



Mapping the sequence

A labour-market look at Canada's bio-economy



Building skills for Canada's bio-economy



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BioTalent Canada helps Canada's bio-economy industry thrive globally. As a non-profit national organization of innovators leading our bio-economy, BioTalent Canada anticipates needs and creates new opportunities, delivering human resources tools, information and skills development to ensure the industry has access to job-ready people.

With a direct link to a network of leaders in Canada's bio-economy, BioTalent Canada is the industry's trusted and comprehensive source for human resource information and skills development. BioTalent Canada's research, reports, courses, employment bank and programs promote careers, assist companies with human resource issues, and encourage continuing education within the industry. BioTalent Canada is a Canadian sector council—one of many partnership organizations created to address skills-development issues in key sectors of the economy.

Sector councils work as a uniting element to engage business, workers, educators, professional associations and government in a strategic alliance that is focused on determining the specific skills and human resource needs that will enable the sector to thrive. Sector councils provide an industry-specific focus that highlights the technological advancements, human resource planning, training opportunities and industry forecasting, enabling businesses to better prepare for current and future developments.

BioTalent Canada is doing important work on the biotechnology sector's behalf. This work will help resolve the data issues that have an impact on how the sector's human resources will be managed in the years ahead. This report represents the initial steps to continue this work.

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Introduction



How ready are we for the bio-economy?

Technologies have always been tools for transformation. Europe was intellectually reinvented by the printing press. Machinery powered the industrial revolution. Computers and the Internet have, in the space of a few short decades, effectively shrunk the globe and exponentially accelerated the pace of both life and business.

Biotechnology is no different. From agriculture to medicine, food processing to natural-resource management, it is a broad and fertile field that applies science and technology to living organisms in ways that benefit people, their communities, and the world as a whole.



Bio-economy

The bio-economy involves the research, development, manufacturing and commercialization of technologies and products for such areas as:

Agriculture	Food processing
Aquaculture	Human health
Bioenergy	Life sciences
Bioinformatics	Medical devices
Biosciences	Natural resources
Environment	Pharmaceuticals

Biotechnologies also have significant economic implications. Crops enhanced to withstand changing climatic conditions help stabilize and strengthen the often vulnerable industry of agriculture. Superior medicines improve health outcomes, reducing the social and monetary costs of illness and disease.

These are but two examples of the myriad possibilities enabled by biotechnology. All those possibilities combined—the increasing integration of biotechnology into our industries, the ever-more direct intersection of science with daily life—constitute the *bio-economy*.

The opportunity is here

The bio-economy is taking shape around the world today. As a developed nation with great capacity for innovation and research, one with deep roots in agriculture and resource-related industries, Canada has emerged as an early leader and is ideally equipped to remain so. Yet if Canada does not work actively to maintain and strengthen that leadership, it will lose ground to other countries. We must not let the opportunity to grow and prosper pass us by.

Talent—a pool of skilled and qualified human resources—is critical to success in the bio-economy. Yet in many regions of Canada today, demand for biotechnology talent outstrips its availability. To date, there has been no comprehensive body of biotechnology-specific labour-market information to help guide human resource strategies and the decisions of policymakers. It is one of BioTalent Canada's principal goals to address this gap: to fill in the blanks.

Many of the specializations or particular combinations of skills required in biotechnology are not represented in the National Occupational Classification (NOC) system, making it difficult again for policymakers and also for job seekers to gain a clear understanding of the sector's human resource needs.

If we are to be ready to take a leading place in the emerging bio-economy, we must be able to see our biotechnology sector in full: both the big picture and the fine details. We must ensure that its required skillsets are well-understood and well-defined. The goal of BioTalent Canada is to facilitate this understanding: to help map the genetic sequence, as it were, of Canada's biotechnology sector.

BioTalent Canada is Canada's most trusted and comprehensive source for biotechnology skills development and human resource information. Its core purpose is to facilitate the growth of a talented pool of biotechnology human resources and to help the Canadian biotechnology sector strategically manage its workforce with human resource tools and human resources intelligence services.

BioTalent Canada's Mandate

BioTalent Canada—formerly the Biotechnology Human Resource Council (BHRC) — was created in 1997 with a fourfold mandate:

- To help Canadian companies and academic institutions develop the highly skilled staff necessary for commercial success in biotechnology;
- To facilitate industry involvement in skills training and knowledge upgrading for employees;
- To help the Canadian biotechnology sector manage its workforce strategically with human resource tools and HR intelligence services; and
- To facilitate the entry of new workers into biotechnology by communicating job opportunities to a broad audience.

The pieces we possess



Labour market knowledge of biotechnology today

By definition, biotechnology is the application of science and technology to living organisms. Its toolbox includes DNA and RNA; proteins, peptides and enzymes; cells and tissue cultures; gene and RNA vectors. It extends across everything from bioinformatics to nanobiotechnology and process biotechnologies.

One of the challenges in comprehending the biotechnology ‘sector’ is that its field of application is vast and varied; it is hardly homogeneous. Conventionally, surveys have focused on a narrow sliver of the biotechnology spectrum associated with bio-research. This is gradually changing.

Based on information gathered from various sources—and on observations made directly of the field—biotechnology is growing, expanding by an estimated nine percent between 2003 and 2005. Yet not all biotechnology subsectors have been monitored and measured. Bioenergy, a visibly fast-growing area of biotechnology, is not represented statistically in any meaningful way at present. Subsectors that have been somewhat tracked and are known to be growing are Human Health, Agriculture, Food Processing, and Environment.

Labour-market information is important because it influences the policies, strategies, economy, and investments of governments, educational institutions, and businesses. To gain a more accurate perspective on Canada’s bio-economy—and specifically its labour-market dimension—BioTalent Canada commissioned a survey of companies across the country. Narrowed down from a list of hundreds, 50 firms representative of the sector’s current

distribution were interviewed. The findings of that survey echoed the established growth statistics: small and medium-sized companies are planning to expand their employee bases over the next one to three years.

A snapshot of biotechnology in Canada

Statistics Canada is a major source of information about the country’s bio-economy. According to the Conference Board of Canada’s *Biotechnology in Canada – A Technology Platform for Growth* – Report December 2005, Statistics Canada is quite possibly the world’s most advanced organization when it comes to measuring biotechnology. The Statistics Canada *Biotechnology Use and Development Survey, 2005* (published in 2007) captured various information about the biotechnology sector. Key observations of that survey include:

Signs of growth

✕ The number of employees involved in biotechnology-related activities increased by 13% between 2003 and 2005.

Regional distribution

✕ In 2005, as in 2003, Ontario, Quebec, and British Columbia were home to the highest number of biotechnology companies, accounting for nearly 80 percent of all firms in the sector in Canada.

A shift toward SMEs

✕ ‘Traditional’ biotechnology companies (i.e. heavily research-oriented organizations with 150 employees or more) represented 10 percent of the country’s total in 2005, down from 12 percent in 2003. This suggests that the sector’s growth is being driven by small and medium-sized firms often in non-traditional areas of biotechnology. Companies with 49 employees or fewer represented 75% of the total, up from 72% in 2003.

The people component

Several human resource trends are apparent in the sector among companies planning to expand over the short term. Regardless of size and discipline, nearly half of all firms surveyed by BioTalent Canada in 2006 said they needed resources whose academic credentials include training at a Masters or PhD level. Many said that in addition to such training, they required individuals who also have strong business and project-management skills. Given that companies are at varying levels of maturity, the competencies for projected hiring covered a broad range of skills.

To satisfy their growth requirements and overcome the nearly universally stated challenge of finding and attracting qualified candidates, companies are looking at various strategies including recruiting internationally, outsourcing labour, and subcontracting training to external organizations.

A competitive marketplace

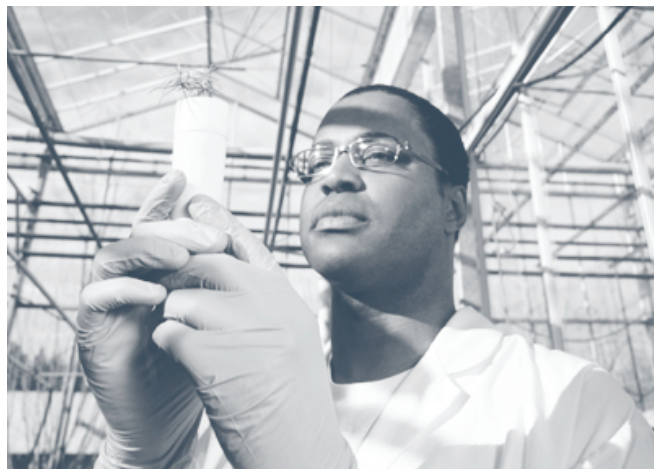
There are more than 5,000 biotechnology companies worldwide. Due to globalization and the specialized nature of biotechnology, these firms are more or less in competition for the same workforce. They and their governments must grasp this fact and be prepared to attract workers from abroad or suffer competitively as a result.

Canada's chief competitors for talent are Europe and the United States. Of the two, the U.S. tends to be further along the commercialization chain, with more companies doing business along with research (rather than R&D alone). Japan, China, South Korea, Taiwan, India and Singapore also have significant biotechnology capabilities,

particularly in the areas of health and agriculture. Progress in genomics coupled with strong abilities in medical sciences provide a significant opportunity for Asia to become a major player in medical biotechnology and biopharmaceuticals.

The struggle for Canadian companies is threefold. First, they must establish some means of reaching out to and attracting workers both from abroad and from within Canada—including, for example, members of the country's Aboriginal population. Second, they must find a way to evaluate the skills of workers trained internationally: not only their professional credentials but also their readiness to participate in the Canadian biotechnology work environment. Finally, companies need resources that can support the acculturation and language training of international professionals.

Strategies for dealing with these issues are outlined in BioTalent Canada's 2006 report, *Recognizing Talent: Capitalizing on the skills of foreign-trained professionals for a vital bio-economy*. But the first—attracting workers—pertains to an issue addressed more fully in the following pages: namely, using the National Occupational Classification (NOC) system to define and promote biotechnology career opportunities in Canada.



Raising awareness



Why we need to be in the NOC

The National Occupational Classification system (NOC) describes Canadian occupations. It provides a standardized way of understanding the nature of work. The NOC codes inform:

Labour-market analysis

Economists and statisticians use NOC codes to collect data and analyze labour-market trends. That analysis helps guide policy decisions and the development of training, recruiting, retention and job-matching programs and services.

Federal government spending

The government uses NOC code analysis to allocate spending and match jobs with immigration-selection processes.

Many people unfamiliar with the NOCs underestimate their importance. Yet the NOCs are typically crucial to the profile, visibility and political priority of entire economic sectors, catching the eyes of policymakers and job-seekers alike.

Occupational forecasting

Occupational forecasting considers job openings and growth rates related to specific occupations as identified by the NOC codes. Capturing industry employment projections is necessary for developing recruiting programs that meet human resource demands and sustain long-term industry growth.

Immigration eligibility

Job seekers hoping to come to Canada use the NOC codes and definitions to determine if the country offers the kinds of opportunities they seek.

Career planning and job searches

NOC codes and definitions are important to career developers, counselors, and students. The Government of Canada Job Bank lists only jobs recognized by NOC codes. Job seekers, employment counselors, and employers use the job bank for labour-market information.



Unfortunately, many people unfamiliar with the NOCs underestimate their importance. They see them as merely administrative and bureaucratic tools—perhaps not so salient to daily frontline working realities. But nothing could be further from the truth. The NOCs are typically crucial to the profile, visibility and political priority of entire economic sectors, catching the eyes of policymakers and job-seekers alike.

So where is biotechnology?

The most recent labour-market analysis indicates that the significant growth in biotechnology has opened up gaps in the NOCs: evolving job titles and task areas are not represented.

Data from BioTalent Canada's survey of 50 representative biotechnology companies were analyzed against existing biotechnology sector occupations within the National Occupational Classification (NOC). This comparison is expected to hold true when jobs in the sector are examined per the National Occupational Classification – Statistics (NOC-S), and the North American Industry Classification System (NAICS) as well.

Industry participants were consistently of the opinion that job titles and corresponding skills recognized in other industries, while similar, may not accurately describe or define job titles and associated skills required for biotechnology. Moreover, they felt this was something that demanded to be rectified. In fact, the language used in the NOC has not kept pace either with the bio-economy. Because individuals employed in biotechnology possess industry-specific skills and competencies, job titles and skill-cluster categories unique to biotechnology need to be recognized.

Across the country, employers expressed concern that gaps in job titles acknowledged by the federal government, industry and other organizations could have a detrimental long-term impact on the strategic management of human resources in biotechnology.

How the NOCs are structured

The NOC includes 520 unit groups and more than 35,000 occupational titles. One of ten distinct skill types is represented by the first digit of each code:

- 0 Management
- 1 Business, finance and administration
- 2 Natural and applied sciences
- 3 Health
- 4 Social science, education, government service and religion
- 5 Art, culture, recreation and sport
- 6 Sales and service
- 7 Trades, transport and equipment operators
- 8 Occupations unique to primary industry
- 9 Occupations unique to manufacturing, processing and utilities

That the need is recognized—and being called for—is a good thing. Yet it is not always so simple as adding a job title to a list. Companies asserted strongly to BioTalent Canada their feeling that in biotechnology roles are defined less by *position* than they are by *skill sets*. And in smaller, entrepreneurial firms where a relatively few employees must wear multiple 'hats', those skill sets can be broad and diverse, encompassing both business and scientific expertise. Many small firms, for example, employ individuals who are actively engaged in biotechnology activities such as research and development in addition to performing executive-management functions.

The talent we need



Human resource requirements for the sector

Before we proceed to discuss the biotechnology profiles missing from the NOCs, it will be helpful to strengthen our understanding of the sector's HR needs.

The labour-market research phase of BioTalent Canada's survey project greatly helped shed light on the critical work functions that define biotechnology.



To begin: from a labour-market point of view, the bio-economy is complex because it ranges across many NOC categories. A significant number of companies delivers products or services to more than one biotechnology subsector.

As mentioned previously, the companies surveyed by BioTalent Canada declared more or less similar competency requirements regardless of their size or specific application area (e.g. molecular sciences, microbiology, biology, chemistry, organic chemistry or pharmaceuticals). Nearly half of these said they needed scientific researchers and developers with academic training at the PhD level.

Medium-sized and large companies tend to have *de facto* standard administrative and management functions in place, while smaller companies answer their business-management needs by employing individuals with MBAs or extensive experience in the business of biotechnology sector.

The raw science or research dimension of biotechnology is therefore one 'job area'; business management is another. Commercialization—the process of taking products from the lab through further development to market—is a third. Certain specialized management and technical positions requiring competencies in biotechnology-related scientific activities are becoming more prevalent as many small companies look to commercialize their products and services. This is one example of an area where a reasonable match between biotechnology job positions or skills and NOC codes does not exist.

About NAICS

NAICS (the North American Industry Classification System) was developed by the statistical agencies of Canada, Mexico and the United States. It provides common definitions to describe the industrial structure of the three countries and gives a framework for analyzing their economies. NAICS is based on supply-side or production-oriented principles to ensure that its industrial data is suited to production-related issues such as industrial performance.

What's missing from the codes

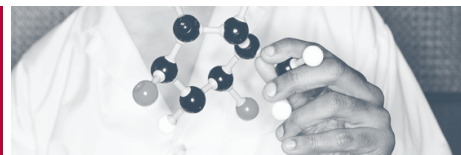
BioTalent Canada has identified hundreds of job titles currently used in Canada's biotechnology industry. These have been confirmed by industry representatives, universities, businesses and individuals in the biotechnology sector as being current and relevant to the industry.

Each of the identified job titles was carefully examined and then compared to the existing NOC codes. Of the total, 48 had no matching NOC code. These include:

- *Animal Care Manager*
- *Animal Technician*
- *BioDiesel Manager*
- *Bioinformatics Programmer Analyst*
- *BioJet Fuel Research Director*
- *Biomass Gasification Specialist*
- *Chief Scientific Officer*
- *Clinical Research Data Specialist*
- *Commodity Risk Manager*
- *Computational Chemist*
- *Contract Manufacturing Project Managers*
- *Customer Service Director*
- *Documentation Specialist*
- *Government Relations Director*
- *Human Resource Information System (HRIS) Manager*
- *Intellectual Property Research / Senior Scientist*
- *Investor Relations Director*
- *Logistics Analyst*
- *Logistics Coordinator*
- *Logistics Director*
- *Clinical Research - Medical Writer*
- *Metrologists*
- *Pharmacokinetics Scientist*
- *Planning and Scheduling Engineer*
- *Preclinical Scientist*
- *Preclinical Senior Process Development Engineer*
- *President and Chief Executive Officer (CEO)*
- *Process Development Scientist*
- *Project Manager*
- *QA Inspector*
- *QA Supervisor*
- *Quality Control Analyst*
- *Regulatory Affairs Manager*
- *Regulatory Affairs Specialist*
- *Reliability Engineer*
- *Research Associate*
- *Tax Manager*
- *Telemarketing Manager*
- *Vice-President Business Development*
- *Vice-President Clinical Research Medical Affairs*
- *Vice-President Corporate Development*
- *Vice-President Customer Service*
- *Vice-President Government Relations*
- *Vice-President Manufacturing*
- *Vice-President Public Relations*
- *Vice-President Regulatory Affairs*
- *Vice-President Research and Development*
- *Vice-President Risk Management*

For a detailed list of biotechnology job titles please visit www.biotalent.ca.

Conclusion



What we aim to do

The role of BioTalent Canada is to foster the success of the country's bio-economy by attending to its human-resource requirements. As this research has shown, biotechnology is a growth sector and Canada is well-equipped to be a world-leading force within it.

Fulfilling that promise is a matter of attracting, retaining and supporting qualified biotechnology professionals—competing internationally with other major players to do so.

Canada's biotechnology industry is undergoing rapid growth and constant change. Flexibility, adaptability, and an ability to manage a multi-talented workforce are fundamental human resource needs. ... This is due in part to the global nature of modern biotechnology businesses, the fierce competition for highly specialized candidates, the necessity of foreign-trained talent, and the diversity of companies incorporating biotechnology.

To draw the necessary talent to Canada, and to attract and develop Canadian biotechnology professionals—including those from the country's aboriginal communities—required functions must be defined and described in standardized terms. They must be captured, in other words, in the NOCs.

Exactly how to capture these remains a question. As discussed, biotechnology today is less an industry of *positions* than of *functions*—positions that in their classification may not always conform to the established NOC structure. A Project Manager, a Vice-President of Manufacturing, even a CEO in a biotechnology firm will

have specific and distinct responsibilities from a manager or executive holding the same title in another industry. However, when the NOCs are updated, they must reflect this reality.

They must also look beyond the Canadian context alone. Biotechnology is a global endeavour. Classifications must be recognizable around the world. This will also assist the activities of Canadian companies engaged in outsourcing specific functions: the tasks to be performed abroad—in countries such as China and India—will be clearly understood and articulated.

Finally, augmenting the NOC codes will foster secondary, post-secondary and academic program development, re-licensing issues, and will guide other government policies and procedures such as budgeting and long-term financial planning within the sector, Canada-wide, and globally.



The path to productivity and competitiveness

BioTalent Canada is engaged in a broad range of labour-market information activities, with support from Human Resources and Social Development Canada (HRSDC), to deepen the country's understanding of its biotechnology sector and the dynamics within it.

As part of that activity, BioTalent Canada plans to pursue a comprehensive competency analysis for each of the occupations currently unclassified in the NOC, and to formally request that HRSDC revise and update the NOC to include those job titles.

At the same time, BioTalent Canada is enacting a strategic approach to help Canadian biotechnology companies answer their human resource needs through tools such as internships, the establishment of a comprehensive web portal, and developing competency profiles that may contribute to or help inform the occupational classification process.

Through knowledge collection, resource development and the creation of assessment mechanisms as part of BioTalent Canada's national biotechnology human resource strategy, Canada's industry will be able to translate competencies into occupational standards and standards into profiles that lead to employment for trained professionals and to a stable, accessible source of talent for biotechnology companies.



Key to these activities is a comprehensive labour-market information (LMI) project being led by BioTalent Canada. That LMI initiative will close the gaps in Canada's understanding of its bio-economy, providing for the first time a more complete picture of the subsectors involved, the skills required, and the human-resource dynamics at play. This LMI will give decision-makers and industry stakeholders alike the information they need to establish sound strategies for meeting human resource needs and propelling Canada's biotechnology success. BioTalent Canada is also working on practical human resource tools to assist small to medium size enterprises even further with their proactive efforts in recruiting and retaining skilled employees within the Canadian bio-economy.

Strong Board of Directors

The Board of Directors is composed of experts in the field of HR: CEO's, CFO's and CSO's from across Canada with extensive financial and industry experience representing companies and organizations in Canada's bio-economy. BioTalent Canada is not a membership organization and therefore relies on the guidance provided by its dedicated volunteer Board of Directors.

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