of their bio-manufacturing facility. This will further augment their capacity in the development, manufacture, purification and packaging of high-quality biological therapeutics.

Scarborough, Ontario-based **Teva Canada**, a subsidiary of Israel-based Teva Pharmaceuticals Industries Limited, the world's largest generic pharmaceutical company, is investing $56 million to expand its Stouffville, Ontario production plant. Ontario is providing a $6.5-million grant from the Next Generation of Jobs Fund to Teva Canada. More than half of the drugs produced by Teva in Canada are exported globally.

The Strategic Support for Investment Program (PASI) provided funding of $3.8 million for an expansion of **Galderma** manufacturing operation in Montréal. The $38 million project allowed Galderma to modernize and expand its drug manufacturing plant and become a world class center of excellence for the production of liquid, ointment and cream. Appendix C presents more detail about PASI program.

In March 2010, the government of Québec announced a contribution of 9M$ in 3 years (3M$ a year) to the Québec Consortium for Drug Discovery (QCDD), whose mission is to identify, fund and support research projects carried out in partnership between the academic and hospital milieus in the public sector and the biotechnology and contract research organization (CRO) in the private sector.

In September 2010, the Ontario Emerging Technologies Fund co-invested in two young life sciences companies. They co-invested with the CTI Life Sciences Fund in **NeurAxon Therapeutics** targeting migraines and co-invested with the Business Development Bank of Canada in **Natrix Separations**, a provider of innovative solutions for the separation of biologically active compounds.

2009 (year announced)

The Ontario Institute for Cancer Research (OICR) and the Princess Margaret Hospital research arm - Ontario Cancer Institute are at the forefront of global expertise in genomics, cancer stem cell research and cancer metabolism. It's their expertise that the world's largest pharmaceutical company, **Pfizer**, is tapping into to help identify new molecular targets and biomarkers. This collaboration is supported by a $900,000 investment from Ontario's Biopharmaceutical Investment Program to develop more effective drugs aimed at detecting and treating colorectal cancer.

Agfa HealthCare, a member of the Belgium-based Agfa-Gevaert Group, is a leading provider of IT-enabled clinical workflow and diagnostic image management solutions, and state-of-the-art systems for capturing and processing images in hospitals and healthcare facilities, was awarded a CDN $29 million grant from the Next Generation of Jobs Fund to support the growth of Agfa HealthCare's research, development and regional operation centres in Toronto and Waterloo, Ontario – a total company investment of approximately CDN $200 million.

Purdue Pharma Canada will receive a $4.9 million grant from the Biopharmaceutical Investment Program to support a $32 million advanced manufacturing and R&D investment.

In October 2009, **Génome Québec** received $30 million over 3 years from the government of Québec to strengthen Québec's competitiveness in genomics.

2008 (year announced)

Two of Canada's leading pharmaceutical companies are joining forces with the **Fonds de la recherche en santé du Québec** (FRSQ) and **Ministère de la Santé et des Services Sociaux du Québec** (MSSS) to help in the battle against chronic pain. The partnership—a first in Canada—is designed to strengthen what is already the country's leading pain research and treatment network, the Québec Pain Research Network (QPRN), which links pain clinics at Québec's four university-hospital networks and more than 75 doctors and researchers specialized in chronic pain.

Under the partnership, Pfizer Canada, AstraZeneca, the FRSQ and MSSS will provide $4.35 million over four years to fund research and education that will improve our understanding of chronic pain and help doctors diagnose and treat pain more effectively.

The FRSQ (the health-research funding arm of Québec's MDEIE) has committed $2 million over four years, Pfizer Canada $1.2 million over four years, AstraZeneca $750,000 over three years, and MSSS $400,000 over four years.

Sanofi pasteur in Canada, the vaccines division of the sanofi-aventis Group, received a contribution of nearly CDN $14 million from Ontario's Biopharmaceutical Investment Program to support a CDN $101 million state-of-the-art R&D centre at its site in Toronto, Ontario.

In April, **Alethia Biotherapeutics** secured CDN $2.4 million in financing from the BDC Venture Capital and GO Capital Fund.

This investment will allow Alethia to initiate the pre-clinical development of therapeutic monoclonal antibodies for the treatment and prevention of severe bone loss, ovarian cancer and metastatic breast cancer, indications for which there are currently few therapeutic options.

ARCTIC Project

Ontario / Québec collaboration tackles developing a test for colorectal cancer

ArcticDX Inc.

Assessment of Risk for Colorectal Cancer Tumours in Canada (ARCTIC) Project and ArcticDx Inc.

In Canada, more than 16,000 new cases of colon cancer occur on average each year; 6,000 resulting in death. Effective, early intervention could save many of these lives. Although researchers have not yet identified the genes responsible, they do know that heredity plays a role—as many as 20% of cases occur in families. By uncovering key genetic factors that predict cancer susceptibility, researchers will be able to create tests to identify individuals at risk—and save lives.

In 2004, lead investigators Drs. Brent Zanke (Cancer Care Ontario) and Tom Hudson (then McGill University, now the Ontario Institute for Cancer Research) assembled the ARCTIC project team with the objective of developing a test to predict peoples' genetic susceptibility to colon cancer. Through DNA genotyping, the ARCTIC program worked to identify patterns of mutation by comparison between colorectal cancer samples and control samples, to develop a predictive test for genetic susceptibility to colon cancer and to assign specific markers to risk categories for all members of the population.

In addition to leading to high-impact publications[37], the intellectual property arising from the ARCTIC project has been licensed exclusively to ArcticDx Inc., a private company incorporated federally in Canada.

Sources:
http://www.ontariogenomics.ca/research/project/49
http://www.arcticdx.com/about.jsp
http://www.law.utoronto.ca/healthlaw/ARCTIC/arctic.html

MaRS

MaRS drives social and economic prosperity through innovation

MaRS is a non-profit innovation centre connecting science, technology and social entrepreneurs with business skills, networks and capital to stimulate innovation and accelerate the creation and growth of successful Canadian enterprises.

MaRS drives social and economic prosperity through innovation. A non-profit organization, MaRS connects the communities of science, business and capital and fosters collaboration among them.

This happens physically through location of research labs, companies of all sizes, business advisors, investors and professional services within the MaRS Centre and more broadly through hands-on advisory services for start-up companies across Ontario, entrepreneurial programming, structured networks and an expanding electronic community at marsdd.com.

Located in Toronto's Discovery District—two square kilometres that have been designated as the city's centre of innovation—the MaRS Centre is the gateway to Canada's largest concentration of scientific research, anchored by major teaching hospitals, the University of Toronto and more than two dozen affiliated research institutes. The Centre is also close to the Bay Street financial district, provincial legislature, key government organizations, as well as arts and cultural attractions.

Sources
http://www.marsdd.com
http://www.torontodiscoverydistrict.ca/Page.asp?IdPage=5796

"Montréal and Québec act as a cultural bridge between the U.S. and Europe, with the capability to attract Europeans. Ontario has a strong entrepreneurial culture, as shown by the MaRS initiative in Toronto's Discovery District."

Phillippe Walker,
Interim Global Vice President, CNS and Pain, Astrazeneca Canada

Photo courtesy of MaRS/Ben Rahn-A-Frame Inc. 2005

4.3 Broad access to private funding

Funding for private companies and institutions in the life sciences industry depends heavily on investments from venture capitalists, angel investors and strategic partners, as they play an important role in moving innovations from the laboratory to the global marketplace.

Major investments by venture capitalists

In 2010, the Montréal and Toronto region received the biggest portion of venture capital investment with 26% (300M$) for each city. With the Ottawa region, the corridor received, in 2010, 59% of the invesment in Canada.[38] In 2010, Québec and Ontario ranked fifth in terms of venture capital disbursements in North America, as illustrated in Figure 14. In 2010 a few notable transaction happened in Québec:

- CDN $16 million in Gemin X Pharmaceuticals, Montréal, April 20th
- CDN $12 million in Æterna Zentaris, Québec city, June 21st
- CDN $10 million in Medicago, Québec city, May 13th.

"We're in a global economy and relevant partnerships can be of mutual support."

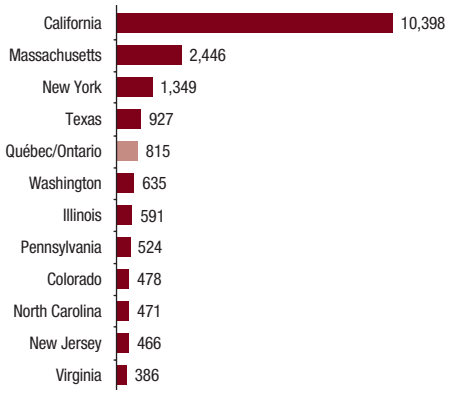
Morris Milner,
Former President and CEO,
htx.ca – the Health Technology Exchange

Life sciences absorb the largest share of Canadian venture capital

In 2010, the Canadian life sciences industry received CDN $286 million, approximately 26% of the total venture capital investment in Canada (CDN $1.1 billion), as reflected in Figure 15.[39]

Moreover, the Toronto Stock Exchange (TSX) Group and TSX Venture Exchange (TSXV) provide additional access to equity capital. More than CDN $360 million in equity capital was raised for Toronto TSX and TSXV listed life sciences companies in 2009.[40] TSX and TSXV list 136 companies,[41] and while TSX trails NASDAQ based on the number of listed life sciences public companies, it is larger than the American Stock Exchange (AMEX) and the London Stock Exchange.[42]

Figure 14: Venture Capital Disbursements in 2010 in North America by Province and State (C$MM)



Source: Thomson Reuters, 2011.

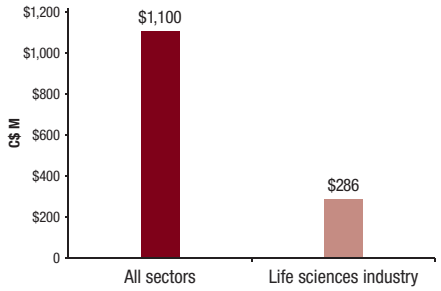
4.4 A great place to do business

The Corridor is a great place to do business due to its large, skilled and diversified labour force, its strategic location, the strength of its transportation network, and its ethnic and cultural diversity.

Fully integrated within North American networks, the Corridor's transportation system allows easy access to major U.S. markets, and 90% of the Canadian population is located within 160 kilometers (100 miles) of the U.S. border.[43] Québec and Ontario are the key points of entry for international trade with the U.S. economic base and large consumer markets, and these two provinces comprise a secure and efficient hub for trade from the Pacific and Atlantic coasts. The Windsor-Detroit border crossing is the busiest trade corridor in North America. Every year, more than 16 million trucks and cars and $140 billion in goods pass through the gateway. Québec and Ontario offer direct access to 135 million North American consumers within a 1,000-kilometre radius, less than a one-day drive.

The Corridor's transportation system includes many ports along the St. Lawrence River and the five Great

Figure 15: Venture Capital Investment in 2010 in Canada (C$MM)



Source: Thomson Reuters, 2011.

"Most international companies don't see a difference between Québec and Ontario. Because it's a global market, decisions are being made by companies investing in many countries and they don't see a division. I am committed to having our organization build links with Québec because industry has told me it is necessary."

Tom Hudson, President and Scientific Director, Ontario Institute for Cancer Research

Lakes, as well as six international airports including three of Canada's four largest international airports — Montréal's Pierre Elliott Trudeau International Airport, the Ottawa International Airport and Toronto's Lester B. Pearson Airport, which is Canada's premier air passenger and cargo gateway and is serviced by more than 75 carriers offering non-stop service to 29 Canadian and 47 United States destinations and same plane service to 76 other international cities. Two national railways and major highways provide links between all key facilities, offering safe, secure and reliable access to the rest of the continent.[44]

Furthermore, ethnic diversity offers a crucial factor in performing successful clinical trials. Canada is recognized for its ethnic diversity, with people from numerous backgrounds and a large percentage with mixed ancestry.

Finally, Canada has a proven track record for donations and philanthropy in the life sciences industry, demonstrating a commitment to corporate social responsibility in supporting both local charities and developing countries around the world. Among such examples are the following:

- The McLaughlin-Rotman[45] Centre for Global Health harnesses the advances of innovative technology for global health equity.
- For 50 years, the Gairdner Foundation[46] has awarded leading medical research scientists through the Canada Gairdner International Award, among the most prestigious of honours in biomedical science.
- The key objective of the best care for life campaign, a Partnership of McGill University Health Centre Foundation, is ensuring that the MUHC's research institute can maintain its status as a scientific leader. Of the campaign's $300 million total, $50 million has been earmarked to support research. Our researchers are already benefiting from several generous leadership gifts, including support for research into peanut allergies in children, geriatrics and diabetes.

5. Next Steps for the Corridor

Québec and Ontario are known worldwide as leaders in fundamental research in life sciences and home to many Canadian and international life sciences companies. Together, these two provinces have significant assets and strengths in this field, including outstanding research and academic infrastructure, a large talent pool and an attractive business environment. With increasing global competition, they are working aggressively together to further grow the life sciences industry and succeed in the global marketplace. More specifically, the Québec and Ontario governments are taking steps to foster the establishment of the Corridor and ensure its continued effectiveness and success, including the following:

- **Establishing an effective governance structure** for the Corridor. Québec and Ontario will strike a working group composed of representatives from both governments to create a joint governance structure for effectively coordinating and facilitating provincial activities in support of the Corridor. This includes consultation with and involvement of key industry stakeholders, and clearly defined key strategies and priorities (both short-term and longer-term), as well as roles, responsibilities and accountabilities, all focused on the continued differentiation, growth and success of the Corridor. Key performance metrics and targets for success will be defined and established, then monitored and measured on an ongoing basis.
- **Building on the Ontario-Québec Trade and Cooperation Agreement** as a foundation for establishing the Corridor. The elimination of economic and trade barriers between the two provinces are opening numerous opportunities for connecting life sciences communities in both provinces through the free movement of people, goods and ideas. In addition, the two provinces are working closely together to identify areas that could be improved for the benefit of the life science sector.
- **Developing and maintaining a comprehensive consolidated inventory of capacities of the life sciences industry within the Corridor,** including registries of researchers and companies and asset maps. This database of life sciences companies, organizations and institutions will act as a mechanism for networking and connections, thereby facilitating the process for stakeholders to move to commercialization if they lack specific expertise or contacts. It will also provide a basis for marketing the Corridor to other potential partners.
- **Studying methods to enhance access to venture capital and other sources of private financing, including angel investors and strategic partnerships.** Facilitating access to funding is considered a priority for both the Québec and Ontario governments. Along with the creation of the Corridor, both provincial governments are taking a leading role in studying methods of improving access to private and other sources of financing for life sciences companies.

Lastly, both the Québec and Ontario governments are strongly committed to the establishment, growth and success of the Corridor, and are taking an active leadership role in effectively promoting and supporting it. They are also taking a long-term view in developing the strategy, objectives and targets for the Corridor. As such, the Corridor will continue to be distinct, recognizable and successful — within Canada as well as internationally — as one of the leading life sciences clusters worldwide.

Appendices

Appendix A
Contextual Background

PwC was retained to develop a report, in conjunction with MDEIE and MRI, aimed at providing an overview of the shared life sciences economic assets along the Corridor in order to leverage the strengths and assets of both provinces to support the development of an international hub for discovery and collaboration. The establishment of the Corridor is anticipated to enable the life sciences sector in both provinces to enhance its competitive advantage globally.

This report was conducted in the context of the Ontario-Québec Trade and Cooperation Agreement signed on September 11, 2009. The vision for this collaboration between the two provinces is to develop a "modern, comprehensive economic and trade agreement that would build on existing bilateral procurement and construction labour mobility agreements and the two provinces' co-operation agreements."[47] The objective of the agreement is to establish a common business space between Québec and Ontario and that will reduce barriers to trade, increase labour mobility and improve the long-term economic prosperity of both provinces.

Together the two provinces represent the fourth largest economic zone in North America behind New York, Texas and California.

The research for this report included an overview of life sciences activities and capacities in Québec and Ontario with an emphasis on strengths in scientific excellence, research infrastructure, business climate and creative talent. For the purposes of this report, the life sciences industry is defined as being comprised of the following six elements:

1. biotechnology companies;
2. pharmaceutical companies;
3. medical devices companies;
4. contract research organizations (CROs);
5. contract manufacturing organizations (CMOs); and
6. academic research institutions.

The definition of the life sciences industry is discussed in more detail in Appendix B.

The report includes a review of secondary (predominantly publicly available) data and interviews with stakeholders in the life sciences sector in both Québec and Ontario as outlined in Appendix D.

Appendix B
Defining the Life Sciences Industry

For the purposes of the report, the life sciences industry has been broadly defined to include the following:

1. biotechnology companies
2. pharmaceutical companies (generic and research-based)
3. medical devices companies
4. contract research organizations (CROs)
5. contract manufacturing organizations (CMOs)
6. academic research institutions

The term "life sciences" encompasses all sciences that involve "organisms," including humans, animals and plants. However, life sciences often covers a broad scope of activities and is used in different contexts and for different purposes. Hence, it's imperative for this document to define what is to be included in the life sciences industry. Taking a definition of the life sciences industry that is too broad will distort numbers and make a comparison with other life sciences clusters less valuable. Using too narrow a definition, however, will not reflect the actual and needed level of activity in Québec and Ontario.

1. Biotechnology Companies

"Biotechnology" refers to techniques used to genetically modify living organisms in order to generate marketable products. The biotechnological industry is a collection of firms that use cellular and molecular processes, particularly recombinant DNA technology, to produce goods or services.[48] It is also important to note that academic laboratories — both university- and hospital-based — that perform basic and applied research contribute significantly to the biotechnology industry.

The following elements are included in the definition of "biotechnology":

- biotechnology research – e.g., genomics, proteomics;
- biotech drugs and therapeutic approaches – e.g., therapeutic proteins, gene therapy, stem cell therapy;
- agricultural biotech – e.g., round-up-ready crops, insect-protected crops; and
- industrial biotech – e.g., energy, environmental technology.

2. Pharmaceutical Companies

This industry comprises establishments primarily engaged in one or more of the following: (1) manufacturing biological and medicinal products; (2) processing (i.e., grading, grinding and milling) botanical drugs and herbs; (3) isolating active medicinal principals from botanical drugs and herbs; and (4) manufacturing pharmaceutical products intended for internal and external consumption in such forms as ampoules, tablets, capsules, vials, ointments, powders, solutions and suspensions. The Pharmaceutical industry consists of brand-name and generic drug companies.

Hence, the following elements are part of the pharmaceutical industry[49]:

- medicinals and botanicals;
- pharmaceutical preparations; and
- biological products (excluding diagnostics).

3. Medical Devices Companies

The medical devices industry merges science and engineering in the creation of innovations that benefit the healthcare system as well as society at large. Advancements in medical devices improve the accuracy of diagnoses, enhance treatments and cure of diseases, reduce long-term disabilities and help provide better medical care.

Following the North American Industry Classification System (NAICS), the following should be included[50]:

- in vitro and in vivo diagnostic substances;
- electromedical apparatus;
- analytical instruments;
- X-ray apparatus and tubes;
- laboratory apparatus and furniture;
- surgical and medical instruments;
- surgical appliances and supplies;
- dental equipment and supplies manufacturing;
- ophthalmic goods manufacturing; and
- dental laboratories.

4. Contract Research Organizations

Contract research organizations (CROs) specialize in conducting high-quality clinical studies, primarily on behalf of pharmaceutical, biotechnology and medical devices companies. They offer a diverse range of services such as clinical trial management, product development and regulatory affairs support.

CROs have become an increasingly important component of the life sciences research enterprise. From providing primarily pre-clinical services or single-service support in clinical monitoring and data management, the industry has evolved into one that provides full services, from the earliest stages of development through to clinical trials and commercialization of products.

5. Contract Manufacturing Organizations

Contract Manufacturing Organization (CMO), or Contract Development and Manufacturing Organization (CDMO), are organizations that serve the pharmaceutical industry and provide clients with comprehensive services from drug development through manufacturing.

Services offered by CMOs include, but are not limited to: pre-formulation, formulation development, stability studies, method development, pre-clinical and Phase I clinical trial materials, late-stage clinical trial materials, formal stability, scale-up, registration batches and commercial production.

6. Academic Research Institutions

Academic laboratories and research institutions are dedicated research organizations. Besides employing scientists focused on innovative discoveries in specific areas, they also train the next generation of scientists through graduate programs. Predominantly publicly funded, these institutes explore both basic and applied research questions involving life sciences. Academic institutions and publicly funded research organizations are often home to highly talented scientific researchers.

The geographical dimension of the Corridor

The areas in Québec and Ontario where there are significant activities in the life sciences industry define the geographical extent of the Corridor. These activities are mostly concentrated around the larger cities of these two provinces — Montréal, Ottawa and Toronto. However, municipalities such as Mississauga and Québec City show critical contribution to the life sciences industry as well. Accordingly, based on (i) the number of companies in the life sciences industry and (ii) academic institutions in several cities in Québec and Ontario, the Corridor is defined generally as the area from Windsor, Ontario, in the west, through major cities in both provinces to Rimouski, Québec, in the east. This is also illustrated in section 2 — The Québec-Ontario Life Sciences Corridor: Where We Are.

Appendix C
Key Corridor funding-related programs

Earlier in this report, several examples were mentioned regarding how funding programs were used to support companies in the life sciences industry. Some key funding related programs for the life sciences industry are summarized here.

Forum permanent d'échanges

In October 2009 when releasing the biopharmaceutical strategy, the Ministère du Développement économique, de l'Innovation et de l'Exportation committed to establish with the collaboration of the Ministère de la Santé et des Services Sociaux and members of the industry the Forum permanent d'échanges as stipulated in the Québec drug policy.

The committee, made up of leaders from the big biopharmaceutical companies and biotechnology firms, deputy ministers and assistant deputy ministers from the Ministère de la Santé et des Services Sociaux and the Ministère du Développement économique, de l'Innovation et de l'Exportation, and political representatives from the two government departments, will facilitate dialogue at the senior level and advise the Minister of Economic Development, Innovation and Export Trade and the Minister of Health and Social Services on possible solutions to develop and maintain an attractive, competitive business environment for the Québec economy and businesses in these sectors on the international scene.[51]

Québec Research and Innovation Strategy: Mobilize, Innovate, Prosper (QRIS)

Announced on June 28th, 2010, the second Research and Innovation Strategy with investment of $1.16 billion, pursues that of the first strategy which is to recognize research and innovation as the foundation of the province's competitiveness and as the engine of both economic development and job creation. It stems from the development of priorities that seeks to maximize the economic and social spinoffs from the Québec government's investments. This renewed vision is reflected in the consolidation of the past achievements of public research, the acceleration of innovation in Québec businesses, and the mobilization of stakeholders around promising projects for Québec's society.

The second QRIS must pursue the efforts initiated in 2007 to:

- consolidate the QRIS's past achievements and adjust certain measures in order to ensure that they produce maximum benefits;
- adopt a renewed approach and add new measures more closely focused on priority sectors and major developmental projects;
- rely on Québec's strengths to accelerate innovation in priority sectors and in businesses;
- remain competitive with our partners and competitors; and
- help Québec achieve the lowest carbon footprint.

Ontario Innovation Agenda

Ontario is investing in an aggressive innovation agenda to ensure Ontario is one of the winning economies in the 21st century. Supported by $3.2 billion in spending and a focus on seizing global market opportunities, this agenda builds on the strength of Ontario's creative environment, diverse culture, highly skilled workforce, world-class education system and internationally recognized research community.

It's aimed at igniting growth in the industries, including life sciences, that will shape our future and create Ontario's next generation of jobs and prosperity. And, it builds on this province's greatest strength: the talent and ingenuity of our people.

Québec's drug policy

Québec adopted a drug-medication policy in the spring of 2007, which is the first of its kind in North America. The integrated strategy is designed to ensure that economically disadvantaged people get better access to prescription medication and it encourages the rational use of medication. This policy also recognizes the pharmaceutical industry's significant contribution to the economy and encourages its development.

Québec's 15-year rule

The Québec Drug Policy confirms the maintenance of "the 15-year rule", adopted in 1994 as part of Québec's industrial development strategies. The 15-year rule guarantees manufacturers of innovative drugs that they will be fully reimbursed for the price of their products over a period of 15 years from the time the product is registered on one of the drug formularies, even if the patent for the drug has run out and there is a less expensive generic drug available. Québec is the only province offering patent extension term to protect an innovative drug.

Ontario Genomics Institute (OGI)

The Ontario Genomics Institute is a private, not-for-profit corporation focused on using world-class research to create strategic genomics resources and accelerate Ontario's development of a globally-competitive life sciences sector. Through its relationship with Genome Canada, the Ontario Ministry of Research and Innovation, and other private and public sector partners, OGI works to: identify, attract and support investment in Ontario-led genomics research; catalyze access to and the impact of genomics research and its outcomes; and, raise the visibility of genomics as well as its impact on society. For more information on OGI, please visit www.OntarioGenomics.ca

Ontario Network of Excellence (ONE)

The Ontario Network of Excellence is a collaborative network of organizations across Ontario, designed to help commercialize ideas from innovators, technology-based businesses, entrepreneurs, or researchers. The programs and services of the ONE include: educational programs, advisory services, industry-academic programs, customer development and information on financing programs and opportunities with potential investors.

Québec's Sponsorship Network

The network will be one of Québec's key initiatives to foster collaboration between biotechnology firms and large biopharmaceutical companies. It will comprise of recognized experts from the biopharmaceutical sector who, in collaboration with industry stakeholders, will assist entrepreneurs to pinpoint the necessary steps to increase the success of their product, which will include involving the most relevant stakeholders in developing an implementation strategy.

Québec Public Research Development Corporations

Québec has created four public research development corporations, namely Sovar, MSBI Valorisation, Gestion Univalor and Gestion Valeo. Public research development corporations are limited partnerships consisting of universities, affiliated research centers and university hospital centres. The mission of these groups is the market introduction of technologies originating from sound scientific research by limited partners, leveraging the value of intellectual property inherent in these technologies.

Génome Québec

Génome Québec is a major Québec initiative to promote research and the development of genomics in human health, forestry, agriculture, fisheries, the environment and bioinformatics. By focusing on a national genomics research project, it brings together industry, governments, universities, hospitals, research institutes, and the general public and promotes the study of genomic issues as they relate to ethics, law and society.

Fonds de la recherche en santé du Québec (FRSQ)

The FRSQ is a non-profit funding agency created in 1964. A pioneer in both Québec and Canada, the FRSQ advised the health minister in matters of medical research. Forty years later, the FRSQ plays a leading role in planning and coordinating the development of health research in Québec. The FRSQ allocates $90M annually in awards and grants for public-sector research into human health carried out today in universities and hospital-based research centres.

Québec Research Assistance Program

Designed to support projects or initiatives in the research and innovation fields. It is intended for non-profit organizations in the various sectors of science and technology research, innovation and dissemination, as well as for public research institutions, research institutions in the health and education networks, and businesses.

Québec Strategic Support for Investment Program (PASI)

Through the PASI, Investissement Québec (IQ) helps life sciences companies by providing interest-free loans, equity-type loans, and loans with interest repayable through royalties or contribution repayable through royalties, as well as loan guarantees. If no other form of financing is possible, IQ can provide a non-repayable contribution.

Research attraction and retention investment (PARIR)

With this program, Québec helps support the implantation and augmentation of private research activities. Admissible projects could benefit from subvention up to 15% of construction or modernization cost to facilities and up to 15% of research equipment acquisition costs.

Ontario Emerging Technologies Fund (OETF)

The $250M OETF will co-invest—with qualified venture capital funds and other private investors—directly into companies working within the focus areas defined by Ontario's Innovation Agenda, including life sciences.

Ontario Venture Capital Fund (OVCF)

The $205M OVCF is a joint initiative between the Government of Ontario and leading institutional investors to invest primarily in Ontario-based and Ontario-focused venture capital and growth equity funds that support innovative, high growth companies, including life science companies. Ontario has committed $90M to the Fund, with the balance coming from partner institutions.

Ontario – The Health Technology Exchange (HTX)

The $21M HTX program supports emerging and established Ontario-based companies to develop, produce and commercialize innovative market-leading Medical and Assistive Technologies. Market segments include: medical devices, diagnostic and medical imaging, healthcare IT and wireless health, and assistive devices and home healthcare.

Ontario – Investment Accelerator Fund (IAF) – Life Sciences Round

The $7M one-time fund helps accelerate the growth of Ontario life sciences companies. The fund is two-pronged and will invest up to $500,000 in early stage companies and up to $1M for investor backed companies.

The IAF is a seed-stage fund that assists emerging Ontario technology companies to bring their products and services to market.

Ontario Research Fund (ORF)

Through a commitment of $1.1 billion, Ontario is providing talented researchers with the support they need to undertake cutting-edge research. The Ontario Research Fund is designed to provide Ontario's research community with one window for research funding and provides funding for project operating costs, such as researcher's salaries (through The Research Excellence Program and the Ontario Research Fund - Global Leadership Round in Genomics & Life Sciences (GL2 Competition) and for new research infrastructure, such as lab equipment (through the Research Infrastructure program).

Amorchem seed fund

The $41.25M fund, is made up of contributions from Investissement Québec, FIER Partenaires (a Québec government-sponsored fund) and the QFL's solidarity fund as well as $8.25M from the private sector, of which $6.8M comes from pharmaceutical giant Merck. This is the third of three new venture capital funds the Québec government has created in recent months. The AmorChem Seed Fund will give Québec a new model for product and technology development in life sciences. This model will aim to validate and commercialize therapeutic, diagnostic and medical instrumentation products developed in universities, companies and research centres in Québec.

Québec GO Capital Co-Investment Fund

The Ministère du Développement économique, de l'Innovation et de l'Exportation (MDEIE), together with the Development Bank of Canada (BDC), established the GO Capital co-investment fund, which will provide CDN $50M for business creation and start-up in Québec's technology sector. GO Capital investments in the selected firms will match, dollar for dollar, the investments by BDC, bringing the available capital to CDN $100 million.

Québec AgeChem Ventures L.P.

AgeChem, which is part of the Fier public-private development fund,[52] is a venture-capital fund that invests in biotechnology companies specializing in developing compounds for the treatment of diseases related to the aging of the population. It represents a new source of financing for companies seeking capital at various financing and product cycle stages, particularly companies that operate in the field of illnesses relating to aging, such as osteoporosis, diabetes, cancer, arthritis, cardiovascular diseases and glaucoma.

Québec CTI Life Sciences Fund L.P.

A limited partnership that makes venture-capital investments in high-quality emerging life sciences companies at the start-up and clinical development stage primarily in Canada. It is also part of the Fier public-private development fund and has secured CDN $100 million in commitments from several investors.[53]

Ontario Early Researcher Award

The Ontario Early Researcher Awards program provides funding of up to $140,000 for promising, recently-appointed Ontario researchers to build their research teams of undergraduates, graduate students, post-doctoral fellows, research assistants, associates, and technicians.

Ontario Post-Doctoral Fellowship Program

The Ontario Post-Doctoral Fellowship Program provides outstanding scientists with $50,000, two year fellowships at Ontario universities. Post-doctoral fellows play an important role in academic research teams as contributing scientists and as mentors to graduate students.

Ontario Research and Development Tax Credit (ORDTC)

Provides a 4.5% tax credit based on eligible scientific research and experimental development (SR&ED) expenses carried out in Ontario.

Scientific Research and Experimental Development (SR&ED)

- A 100% deduction of all eligible SR&ED costs;
- A 20% investment tax credit on SR&ED expenditures; and
- Partnering with an eligible research institute in Ontario can further reduce SR&ED costs.

Québec's R&D tax credit

For R&D carried out in-house:

- A fully refundable basic tax credit corresponding to 17.5% of R&D salaries paid in Québec;
- A fully refundable tax credit of 37.5% on the first $3 000 000 of R&D salaries per year for a Canadian-controlled SMB.

Québec's Refundable tax credit Precompetitive Research Project under Private Partnership

This 35% tax credit applies in whole or in part to eligible SR&ED expenditures, notably salaries, current expenses and capital expenses. It is granted to each private business involved in the partnership.

Ontario Tax Exemption for Commercialization (OTEC)

10-year Ontario income tax exemption for new corporations that commercialize intellectual property developed by qualifying Canadian universities, colleges or research institutions.

Ontario Innovation Tax Credit (OITC)

- A refundable 10% tax credit for SR&ED expenditures;
- $2M annual cap for a maximum $200,000 credit; and
- Qualifying expenditures include 100% of current expenses and 40% of capital expenditures.

Ontario Business Research Institute Tax Credit (OBRI)

- Provides a 20% refundable tax credit for a scientific research and experimental development (SR&ED);
- Annual cap of $20M for a maximum credit of $4M; and
- Small businesses may claim the 20% OBRI tax credit in addition to the 10% OITC, for a combined tax credit of 30%.

Section 116 barrier eliminated for foreign Venture Capital Investment in Canadian firms

- Eliminates tax reporting for foreign investments in a Canadian high technology firm; and
- Eliminates tax clearance certificate requirement.

Québec tax holiday for foreign experts

Foreign researchers employed by a company in Canada that does R&D in Québec benefit from a provincial tax holiday on their salary for five consecutive years. It is a declining tax holiday computed as follows: 100% the experts' taxable income in the first two years, 75% in the third year, 50% in the fourth year and 25% in the fifth year. This measure also applies to other foreign experts; e.g., managers working in innovative fields.

Appendix D
List of interviewees

	Organization	Position	Name
Québec	Centre d'expertise en santé de Sherbrooke/Sherbrooke Innovation Commercialization Centre	Director	Roch Bernier
	iNovia Capital	Life Sciences Managing Partner	Cedric Bisson
	Consortium québécois sur la découverte du médicament	President and CEO	Max Fehlmann
	Centre québécois de valorisation des biotechnologies	President and CEO	Jean-Maurice Plourde
	BioQuébec Theratechnologies	Former Chairman of the Board Former President and CEO	Yves Rosconi
	Montréal InVivo	General Manager	Michelle Savoie
	Québec International	President and CEO	Carl Viel
	Centre de recherche sur les biotechnologies marines — Rimouski Marine Biotech Institute	Director	Guy Viel
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	Ontario Institute for Cancer Research	President and Scientific Director	Tom Hudson
	htx.ca - The Health Technology Exchange	Former President and CEO	Morris (Mickey) Milner
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	Toronto Region Research Alliance	Senior Advisor, Research Capacity Building	Walter Stewart
National	BIOTECanada	President and CEO	Peter Brenders
	Canada's Research-Based Pharmaceutical Companies (Rx&D)	President	Russell Williams
	Canadian Generic Pharmaceutical Association	Director of Public Affairs	Jeff Connell
	MEDEC (a national association for Canada's medical technology companies)	President and CEO	Stephen Dibert
	Bioniche Life Sciences Inc.	President and CEO	Graeme McRae
	Merck Canada Ltd.	Executive Director, Policy, Reimbursement and Communications	Gregg Szabo
	Astrazeneca Canada	Vice President, Research	Philippe Walker

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