

# **TORONTO** STAFF REPORT

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May 19, 2006

To: Economic Development and Parks Committee

From: Donald G. Eastwood, General Manager,  
Economic Development, Culture and Tourism

Subject: Update on Toronto's Biotechnology Sector – A Cluster Overview  
All Wards

Purpose:

To provide an update on recent initiatives in Toronto's biotechnology sector, comment on the development of commercialization of innovative new technologies emerging from Toronto universities and research institutes and identify some challenges facing Toronto's biotechnology industry.

Financial Implications and Impact Statement:

There are no financial implications resulting from the adoption of this report.

Recommendations:

It is recommended that this report be received for information only.

Background:

The Chair of the Economic Development and Parks Committee requested staff to report on key sectors of the city's economy. This report provides intelligence on recent initiatives in Toronto's biotechnology sector, comments on the process of commercialization of innovative new technologies emerging from the universities and research institutes and reviews some of the challenges involved with moving Toronto's biotechnology industry forward.

Comments:

Toronto's ability to compete in global markets demands that we build powerful and successful technology platforms. Canada, and Toronto, were quick to embrace and develop Information Technology. This has led to many fundamental changes in the way we conduct business and how we communicate with each other. Biotechnology is another example of a technology platform where Canadian knowledge and expertise has been supported over the last decades, and where our successes have allowed us to emerge, and be recognized, as a global leader.

What is Biotechnology?

Biotechnology is only one of the sub-segments that comprise the bio-medical industry. Though the youngest (not much more than 20 years since its inception), Biotechnology has emerged globally as an exciting technology that is transforming the way in which we experience life.

Biotechnology is the use of living organisms to create new products that improve the quality of food, health and the environment. Biotechnology research has yielded diagnostic products that help doctors identify disease and perform other life-saving tests. It also produces therapeutic drugs that treat and help prevent many of the vicious molecular-based diseases that affect humans; diseases, such as Cancer, HIV/AIDS, Parkinson's, Alzheimer's and Muscular Dystrophy.

The focus of biotechnology in Toronto is essentially directed towards the development of diagnostic and therapeutic products for human health.

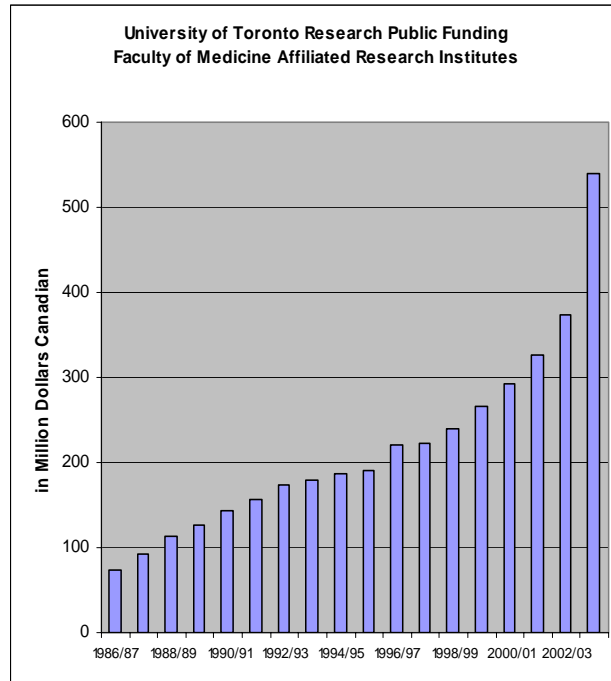
Cluster Overview

Canada is second only to the United States in the development of biotechnology in terms of number of companies. Ontario is ranked as the fourth largest biotechnology community in North America and within the top ten globally. While the provincial government recognizes no fewer than twelve (12) biotechnology clusters across the province, Toronto is clearly the largest with 80 to 85 percent of the sector established here. With almost 40 percent of Canada's biotechnology companies and home to Canada's largest and most research-intensive university and one of the largest base of teaching hospitals in North America, Toronto has a significantly important role to play.

Toronto's world-class research community and teaching hospital is the base from which start-up biotech companies emerge. Toronto's aptly named 'Discovery District' is the largest in Canada and ranks fourth in North America. The Faculty of Medicine at the University of Toronto, and its affiliated nine teaching hospitals and 37 research institutes, attracts more than \$500 million from public funding sources annually. Including investments from the private sector, the investment in Toronto's research projects amounts to over \$1 billion annually.

Public funding at the University of Toronto Faculty of Medicine Affiliated Research Institutes has doubled since 1999, as illustrated in Table 1.

Table 1



Toronto is in an excellent position to build on its strengths. The dramatic growth of biotechnology activity in Canada - from a handful of companies in 1990 to a current industry of more than 500 companies employing more than 25,000 - amply demonstrates the success of this sector over the last 15 years.

Toronto has benefited from the dramatic growth in biotechnology and has emerged as a key player both from a national as well as an international perspective. In addition to the large number of biotechnology companies in the city, many multi-national pharmaceutical companies have their Canadian head offices located here. Along with leading financial and business service firms (key requirements for the continued growth of biotechnology). Toronto clearly has the potential to be a global leader in biotechnology innovation and succeed in making this sector a significant factor in our continued prosperity.

Competition, globally, however, is fierce. Countries such as Australia, the United Kingdom, Germany, Japan and Ireland are investing heavily in research and development and are aggressively developing initiatives and programs to attract and retain scientific and business talent. Our record with respect to commercialization of research has been improving but we must do even better. To date there has been a lack of focus. The sector's ability to harness increased financial capital is limited and there is a critical shortage of highly-skilled talent. In order to maintain a leadership position and harness the huge potential of biotechnology, Toronto needs to address any weaknesses without delay.

The potential is huge and the challenges are significant. Though much work remains to be done and more resources are needed to support the development of this sector, the city is headed in the right direction and much needed infrastructure is now being provided. The following sections describe a number of Toronto-based initiatives that support the growth of the sector that are in progress.

#### Key Initiatives:

##### The Medical and Related Science (MaRS) Centre

The MaRS facility helps Canadian innovators and entrepreneurs create new technology start-ups and supports them on the road toward commercial success. Funded jointly by the public and private sectors, Phase One completed last year with 750,000 square feet was fully subscribed prior to its opening with over fifty (50) organizations connected to the innovation and commercialization marketplace, including legal and financial firms. Seventeen (17) start-up companies are located in the biotechnology business incubator. Over 2,000 people work at MaRS and thousands more participate in its events and programs annually. Later this year, construction will begin on Phase Two, an expansion that will provide an additional 800,000 square feet of research and commercialization facilities with completion slated for 2008.

The primary focus of MaRS is to provide incubation space for high technology start-up companies and to create powerful business networks nationally as well as internationally. These networks connect leaders from the scientific, business and investment communities to their international peers.

Beyond providing space for companies, academic research and business services, programs provided by MaRS include: a Business Resource Centre that accelerates the commercialization process. The centre provides specialized information resources and business tools, complemented by a network of experts, investment bankers and a host of other business advisors. The MaRS Collaboration Centre hosts a broad range of educational and networking events from scientific and technology conferences, entrepreneurial forums and business symposia to public lectures that advise and report on the many benefits that biotechnology and other forms of technology play in the lives of Canadians and people all over the globe.

The City of Toronto, through the Toronto Economic Development Corporation (TEDCO), provided MaRS with a loan to help get the project off ground. TEDCO is now in discussions with MaRS with respect to providing on-going support for its business incubation activities. The Economic Development, Culture and Tourism staff has also been talking to MaRS about its next phase of development, another 800,000 square feet at College and University and will coordinate an inter-departmental team to facilitate the implementation of the Phase II development.

### Donnelly Centre for Cellular and Biomolecular Research (CCBR)

The Donnelly CCBR also opened in the fall 2005 is located adjacent to MaRS. It's a ten-storey, state-of-the-art research building that provides 200,000 square feet for scientific investigators from the University of Toronto's Faculties of Medicine, Pharmacy, Applied Science and Engineering, and Arts and Science. The Donnelly CCBR is an open-concept, fluid research environment that encourages new approaches to biological research by stimulating unconventional interactions between scientists and technological disciplines.

The Donnelly CCBR also devotes an entire floor (more than 20,000 square feet) to the growing fields of 'bio-informatics' and 'computational biology' - the nexus of information technology and biology. The large-scale bio-molecular research projects at the CCBR create massive amounts of data, data that is essentially meaningless and undecipherable unless it is analyzed using new pattern sensing algorithms and high-speed computer systems to allow scientists to discern critical patterns that reveal new and important information regarding cell and organism functions.

Termed as a 'factory for Nobel Laureates' it is expected that the exceptionally high-calibre of scientific endeavors at the Donnelly CCBR will act as a magnet to attract outstanding scientists from around the world to Toronto. In fact, several new faculty members have already been recruited by the Donnelly CCBR from universities in the United States and Europe.

### BioDiscovery Toronto (BDT)

BioDiscovery Toronto is a non-profit technology commercialization organization consisting of renowned universities, teaching hospitals and research institutions located within Toronto's Discovery District. It was established to increase knowledge and awareness of the investment and partnership opportunities represented by the transfer of new, innovative technologies to the private sector.

BioDiscovery Toronto has developed three programs designed to enhance technology transfer and the growth of research investments by the financial community and industry.

'Discovery' identifies early-stage commercialization projects recognized as having a firm scientific and commercial foundation. These projects are provided with project management, business planning and business network resources to increase venture financing.

'Development' provides targeted funding at the 'proof of principle' stage and management expertise from knowledgeable commercialization teams. This will overcome limitations associated with intellectual property protection (patenting of new discoveries) and early stage business planning.

'Partnership' increases interactions with industry at all levels with greater and easier access by industry to scientific endeavors taking place in Toronto. It involves industry at the very earliest stages of scientific invention. The primary objective is to create a pipeline of projects and

products with the right characteristics - ones that will attract developmental financing and partnerships. A secondary objective is to provide the exchange of highly-qualified personnel with enhanced professional development and experience in business networking.

The City of Toronto was a founding partner in the initiative and is currently providing financial support to the project through the Economic Development Sectors Investment Program (EDSIP). Recently Economic Development, Culture and Tourism staff partnered with BioDiscovery Toronto members to market the City's biotechnology capabilities at the international BIO 2006 convention and tradeshow.

#### The Toronto Region Research Alliance (TRRA)

The TRRA is a non-profit corporation very recently established by the Toronto City Summit Alliance in collaboration with public and private organizations from the greater Toronto region that are engaged in research and its commercialization. These include: the City of Toronto, universities and colleges, research hospitals, private research institutes, leading companies, regional development organizations and other municipal, provincial and federal governments.

The TRRA's mission is to increase the awareness of the Toronto region as a world-leading centre for research and development. This will be accomplished by enhancing public and private research capacity, increasing the commercialization of research and by attracting new research and development companies while retaining and expanding the businesses already located here.

To achieve this TRRA will undertake strategic and coordinated actions with the goal of growing research capacity, building on current strengths and creating an environment that will develop, attract and retain the best scientific talent in the world. The focus will be on achieving a critical mass of top scientific researchers who, together with the required infrastructure in research areas, will allow the Toronto region to excel in international markets.

Economic Development, Culture and Tourism and TEDCO are now providing some financial support to the TRRA. Staff are in on-going discussions with the TRRA with respect to coordinating our work programs. Currently, the TRRA is an active participant in the development of the ICT Toronto marketing program.

#### Toronto Biotechnology Initiative (TBI)

The biotechnology industry is represented by TBI, a non-profit organization founded in 1989 to further the development of biotechnology in the Toronto region. With more than 400 members representing the biotechnology industry, academe, business service providers and all three levels of government, TBI is one of the world's largest regional biotechnology associations. It brings together the fields of research, business, academe and government through monthly networking meetings, and other programs involved in education (at the secondary and post secondary levels), regulatory affairs, finance, public awareness, technology transfer and international business.

Most recently, TBI formed the Biotechnology Council of Ontario (BCO), in partnership with other life science organizations in Ontario. The mandate of the BCO is to advocate on behalf of the biotechnology industry and develop a more supportive and effective business development relationship with the Government of Ontario.

TBI's central role is to build bridges and bring together all of the stakeholders linking the research, business and public interest communities. In addition, through active participation with Canada's national biotech organization, BioteCanada, and with the Biotechnology Human Resource Council, TBI is actively involved with the key issues and opportunities that affect the growth of biotechnology today and into the future. Through membership and participation in other organizations and their activities, TBI collaborates in the advancement of biotechnology regionally, nationally and internationally.

Over twenty states in the U.S. and the principal provinces and biotech cities and communities in Canada now have formal biotech strategies and are putting significant resources behind marketing efforts to lure biotech companies to their jurisdictions and to work with their existing firms to stimulate partnerships. A similar trend also exists internationally, where numerous countries and regions are currently actively soliciting biotech investments and partnerships and are working to attract highly-skilled workers to their locale. To maintain a leadership position it is imperative that Toronto intensifies its efforts in this regard.

The City of Toronto role:

Economic Development, Culture and Tourism's primary role in developing the sector is to forge connections and partnerships between businesses, institutions and governments. Many independent studies have shown that the importance of alliances and business partnerships with small and medium-sized enterprises is a significant one. Whether these alliances are research and development collaborations, licensing agreements or co-marketing arrangements, biotech start-ups need them in order to be successful. Toronto's major competitors have benefited from strong partnerships and alliances, and we must create an environment that encourages and supports biotech firms in their search for these collaborations.

There is a continuing challenge to brand and market the Toronto region as a leading centre for research and development. Knowledge-based industries are ready to invest in companies and communities that offer top research talent and an entrepreneurial flair for commercialization. Also important is a critical mass of companies that will serve as suppliers, service providers, partners and customers. Toronto possesses all of these attributes as well as competitive business costs and an excellent quality of life. The common challenge for all of these stakeholders is to face increasingly aggressive competition from other regions and nations.

Economic Development, Culture and Tourism staff work in a collaborative role with all of these stakeholders to help them move forward in an effective, cost-efficient manner by providing financial, intelligence, and consultative support. Staff work with them in a variety of roles to help them fulfill their mandates and build strong relationships with the biotechnology client base.

In addition, there are a number of other sector development initiatives that staff are working on that include:

- (i) An annual series of professional development workshops for senior level management that address key issues and opportunities affecting the biotechnology industry. These forums cover subjects such as financial investment, human resource development and retention and corporate governance. In addition, the workshops provide much needed peer to peer networking where senior decision-makers share experiences.
- (ii) The Sanofi Aventis Biotechnology Challenge (SABC), an annual event for the past 12 years and now in 11 cities across Canada, is a program originally created by Economic Development, Culture and Tourism staff, for talented secondary school science students to expose them to the challenges, rewards and satisfaction of a career in the life sciences.
- (iii) Directly marketing Toronto as a preferred site for biotechnology companies and building awareness of the opportunities for investment and partnership to international investors and the biotechnology industry, by participating at trade show, hosting journalists and presenting the City's strengths to foreign delegations.
- (iv) A Bio-Source Directory – an updated compilation of leading edge biomedical companies in the Toronto area that are actively engaged in biotechnology activities. The listing is in an electronic database covering over 200 commercial enterprises and research institutions and provides a comprehensive overview of the life science sector.
- (v) Co-Hosting the annual BioFinance conference in Toronto where over 100 life science companies from across Canada, the U.S. and Europe gather to present their work, exchange research and development intelligence and secure financing for future initiatives.
- (vi) Publishing the Discovery District Profile booklet that profiles the leading biomedical, healthcare and research institutions within the 2.5 square kilometre research park in Toronto's downtown core.

Through working with the City's bio-technology companies, Economic Development, Culture and Tourism has also identified two key issues affecting the on-going growth of the sector. Staff are currently working with sector stakeholders to address the following issues.

Challenges Affecting the Growth Toronto's Biotechnology Sector:

#### Funding

Biotechnology companies with their heavy R&D commitments and long product development times require large infusions of cash on a fairly regular basis to see their innovative products

through to commercial viability. With a long-term return on investments creating something of a mismatch with typical venture capital investment models, biotech firms need to use every avenue of funding available.

Biotech companies can require many tens of millions of dollars to successfully commercialize their technologies into marketable products. The risk of failure is high and even successful ventures can be the result of ten or more years of investment. These conditions make it imperative that venture capitalists adopt a portfolio approach to investing in biotech companies with the understanding that each situation could require several rounds of investment over an extended period of time. There are, however, few sources of venture capital in Ontario that have the financial resources to commit to this asset class for the long run.

The Toronto Venture Group (TVG), Angel Investors Group (AIG) and other venture capital financiers currently do invest in the biotechnology sector, but at roughly half the amounts that are invested in the information technology (IT) sector. Canada's Venture Capital & Private Equity Association's 2005 Report shows that 24 percent of venture capital raised in Canada was invested in Life Sciences; 51 percent was invested in IT and 25 percent was invested in other and traditional technologies.

Venture capital investment in biotechnology is still relatively small, when compared to investment in IT/Communications. This is likely due to the relatively small number of firms that specialize in biotechnology. In addition, local venture capitalists typically do not have large enough pools of capital to commit the expansive sums required to see their biotech investments through to commercial success. Toronto and the Province of Ontario need to commit to attracting more seed and venture investment into biotechnology in Toronto and Ontario. Some examples of options available are:

- (i) Encourage greater pension fund investment into Canadian biotechnology. Pension funds are the ideal candidate to invest into biotech, as they have vast sums of capital that require a higher than average return on investment than what many traditional portfolios can provide. The funds have the ability to commit large sums for an extended period of time - investing in biotechnology can offer strong investment returns, when measured over an extended period of time.
- (ii) The Province of Ontario needs to make a financial commitment to biotech venture capital investing. A recent study has shown that the majority of biotech firms have, on average, 12 to 18 months of cash flow. As a result, companies must spend a disproportionate amount of time and effort searching for capital, than developing their technology and commercial partnerships.
- (iii) The Government of Ontario could enter into partnerships with the private sector on a matching basis, or serve as a guarantor in providing a backstop on any losses on venture investment, and at the same time, share in commercial proceeds. The government is unlikely to have the size of capital available, sufficient to have an appreciable impact on the sector, to enter into a venture fund alone.

- (iv) The biotechnology industry in Toronto and Ontario could benefit greatly if companies were able to offer flow-through shares. Flow-through shares are a special type of common share, currently allowed to be issued by oil and gas companies engaged in exploration activities. These shares allow certain tax deductions for qualifying exploration (research), development and property expenditures to “flow through” from the company to its shareholders. The biotechnology industry would benefit dramatically if biotech companies were allowed to offer flow-through shares, thereby attracting investors and much needed risk capital. Staff will continue to work with industry partners to advance this incentive.

## Human Resources

The biotechnology industry requires people with very specialized skills: ones that are not easily acquired. From life scientists to regulatory affairs experts, the range of talents required to successfully run a biotech company is broad and acquiring the talent can be a daunting proposition for a start-up, or even an established firm. It is vital that Toronto and Ontario continue to develop the technical, operational and managerial expertise to staff the numerous small start-up companies.

The HR needs of this fast growing, and rapidly changing biotech industry can leave companies challenged as they attempt to plan their organizational strategies. Current and on-going employment information, industry-demand data, specific job requirements and job classifications are all required. Information that is currently available comes from consultation that is performed sporadically and often does not have sufficient depth and breadth to be truly useful. Expanded human resources information gathering and industry HR needs are clearly required. A province-wide HR study that will plot the stage, lifecycle and growth trajectory of the biotech sector in Toronto, and the province, is urgently needed. Stakeholders, universities and colleges, as well as other educational institutions, need on-going HR supply and demand, and skills analysis to better understand the current stage of development of the biotech sector in our city. They need to know where the industry is headed from a human capital perspective and what human capital needs have to be met in order to fulfill the business objectives of the industry. Staff will be working with the Biotechnology Human Resource Council and other partners to coordinate an HR study to help fill this industry deficiency.

Toronto’s biotech companies experience a challenge in finding experienced management with multi-disciplinary skill sets. Talent shortages are said to be the most acute in Regulatory Affairs, Compliance, cGMP Manufacturing and Business Development. These special needs require candidates with a strong working knowledge of science. It is also quite common for senior executives in biotech companies to come from a scientific background and possess little or no knowledge of business management.

## Conclusions:

This report demonstrates that Toronto is becoming one of the leading biotechnology centres in North America. New organizations and facilities have recently been established to expand biotechnology in Toronto. Economic Development and its bio-technology partners look forward

to continuing to work together to bring new investment to the city and to increase research and development in the life sciences. It is a goal that must be achieved if Toronto, as well as Ontario and Canada, is to continue to prosper over the next century. It is imperative that Toronto continues to harness the tremendous social and economic potential that the biotechnology industry offers.

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