



Biotechnology in Atlantic Canada

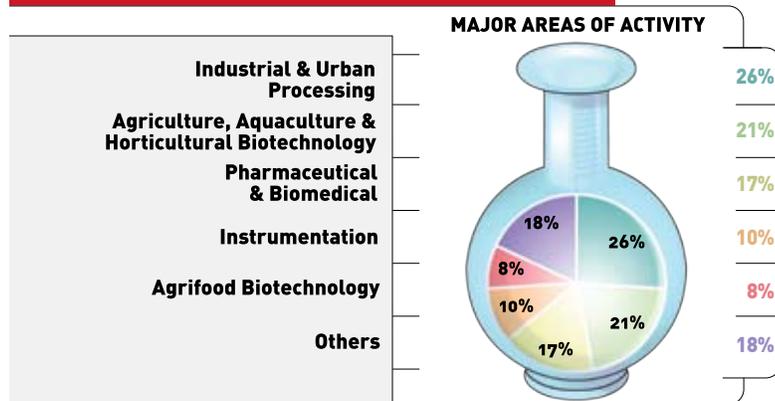
Canada has the second largest biotechnology industry in the world. In comparison to other industrialized countries, Canada's biotechnology industry has the fastest rate of growth in external patent applications and in business expenditures on research and development.

Within the Canadian landscape, Atlantic Canada is a stellar performer in this industry. According to *Competitive Alternatives: KPMG's guide to international business costs, 2006*, four Atlantic Canadian cities are ranked in the top five cities internationally for pharmaceutical production or medical devices manufacturing and Halifax, NS is ranked the number one city in Canada for clinical trials management.

CHARACTERISTICS

Atlantic Canada has a dynamic and innovative biotechnology industry that features some of the top new biotech firms in the country. Biotechnological innovation has spurred development in such key industries as aquaculture, forestry, fisheries, marine sciences, agriculture, health care and environmental management.

ATLANTIC CANADA BIOTECHNOLOGY INDUSTRY



source: Statistics Canada (2002)

Newfoundland and Labrador is becoming recognized as a world leader in marine biotechnology.

Nova Scotia's life science cluster now invests over \$100 million annually in research and boasts more than 60 core companies.

New Brunswick is a global leader in agricultural and environmental biotechnology.

Prince Edward Island is recognized for its leadership in the nutrition and health fields, and not only for people, but for fish and animals as well.

BIOTECHNOLOGY IN ATLANTIC CANADA

Atlantic Canada's biotechnology industry is diversified, undergoing dynamic growth and well supported by research and development at the industrial, institutional and government levels.

Atlantic Canada offers the best business cost environment within the G7 countries, an advanced infrastructure, strong research institutions, and a highly skilled workforce. The region also has highly developed research and development networks. Canada's tax treatment of research and development expenditures is the most favourable among major industrialized nations.

COMPARATIVE BUSINESS COSTS INDEX*

BIOTECHNOLOGY AVERAGE (BIOMEDICAL R&D, ELECTRONIC SYSTEMS DEVELOPMENT AND TESTING)

New York, NY	119.7	ATLANTIC CANADA	Charlottetown, PE	84.2
Detroit, MI	105.9		Halifax, NS	80.4
San Diego, CA	107.0		Moncton, NB	79.3
Boston, MA	113.5		St. John's, NL	80.4
Chicago, IL	103.3		Sydney, NS	76.1
Phoenix, AZ	102.4		Truro, NS	74.8
Atlanta, GA	95.8		Pictou, NS	74.6

source: *Competitive Alternatives: KPMG's guide to international business costs, 2006 Edition.*

* Business costs are expressed as an index, with the United States average being assigned the baseline index of 100. A cost index of less than 100 indicates lower costs than those in the U.S.

BUSINESS COSTS

According to *Competitive Alternatives: KPMG's guide to international business costs, 2006*, the Atlantic Canada region has the lowest business costs among the G7 countries. Add to that the available pool of science and technical graduates, generous research and development tax benefits, an excellent business and telecommunications infrastructure, and ready access to markets in the Americas and the European Union, and it's easy to see why Atlantic Canada has global appeal as a centre for biotechnology.

BUSINESS ENVIRONMENT

Biotechnology in Atlantic Canada is thriving. In recent years, the industry has experienced impressive growth in research commercialization and development. The following are just a few of the industry organizations that work together to develop and enhance the biotechnology sector in Atlantic Canada.

Atlantic Canada Bio-Industries

Alliance (Pan-Atlantic) is dedicated to increasing international awareness of the biotechnology industry in Atlantic Canada through trade, investment and industry development activities.

BIOTECHNOLOGY IN ATLANTIC CANADA

Springboard (Pan-Atlantic) facilitates technology transfer and commercialization of research among 17 universities from across Atlantic Canada. The network offers support in areas such as technology assessment, intellectual property protection, licensing, industry liaison, industry sponsored research and spin-off company creation.

BioAtlantech (Fredericton, NB) provides expertise, company incubation, capacity building and networking, particularly in the areas of agriculture and plant sciences.

BioNova (Halifax, NS) is a biotechnology and life sciences industry association in Nova Scotia. It supports the industry and promotes research commercialization through advocacy and the facilitation of conferences, workshops, educational events and networking opportunities.

Office of Research Services

(Fredericton and Saint John, NB) promotes collaboration in the areas of technology transfer and business development, and actively supports economic development initiatives to attract new firms to the province.

Life Sciences Research Institute

(Halifax, NS), a partnership of Dalhousie University, Capital Health and the IWK Health Centre, promotes world-class life sciences research and the commercialization of research.

NATI - Newfoundland and Labrador Association of Technology Industries

(St. John's, NL) accelerates the biotechnology industry by providing market research, program support to companies, human resource services and networking opportunities.

Technology PEI (Charlottetown, PE) advances the growth and development of Prince Edward Island's technology industry with bioscience as a key area of focus.

The Genesis Group (St. John's, NL) is a technology transfer and commercialization centre focused on intellectual property protection, joint venture partnerships, licensing and spin-off company formation. The centre also has a business incubator facility for high-tech companies.

LEADERSHIP

The four Atlantic Provinces are leaders in the biotechnology industry. Newfoundland and Labrador is recognized internationally for its expertise in marine biology. Nova Scotia's life sciences industry is a global leader in human health, medical diagnostics and marine sciences. Prince Edward Island and New Brunswick are at the forefront of global research in agricultural biotechnology.

Expertise in Healthcare

Immuno Vaccine Technologies Inc. (Halifax, NS) develops and commercializes immune-enhancement technologies for human and veterinary applications. Research and development is progressing towards developing vaccines for bacterial, viral and cancer applications. In 2005, the company won a Promising Early Stage Company award from Canada's National Biotechnology Association.

KytoGenics Pharmaceutical Inc.

(Dartmouth, NS) has developed proprietary platform technology for the production of biomedical grade, water soluble arboxymethyl/derivatives of chitosan. The company is working on medical applications such as surgical aids to reduce adhesions, orthopaedic products to promote wound healing and drug delivery devices.

MedMira Inc. (Halifax, NS) is the global market leader in flow-through rapid diagnostic tests for the clinical laboratory market. In 2005, the company was named to the 2005 TSX Venture 50™, Canada's top 50 emerging public companies listed on TSX Venture Exchange.

Newfound Genomics (St. John's, NL) specializes in complex gene disease research done through validation studies, novel gene discovery and genotyping. The province has a unique "founder population" which the company uses to investigate relationships between genes, human health and disease, particularly diabetes and obesity.

Ocean Nutrition Canada Ltd.

(Bedford, NS) is a leading global supplier of Omega-3 EPA/DHA food and dietary supplement ingredients. The company has integrated Omega-3 oils into numerous every day food products including milk, tortillas and yogurt. In 2005, the company added a 500-person, 40,000-square-foot manufacturing facility to support its rapid growth.

Precision Biologics (Dartmouth, NS)

develops products and services that enhance quality systems in clinical laboratories. Innovative products include a line of frozen plasmas used to diagnose blood coagulation disorders. The firm serves over 400 clinical laboratories in North America and Europe.

Vaccinium Technologies Inc.

(Fredericton, NB) develops health-related derivatives from wild blueberries and other fruit. It also provides technology and expertise in fruit production and processing for nutraceutical and other applications.

Expertise in Fisheries, Aquaculture and Marine Sciences **Acadian Seaplants Ltd.**

(Dartmouth, NS) is one of the largest independent manufacturers of seaweed products in North America. Innovative products include brewery clarifying agents, feed and fertilizer supplements, and plant growth biostimulants.

Aqua Bounty Canada Inc.

(St. John's, NL) is using cutting-edge transgenic technology to enhance growth rates in salmon, up to six times faster than those of standard bred salmon. The methods used to develop the salmon product, trademarked AquAdvantage, are also being applied to other aquaculture species, such as Arctic char, tilapia and trout. The company has licensing agreements with aquaculture ventures in New Zealand, Scotland, Colombia and the United States.

Novartis Animal Health Canada Inc.

(Charlottetown, PE) is a global leader in the research and development, testing and production of vaccines for the aquaculture industry. The company's vaccines and veterinary biological products are shipped worldwide.

Expertise in Agriculture and Veterinary Sciences

Atlantis Bioactives Corporation

(Charlottetown, PE) produces intermediate taxane ingredients for formulation and synthetic modification by biopharmaceutical companies. The company's proprietary process technologies combined with its manufacturing expertise provide competitive advantages and give the company a leadership position in marketing these quality ingredients to the pharmaceutical industry.

Centre of Excellence in Agriculture and Biotechnological Sciences

(Grand Falls, NB) is part of the New Brunswick Community College network. Its primary areas of focus are agriculture, agro-forestry, food science and biotechnology. Current assets include an experienced M.Sc. level scientist, and modern laboratories (including large scale fermentors).

CESAB provides skills based training in agriculture, agro-forestry, food science and biotechnology and plays a key role in agricultural training for the potato industry. The organization is unique in that it is the only institution in Atlantic Canada that provides diploma level training for biotechnologists.

Biofermentation is one of the key training modules that CESAB offers and expertise in industrial microbial fermentation and there are no institutions in Atlantic Canada that have pilot scale facilities to scale-up fermentation products or technologies to pre-commercial or commercial scale.

NovaLipids (St. John's, NL) develops and manufactures leading-edge liposome-based vaccine and drug delivery systems for the global, non-human health market.

Plant Select (Dartmouth, NS) uses Somatic Embryogenesis (SE) systems to produce ornamental spruces including a select line of blue spruce. It has a cryopreservation bank for several species and develops machinery for production and planting of SE derived conifer material.

Solanum Genomics (Fredericton, NB) generates proprietary genetic, biochemical and proteomic information. This data is used to increase the commercial value of seed, table and processing potatoes through the enhancement of agronomic, nutritive and processing practices.

Atlantic Canada boasts the strongest concentration of potato science and technology in the world. The region is one of North America's largest seed potato exporters, with more than 250 varieties currently being produced.

Nova Scotia ranks #3 nationally among the provinces in per capita health R&D funding to post-secondary institutions.

source: Conference Board of Canada 2005

Contract Pharmaceutical Manufacturing Capacity

PharmEng International, a contract pharmaceutical manufacturer, operates a state-of-the-art manufacturing facility in Cape Breton, Nova Scotia. The facility has the capacity to manufacture pharmaceuticals in solid and liquid dosages and is planning to expand into other dosage forms including suppositories, topicals and injectibles.

RESEARCH AND DEVELOPMENT

In Atlantic Canada, there are many clinical research organizations, universities and institutes that offer knowledge and support to the biotechnology industry. This infrastructure provides many millions of dollars of investment annually for biotechnology research and development.

Research and Development in Healthcare

Atlantic Cancer Research Institute (Moncton, NB) focuses on research related to breast cancer, leukemia and lymphoma. The institute has expertise in genomics, molecular biology, cell biology, immunology, bioinformatics, synthetic and organic chemistry as well in vitro and in vivo testing. The Institute also operates an Atlantic Canadian Microarray Facility.

Dalhousie University Medical School

(Halifax, NS) is ranked number one outside the United States and number four in the world in an international survey of best universities for postdoctoral fellows. Its research departments provide support for clinical and applied research projects at the Queen Elizabeth II Hospital. Main areas of research include cardiovascular research, immunology, infectious diseases and neurology.

Genome Atlantic (Halifax, NS) has well-established genomics platforms and conducts large-scale genomics research and development projects, attracting some of the top talent in the world and helping to build Atlantic Canada's profile as a prime location for genomics research. It is one of five centres established nationally by Genome Canada, a non-profit corporation dedicated to developing and implementing a nation-wide strategy for genomics research.

Memorial University of Newfoundland

(St. John's, NL) conducts a wide variety of health sciences research in areas as diverse as psoriasis, colorectal cancer, obesity and arthritis familial genetic diseases.

National Research Council - Canadian Bioinformatics Resource

(Halifax, NS) is the largest client-driven bioinformatics service provider in the world. The Centre provides collaborators with access to bioinformatics and computational biology applications, databases, large-volume data storage, basic training and helpdesk support.

National Research Council - Institute for Nutrisciences and Health

(Charlottetown, PE) conducts research into the influence of naturally-occurring compounds on human and animal health. Scientists are involved in the identification and characterization of compounds with nutritional and health benefits as well as the targeted exploration of the genetic basis of differences in nutritional and health effects.

University of Prince Edward Island

(Charlottetown, PE) conducts research in a variety of health sectors including breast cancer, diabetes and cardiovascular disease. Its Centre for the Study of Health and Aging focuses on factors affecting seniors' quality of life, such as nutrition and long term memory loss.

Research and Development in Aquaculture, Agriculture and Veterinary Sciences

Atlantic Forestry Centre of the Canadian Forest Services

(Fredericton, NB) conducts silviculture research in areas such as forest regeneration, tree genetic engineering and forest protection techniques.

Atlantic Veterinary College

(Charlottetown, PE) is focused on animal and fish health, biomedical research, clinical research and population health. Its services and resources include the Animal Productivity and Health Information Network, the Pork Production Innovation Group and the Lobster Science Centre.

Huntsman Marine Science Centre

(St. Andrews, NB) is leading a large scale genomics research project on cod aquaculture in Atlantic Canada. The "Atlantic Cod Genomics and Broodstock Development" project also involves The Atlantic Genome Centre in partnership with Genome Atlantic.

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Lobster Science Centre

(Charlottetown, PE) conducts lobster health research, specifically on host-pathogen interactions and infectious diseases. Potential commercial applications include the development of therapeutants and diagnostic tools.

National Research Council - Institute for Marine Biosciences

(Halifax, NS) conducts multidisciplinary research in aquaculture, natural toxins and advanced research technologies. This research includes expertise in bioinformatics, functional genomics, metabolomics and proteomics. Its Industry Partnership Facility and coastal Marine Research Station will enable companies to work side-by-side with researchers and gain access to advanced research technologies.

Nova Scotia Agricultural College

(Truro, NS) is undertaking collaborative research with industry partners in areas such as animal and agricultural sciences, engineering and the environment.

PEI Potato Quality Institute

(Charlottetown, PE) specializes in virus and other pathogen testing for companies that export potato products. The facility offers potato producers expert, efficient and expedient service without long-distance shipping concerns.

The Potato Research Centre

(Fredericton, NB) develops new cultivars and technologies for the production, handling, and management of potatoes. The Centre also maintains a national repository of potato gene resources and conducts research on soil management and conservation.

PROVINCES AND ABBREVIATIONS

- NB** - NEW BRUNSWICK
- PE** - PRINCE EDWARD ISLAND
- NS** - NOVA SCOTIA
- NL** - NEWFOUNDLAND AND LABRADOR

If you would like more information on this industry, please contact:

Atlantic Canada Opportunities Agency

P. O. Box 6051
644 Main Street
Moncton, New Brunswick E1C 9J8 Canada

Phone: 506-851-2573

Toll-free: 1-800-561-7862
(Canada and United States)

Fax: 506-851-7403

Internet: www.acoa.gc.ca/invest

e-mail: invest@acoa-apeca.gc.ca

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BIOTECHNOLOGY IN ACTION

Brain Repair Centre (Halifax, NS) is developing therapies for the treatment and repair of neurological and psychiatric disorders. Research areas include neural transplantation, neuroimaging, stem cell neurobiology, neuroprotective compounds, drug development, tele-health, robotics, retinal degeneration, motor control, rehabilitation medicine and cognitive neuroscience.

NewLab Clinical Research (St. John's, NL) is a world leader in clinical trials with the completion of more than 60 national and international clinical research studies for the pharmaceutical industry. Its current focus is on pharmaceutical, holistic, and cosmeceutical studies, as well as genetic research trials.



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