Abstract

A Strategy for Alberta’s Life Sciences Industry and Post-Secondary Institutions to improve the opportunities to develop highly relevant talent to a growing Alberta industry.
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While every effort has been made to ensure that the information contained in this document has been obtained from reliable sources, BioAlberta is not responsible for any errors or omissions in the contents of this work or for the results obtained from the use of this strategic plan.

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1 EXECUTIVE SUMMARY

The life science’s industry in therapeutics/pharma, medical devices and natural health products is a rapidly growing industry with global potential. Alberta’s industry in these sectors today has seen 15% annualized growth, now contributing nearly $700mm to Alberta’s GDP annually and employing over 16,000 people.

The ability to identify, develop and mobilize talent is critical to the success of Alberta’s life science companies. Industry has identified a growing challenge finding the right kind of talent in Alberta. This is limiting the growth and expansion opportunities of this sector in the province.

Sponsored by Alberta Innovates, Pfizer Canada and Alberta Economic Development & Trade, BioAlberta examined the talent gap in the life sciences industry. Through surveys, key informant interviews and a series of workshops, insight was gained into the disconnect between industry and post-secondary institution views of the required skills of graduates. This report provides a more in-depth assessment of the disconnect in Alberta and makes recommendations for strategies and actions that can bridge this talent gap and strengthen the important relationships between industry, post-secondary institutions and government, thereby improving opportunities for life sciences talent in Alberta.

1.1 Outcomes and Impacts

Through a broad-based consultation process of interviews, surveys and workshops across Alberta, several impacts and outcomes became evident that together help frame a broader view of the strategic environment and outcomes needed to address the Talent Gap. The following figure (found also in Appendix 7.1) summarizes these insights and the actions this report recommends for the collaborative effort of industry, Post Secondary Institutions and Government.

In brief, the Long Term Outcomes for this strategy are that Alberta Post Secondary Institutions (PSI) and companies are known globally for their forward looking approach to life sciences education and training that life sciences companies are thriving, providing employment to local talent and bringing social and economic benefits to Alberta. This assumes life sciences companies are able to recruit well trained, knowledgeable, and competent high-quality people to meet their demands and that PSIs are better able to understand the life sciences industry talent requirements, expand their knowledge about and connection to industry and provide students with relevant skills, competencies and experience. Our findings focused on the need to address life science program requirements at PSIs, improved access to experiential learning opportunities, a supportive industry culture in PSIs and aligned public policy.
The balance of this report provides the basis for these outcomes and outline specific actions for all stakeholders to achieve these outcomes. This paper also proposes metrics to assist in monitoring progress in meeting the Talent Gap challenge.

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**Actions:**
As indicated in Section 5.1 in the Report

**Principles:**
1. Build on strengths
2. Be provincial in scope
3. Be flexible to accommodate local needs and structures
4. Be inclusive of all stakeholders
5. Strive for quick wins at the outset.

Life sciences program requirements at PSIs. Enhancements to program requirements and extracurricular education and training are aligned with life sciences industry talent needs.

**Experiential Learning:**
Work-based learning opportunities are incorporated into life sciences related programs; and work placements are readily available in life sciences companies.

**Supportive Industry Culture:**
PSI faculty actively support their students in work-based learning and are themselves involved in company projects, development, and growth.

**Public Policy:**
Public policy supports and is aligned with talent development for the life sciences industry.

Alberta PSIs and companies are known globally for their forward-thinking approach to life sciences education and training.

Life sciences companies are thriving, providing employment to local talent and bringing social and economic benefit to Alberta.
1.2 Key Observations and Recommendations

Facilitation of annual forums and networking events are necessary to increase student and researcher exposure to industry.

The development of soft skills such as business development is seen as necessary for graduates and as important as technical skills.

Increased experiential opportunities, such as, co-op and internship programs are needed.

Degree programs may need to be adjusted in length to accommodate experiential learning opportunities.

Additional mentorship opportunities need to be created for industry to mentor students and researchers.

Increased quantity and quality of academic and industry partnerships are critical to the sensitization and awareness of industry needs among academic staff.

Government, industry and BioAlberta need to work together to follow up on recommendations of this report.
2 INTRODUCTION

2.1 Background

Alberta’s life sciences industry finds itself at an important time in its growth and development. It is a key sector for employment of highly skilled people, for moving ideas from the “bench” to commercial products, and for contributing significantly to Alberta’s knowledge and innovation-driven economy.

A recent study on the state of Alberta’s life sciences industry (Deloitte, 2017)\(^1\) identified that the industry was responsible for nearly $700 million in revenues and companies employed over 16,000 people in full time positions. Moreover, the results indicated that the industry is growing its contribution to Alberta’s highly skilled, knowledge-based and innovation-driven economy.

While Deloitte found a good mix of focus/product areas, over 80% of the companies involved in the study self-reported that they were focused on: medical technology and devices; health biotechnology and pharma; and, functional food and natural health products. End markets for their products were well diversified with 42% of revenues from within the Province, 43% from the USA and other international markets and 15% from the rest of Canada.

Deloitte also noted that although made-up of a large number of start-ups and small businesses, the sector has a dynamic mix of both small and large companies. Most of these companies (89%) are located in the two large cities, Edmonton and Calgary with the Edmonton area having 51% and the Calgary region having 38% of the companies. The remaining companies are located in some of Alberta’s secondary urban centers such as Red Deer, Lethbridge, and Grand Prairie.

One of Alberta’s strengths is the talent being developed in the post-secondary institutions (PSIs). However, the current employment market for companies in life sciences is challenging. High quality recent graduates are having difficulty obtaining employment in the sector. As some companies have indicated informally, available jobs sometimes require more specialized knowledge and training such as in business development or in regulatory processes and issues. In other cases, there is a divergence between the education and skills of graduates and the actual needs of companies. As many of Alberta’s life sciences companies are startups with very lean budgets, companies have indicated that they do not have the training capacity, the time and/or the funding to support experiential learning and training to address the existing skill and competency gaps. Furthermore, many Alberta life sciences companies being small, do not have the financial capability to attract senior employees. This has resulted in a catch-22 for these companies as they must hire junior employees or recent graduates but struggle to provide the necessary on the job training to internally cultivate their employees’ skills and/or competencies.

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\(^1\) Life Sciences in Alberta: State of the Industry, 2017. Deloitte LLP and Affiliated Entities
Hiring talented people is critical for companies that want to gain an edge on their competition. However, companies are being challenged to find work-ready graduates to fill the roles needed so that companies can continue to remain competitive.

This is not a unique challenge to Alberta’s companies. BioTalent Canada has undertaken a number of studies examining the job-readiness of graduates from post-secondary institutions. Most of the BioTalent reports indicate that graduates are missing key skills and competencies. In one report, Splicing the Data, the authors suggest that “being schooled in a particular scientific discipline is different than training for a career in science-related business.” As the data in the report reveals, almost 30% of biotechnology companies on average across Canada reported skills shortages, with 40% of companies in the west and 44.4% of companies in the prairies reporting skills shortages in their current staff.

BioAlberta is prepared to help address the life sciences talent gap. In order to develop a framework from which to derive solutions, an analysis and understanding of the contributing factors to the talent gap in Alberta is necessary. This study is intended to identify the challenges and needs from the perspective of companies, post-secondary institutions and students to develop a framework and recommendations for addressing the issues.

2.2 Objectives of the Initiative

The objectives of this initiative were:

- To identify the key issues, challenges and needs surrounding work-readiness of graduates.
- To raise awareness of these issues among post-secondary institutions and companies.
- To foster a consensus around a framework and framework-derived action steps that will improve work-readiness and increase employment opportunities for Alberta-trained graduates.

2.3 Critical Challenge

All aspects of this initiative were centered on the critical challenge as reflected below:

*Post-secondary institutions, life sciences companies and government intermediaries should aim to work together to enhance students, at all levels of training, to acquire the necessary knowledge, job-skills and abilities to be more work-ready and to contribute in a more immediate and effective manner to the domestic life sciences industry.*

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To accomplish the outcomes of this initiative, it was necessary for the challenge statement to serve as a focus for information gathering as well as to give direction to the development of a framework from which to derive potential solutions.

2.4 Scope and Limitations of the Initiative

Life Sciences Sectors: Decisions were made to narrow the scope of this initiative. It was agreed to limit the study to the following life sciences sectors: Therapeutics/Pharma, Medical Devices and Natural Health Products.

Participants: Participants for this study were identified through existing organizations.
- Companies that were members of BioAlberta and that fell into the three (3) life sciences sectors were invited to participate in the various data gathering approaches.
- Post-secondary institutions (universities, polytechnics, selected colleges that have an emphasis in the life sciences sectors) were invited to participate through their respective Provosts. Because not all provosts responded to the invitation, follow up calls were made to individuals in the institutions with whom there was an established contact through BioAlberta, the consultants and/or members of the HQP Advisory Committee. These follow-up calls resulted in a number of additional contacts. Note that not all selected PSIs that were invited to participate responded to the request.
- Students were invited to participate through the undergraduate, graduate and postdoc association presidents. Consequently, participation from students relied on the respective student associations to distribute the invitations to potential participants.

Participation was therefore limited based on the reach of the various channels through which the consultants worked.

2.5 Methodology/Approach

Different methods were used to obtain both quantitative and qualitative data that could be used to shape recommendations to bridge the life sciences talent gap. Specifically, a 5-prong approach was utilized as follows:

2.6 Literature Review

In order to be grounded in the challenges and issues in HQP development, a literature search was undertaken to scan for any relevant and related publications on industry – post-secondary institution – student partnerships and programs that examine work-readiness of graduates in the life sciences industry.

2.7 Surveys

After a review of the information gathered through the literature search, separate surveys were developed for companies, post-secondary institutions and students. The surveys, together with a cover letter invitation from BioAlberta to participate, were sent to provosts of post-secondary institutions, to CEOs of life sciences companies and to presidents of undergraduate, graduate and postdoc student associations.
2.8 Interviews

In order to supplement the information gathered from the surveys, key informant telephone interviews were conducted with senior faculty of post-secondary institutions and with CEOs and/or their designates from life sciences companies and/or investor organizations. These interviews focused on obtaining additional information about current programs available to students to assist them in becoming more work-ready, challenges faced by companies in recruiting work-ready graduates, and current activities that companies were undertaking or would like to see being undertaken to enhance the work readiness of students. In all cases, semi-structured interviews were conducted. The interviewers prepared interview notes for each interview to be used in the analysis.

2.8.1 Workshops

Workshops were conducted in Edmonton, Calgary and Lethbridge bringing together representatives from post-secondary institutions, companies and students. The workshops were focused around the challenge statement (see above). In addition to presenting a synthesis of the information gathered through surveys and key informant interviews, facilitated participant discussion centered on the elucidation of the current HQP development system across institutions and companies. Participants were also asked to identify opportunities and actions to improve the system as well as the barriers to the implementation of possible actions.

2.8.2 Analysis and Interpretation

The final stage consisted of pooling all the information gathered for analysis and interpretation. As a result of the analysis, recommendations for action were developed that have both policy and program level implications.
3 ANALYSIS AND SYNTHESIS

This study was designed to obtain information from three key groups with a vested interest in the results (life sciences companies, post-secondary institutions, students). The information gathered utilizing different methods was synthesized and analyzed using primarily descriptive and qualitative approaches. The following represents an integration of all the information.

3.1 Participant Profile

As can be seen in the table below, industry participants made up the primary group of respondents to all three information gathering approaches (N = 61; 54% of all participants) with post-secondary institutions being second (N=33; 29%) and students third (N = 20; 18.0%).

Table 1: Participants as a function of approach to information gathering and affiliation

<table>
<thead>
<tr>
<th>INFORMATION GATHERING</th>
<th>COMPANIES</th>
<th>POST-SECONDARY INSTITUTIONS</th>
<th>STUDENTS</th>
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<tr>
<td>SURVEY</td>
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<tr>
<td>INTERVIEW</td>
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<td>WORKSHOP:</td>
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<tr>
<td>EDMONTON</td>
<td>12</td>
<td>8</td>
<td>2</td>
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<tr>
<td>CALGARY</td>
<td>1</td>
<td>4</td>
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<tr>
<td>LETHBRIDGE</td>
<td>-</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL</td>
<td>61</td>
<td>33</td>
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</table>

Survey:

- Companies. Participants in the survey described their companies as follows (note that some companies classified their focus in more than one category):
  - Forty-three percent (43%) focused on therapeutics; 33% on medical devices, 17% on natural health products, and 30% on “other”.
  - Companies with fewer than 100 employees were coded as “Small”; those with more than 100 employees were coded as “Large”.
    - Of all the responding companies, 67% were categorized as “Small”
    - Seventy-four percent (74%) of small companies indicated that they had been recruiting in the past 12 months and that a total of 74 workers had been hired.
    - Ninety percent (90%) of large firms indicated that they had been recruiting in the past 12 months and that a total of 275 workers had been hired.
    - When asked about skills and competency gaps, about half of the small firms (52%) and a little over one-third of large firms (37%) indicated gaps.
Post-Secondary Institutions. Three (3) Universities, 2 Polytechnics and 2 colleges participated in the survey.

Undergraduate, Graduate and Postdoc student Associations. Surveys were sent to these organizations at all three large universities. Participants were primarily from universities (85.7%), working on Masters or PhD degrees (78.6%), with the majority having aspirations to work in industry (57.1%) or using their program to enter into different fields altogether such as medicine (35.7%).

Key Informant Interviews:
The majority of telephone interviews (N = 21) were conducted with companies (N = 17) and the remainder with post-secondary institutions (N = 4). Almost all of the company interviews were with CEOs and or a designated senior official within the company; interviews at post-secondary institutions were with Vice Presidents, Deans of Graduate Studies, and faculty members.

3.2 Contributing Factors to the Talent Gap
Analyzing the data inputs together, several key observations emerged that appeared to be key contributors to the life sciences talent gap.

3.2.1 A disconnect between Industry and post-secondary institution views of the required skills and competencies

Companies indicated that although they recruit graduates who can demonstrate good technical or specialized skills, more importantly, they look for graduates who can demonstrate “soft skills”. That is, companies look for potential hires to have:
- Life sciences industry knowledge and experience.
- The “right” attitude as reflected in being (self) motivated; driven; goal-oriented; curious; accountable; willing to learn; being a team player.
- Business development
- Domain/technical/specialized expertise.
- Communication skills (writing, presentation, interpersonal).
- Analytical skills.
- Logical and systems thinking.
- Collaboration skills.
- Project management skills (leadership, planning, problem-solving).

Post secondary institutions indicated their emphasis was on the development of numerous skills and competencies (e.g. problem-solving, leadership, teamwork, practical skills) but especially on enhancing both analytical and specialized skills. Universities perceived themselves as assisting students towards career development rather focusing on specific jobs. While colleges and polytechnics perceived themselves similarly, their emphasis is often on more practical skills in order for students to be ready for specific types of work.
Students perceived the most important factors contributing to their employment potential were:

- Reputation of the institution attended.
- Marks.
- Soft skills.

It should be noted that companies indicated that marks were not as important as other factors in the recruitment process.

3.2.2 Limited student exposure to, experience in, and knowledge of the life sciences industry

Work-based learning experience can make classroom learning more relevant. The data from this study revealed not only that work experience was necessary but other related learning also needed emphasis. Participants made the following suggestions for enhancing work-readiness of graduates.

- Need for students to have industry experience through such mechanisms as internships, practicum or co-op program placements.
- Post-secondary institutions need to work with industry to re-envision curriculum and/or programs of study with a view to:
  - Integrate theory and practice (e.g. work on finding solutions for “real world” challenges).
  - Blend science and business education.
  - Enhance knowledge of the life sciences industry.
  - Introduce regulatory frameworks and the process of obtaining regulatory approval for a new product or technology.
  - Enhance communication skills – writing, presentation, interpersonal
- Create and encourage networking opportunities where students and companies are able to meet and interact.
- Increase awareness of students in K-12 of the many different career opportunities in the life sciences sector.

3.2.3 Lack of receptor capacity for graduates in the life sciences industry

As there are a limited number of graduates that will obtain employment in academia (estimates range from 25% to 50% of PhDs and postdocs), more students are looking towards industry or starting their own companies upon completion. However, in Alberta and in Canada more generally, several industry and investor interviewees identified an insufficient number of life sciences companies to absorb the number of students and graduates turning towards industry as a source of employment. For the same reasons, there are not enough opportunities for co-op or internship placements, and/or life sciences professionals able to offer mentorship to students and graduates.
3.2.4 Limited resources and capacity to support training

All of the participating groups identified funding in support of integrated learning opportunities (e.g. internship, practicum, co-op placements) as essential. Companies indicated a willingness to contribute to supporting training but since many of Alberta’s companies are small, their own resources are limited.

Post-secondary institutions are making an effort to address the training needs through such initiatives as the following, although the availability and intensity of these programs vary considerably:

- Professional development programs.
- Career choice/guidance programs.
- Internship, practicum and co-op placements. However, these placements are more likely to be offered in such faculties as engineering, business, law and in specific areas within science than in the life sciences faculties more generally.
- Involvement with, and support for, MITACS.
- Greenstem program supporting entrepreneurship for a selected number of PhDs and postdocs in the area of green energy, but not in therapeutics, medical devices or natural health products. It is noteworthy that students working on masters degrees or MBAs do not qualify even though they may have experience or have actually worked in the area.
- In the past, such programs as Alberta Innovates Postdoc program and the Forefront Program funded by AHFMR were significant in supporting students undertaking industry and entrepreneurial activity.
- Student-designed and managed entrepreneurial challenge competitions in health related areas (e.g. I4H at the University of Calgary).
- Supporting industry networking events.

3.3 Information Synthesis

Integrating all the input resulted in a number of insights into the issues and challenges faced by companies and graduates. These include:

- Knowledge of the life science industry, knowledge of regulatory requirements, data analytics, and language/communication skills were identified by industry as skills lacking by graduates.
- Larger companies were found to have the most exhaustive processes for validating skills and competencies of prospective new hires.
- Company – post-secondary institution partnerships were, for the most part, different on the basis of the size of company
  - Large companies worked closely with post-secondary institutions in terms of teaching and providing practicum placements in order to ensure a steady flow of knowledgeable and well trained graduates.
  - Smaller firms were less likely to be involved with post-secondary institutions re teaching and practicum/internship placements because of such factors as
time and available resources. Consequently, these companies had to do more on-the-job training of new graduates which created its own challenges.

- Company expectations of new hires was found to differ as a function of size
  - Large firms indicated that technical job skills were very important.
  - Small firms indicated that soft skills were essential along with specialized skills.
  - Regardless of size of company, attitude as exemplified by such descriptors as motivation, drive, responsibility, and accountability were identified as important. For small companies, problem-solving, systems thinking, communication via writing and presenting abilities were also identified as very important.

- Regardless of size, companies indicated that over the next 10 years, the following skills/competencies were critical:
  - Data management
  - Knowledge of regulatory processes
  - Communication skills
  - Digital tool use

- Students felt that personal and professional connections as well as work experience were the two most important factors in finding employment. However, there was acknowledgement that such skills as the following were also very important: Soft skills, Industry knowledge, and the ability to utilize digital tools.

- Students (primarily graduate students) indicated that there were very few opportunities for internships or practicum and/or summer job placements in life sciences companies.

- Students suggested that opportunities to meet companies through networking events, seminars and workshops would be helpful.

- Post-secondary institutions indicated strong support for:
  - Training and education in soft skills,
  - Creating extra-curricular opportunities and certificate programs that would support knowledge and skill development in areas of importance to the life sciences industry;
  - Forming partnerships with companies to improve education, training, and research.

It can be concluded that ‘soft skills’ are going to be a central need for future high-quality personnel and that collaboration between PSI’s and industry will be an effective tool to ensure that recent graduates have the necessary level of development as they move into the work force. The ability of recent graduates to utilize digital tools and to obtain interdisciplinary knowledge of the life sciences and associated regulations beyond the students’ specific area of expertise will also be significantly important for the future work force.
4 Addressing the Challenge

4.1 The Opportunities

After a review and discussion of the survey findings, workshop participants were asked to brainstorm possible opportunities that could potentially bridge the talent gap. The following common opportunities emerged.

➢ **Grow integrated, experiential, work learning opportunities in the life sciences:**
  - Significantly expand the life sciences internships, co-op placements, summer jobs.
  - Students working on real-world challenges faced by life sciences companies.
  - Developing life sciences, real-world challenges that students work on solving (e.g. I4H at UC).
  - Identify industry challenges/issues that students take on as thesis/dissertation topics.

➢ **Post-Secondary Institutions to work with the life sciences industry to provide additional life sciences industry-related and recognized education/training for students/graduates:**
  - Life sciences certificate program.
  - Stackable certificates.
  - Specialized workshops and seminars

➢ **Build collaboration mechanisms between post-secondary institutions and Industry:**
  - Post-secondary – Industry advisory /program/curriculum committees.
  - Creating communication channels.
  - Encouraging faculty to become increasingly knowledgeable about and connected to companies.

➢ **Create more networking events for students and companies to meet and interact.**

➢ **Foster student involvement/membership in life sciences industry associations such as BioAlberta.**

4.2 The Barriers

While numerous opportunities were identified to enhance work-readiness in graduates, a number of significant barriers to closing the talent gap were also raised.

➢ Lack of life sciences industry receptor capacity for internship/practicum/co-op placements and/or jobs.

➢ Graduate student requirements and pressures:
  - Internship/practicum/co-op placements take time away from thesis work that supervisors expect to see progress on.
  - Funding support for students from supervisors’ grants may be in jeopardy if students take time away from the work to undertake a placement in industry.
Academic supervisors do not consistently support the need for industry training. Indeed, many identified an insular institutional or departmental culture.

Lack of emphasis on or rewards for commercialization of discoveries as well as a lack of industry collaborations in life sciences faculties at post-secondary institutions.

Funding Sustainability/Resources/Incentives:
- Graduate programs are rigid in terms of academic expectations and requirements. Consequently, such challenges as time taken to undertake an internship placement is time taken away from thesis work or time taken away from work commitments to a principle investigator.
- Financial support for students undertaking internship and co-op placements is necessary for students in order that they can carry on with their studies.
- Flexibility in length of internships/co-op placements especially for graduate students and postdocs.
- Incentive structures. For example, principle investigators are incented to publish, not commercialize.

On-going communication at all levels
- Between PSIs and industry
- Within PSIs
- Between PSIs
- Between students, PSIs and industry

Government processes for approval of curriculum/program changes or additions.

Lack of organized partnerships between PSIs and industry.

IP policy in the institutions as well as potential NDAs that students may have to sign when undertaking a placement at a company. This may result in a student not being able to publish thesis work that was undertaken at a company.

Commitment on the part of industry, post-secondary institutions, government and students to address the talent gap constructively and collaboratively.

4.3 Target Outcomes

To capture these opportunities and overcome these barriers, our consultation surfaced a series of critical outcomes to guide any effort to close the talent gap.

Long Term Goals:
1. Alberta PSIs and companies are known globally for their forward-looking approach to life sciences education and training.
2. Life sciences companies are thriving, providing employment to local talent and bringing social and economic benefit to Alberta.
Medium Term Outcomes:

1. Life Sciences companies are able to recruit well trained, knowledgeable, and competent high quality people to meet their demands;
2. PSIs are better able to understand the life sciences industry talent requirements, expand their knowledge about, and connections to the industry, and provide students with relevant skills, competencies and experiences for obtaining employment.

Enabling Outcomes:

1. Life Sciences Program Requirements at PSIs: Enhancements to program requirements and extracurricular education and training are aligned with life sciences industry talent needs.
2. Experiential Learning: Work-based learning opportunities are incorporated into the life sciences related programs; and work placements are readily available in life sciences companies
3. Supportive Industry Culture: PSI faculty actively support their students in work-based learning and are themselves involved in company projects, development and growth.
4. Public Policy: Public policy supports and is aligned with talent development for the life sciences industry

The logic model illustrated in section 7.1 illustrates how these outcomes guide our recommended action plan.
5 RECOMMENDATIONS: MOVING TO ACTION

5.1 Bridging the Talent Gap

While there are a number of examples throughout Alberta of companies and PSIs working together on networking events, internships and participation in classroom instruction, these tend to be more often than not one-off occurrences. To make a significant impact on bridging the skills gap in the life sciences, it is necessary to think of a more intentional, unified and integrated approach that brings PSIs, companies and students together to scale the benefits of these partnerships.

In order to define a clear approach to addressing the talent gap based on the gathered information, a logic framework was developed that diagrams the rationale underlying the proposed recommendations for action (See Appendix 7.1). This model links outcomes (enabling, medium-term, long-term) with activities and processes as well as the assumptions underlying those linkages. Some of the actions outlined in this section were inspired by a review of other leading jurisdictions in Canada and the USA with strong life sciences industries. See Appendix 7.3 for the jurisdictional scan.

Therefore, based on the logic model developed through the consultations and the insights from the jurisdictional scan, the following are recommended actions for bridging the talent gap in the life sciences.

<table>
<thead>
<tr>
<th>Enabling Outcome</th>
<th>Action (Lead)</th>
<th>Why is it Important?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life Sciences Program Requirements at PSIs: Enhancements to program requirements and extracurricular education and training are aligned with life sciences industry talent needs.</td>
<td>1. Establish an annual forum of regional companies, post-secondary institutions and students to review current labor market data, company hiring demands, continuing challenges and progress being made on initiatives. (BioAlberta)</td>
<td>The annual forum will foster sharing of needs, identifying emerging challenges, developing strategies and actions to address challenges, and developing coordinated and aligned actions among stakeholders based on common information and research.</td>
</tr>
<tr>
<td></td>
<td>2. Encourage networking events, job fairs and field trips where companies and students are able to interact. (BioAlberta)</td>
<td>Relationships between students and companies and employers will be fostered.</td>
</tr>
<tr>
<td></td>
<td>3. Re-envision curriculum and/or programs of study to include student learning of “soft skills”. (PSIs)</td>
<td>Students will develop through direct learning experiences skills and competencies desired by industry.</td>
</tr>
<tr>
<td></td>
<td>4. Encourage and support a significant expansion of life sciences work-based learning opportunities through internships, practicums, job shadowing, co-op and summer job</td>
<td>Companies will have the opportunity to develop a workforce that will meet its increasing demands. Students will benefit through work-based learning experiences.</td>
</tr>
<tr>
<td>Enabling Outcome</td>
<td>Action (Lead)</td>
<td>Why is it Important?</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------</td>
<td>----------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>learning and developing connections to companies.</td>
</tr>
<tr>
<td></td>
<td>Consider longer degree program options that allow students to manage school and work responsibilities.</td>
<td>Such action allows students to benefit from work-based learning and to be more work-ready upon graduation.</td>
</tr>
<tr>
<td></td>
<td>Explore the potential for and implications of implementing a “Second Track” program of studies for graduate students and postdocs who decide mid-way through graduate studies or postdoc work to pursue a more industry-focused direction.</td>
<td>Graduate students and postdocs will have an option other than leaving their program of study early.</td>
</tr>
<tr>
<td>Experiential Learning: Work-based learning opportunities are incorporated into the life sciences related programs; and work placements are readily available in life sciences companies</td>
<td>Support efforts to address the lack of life sciences industry receptor capacity for internships, co-op and summer job placements.</td>
<td>Students will not only be able to put theory into practice but companies will benefit from hiring known people.</td>
</tr>
<tr>
<td></td>
<td>Develop a web-based tool that:</td>
<td>Efficiencies will be achieved in linking students and companies who are looking for internships and mentors.</td>
</tr>
<tr>
<td></td>
<td>a. Connects students, graduates, alumni, life sciences professionals, SMEs for purposes of networking and mentorship support.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. Provides information to students and companies about placement opportunities.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Explore, design and implement a Life Sciences Innovation Challenge Competition for students.</td>
<td>The Life Sciences Innovation Challenge will provide students with the opportunity to learn soft skills through hands on experience – problem identification, development of and working with a team, project development and planning, execution, problem-solving, communication and presentation.</td>
</tr>
<tr>
<td></td>
<td>Implement extra-curricular, modular learning opportunities where students can earn one or more specific certificates in areas of importance to the life sciences industry.</td>
<td>In addition to a degree, graduates will have one or more certificates having completed specific modules of areas of importance to the life sciences industry.</td>
</tr>
<tr>
<td>Supportive Industry Culture: PSI faculty</td>
<td>Explore and encourage the implementation of mechanisms to</td>
<td>Companies will be able to benefit from world-class</td>
</tr>
<tr>
<td>Enabling Outcome</td>
<td>Action (Lead)</td>
<td>Why is it Important?</td>
</tr>
<tr>
<td>------------------</td>
<td>---------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>actively support their students in work-based learning and are themselves involved in company projects, development and growth.</td>
<td>enhance academic and industry partnerships. (BioAlberta)</td>
<td>expertise and researchers will develop a greater appreciation for industry challenges in need of solutions. In addition, such collaborations will change the culture re: industry at academic institutions.</td>
</tr>
</tbody>
</table>

2. Undertake a review of, and develop and implement a plan for addressing, the existing barriers that prevent students (undergraduate, graduate, postdocs) from participating in work-based learning opportunities (e.g. required time commitment, loss of focus and time re: thesis work, PI culture of non-interest in industry collaboration, financial support, IP/NDA impact on thesis work) (PSIs) | Students will have clarity as to how work-based learning opportunities can be managed within the structure of their specific educational programs. |

Public Policy: Public policy supports and is aligned with talent development for the life sciences industry

1. Advocate to the Alberta Technology Advisory Council on Talent (TACT) to explore, plan and implement actions that provide greater awareness of careers in life sciences areas in K-12. (BioAlberta) | Making K-12 students more aware of careers in the life sciences and the kind of solutions needed to real world problems will increase the talent pipeline in years to come. |

2. Re-envision IP policies within institutions and companies that support both work-based learning and company growth and development. (PSIs and Industry) | Students will benefit by learning more about, and/or improving their soft skills. Moreover, students will be more willing to engage in a work-based learning opportunity if they are not dis-advantaged regarding IP development. |

3. Review and align public policy around talent development. Specifically;  
   - Advanced Education work towards supporting and approving, in an expedited manner, life sciences curriculum and program changes that support work-readiness.  
   - Advanced Education and Economic Development and Trade together with post-secondary institutions review and update intellectual property policies to ensure that students with company placements are not disadvantaged in the completion of their studies.  

Students will benefit by learning more about, and/or improving their soft skills. Moreover, students will be more willing to engage in a work-based learning opportunity if they are not dis-advantaged regarding IP development.
4. Develop and implement cost sharing funding supports for life sciences internships, co-op and summer job placements in industry. Such actions as a re-instatement of the Alberta Innovates Postdoc program and use of MITACS could be considered. (GOA and Industry)

<table>
<thead>
<tr>
<th>Enabling Outcome</th>
<th>Action (Lead)</th>
<th>Why is it Important?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Students will be ready to participate in work-based learning if they do not have to worry about funding. Companies will make available more placement opportunities if costs can be mitigated in some fashion.</td>
<td></td>
</tr>
</tbody>
</table>

It is important to emphasize that the opportunity to enhance Alberta’s talent development pathway is built on leadership, commitment, and a willingness to exchange information between companies, PSIs, students and government intermediaries. Each of the stakeholders has a necessary and important role to play. Specifically, companies provide work-based learning opportunities, mentorship and information about skill and competency needs. Post-secondary institutions support students that participate in work-based learning opportunities and work with their faculty in bringing about changes in programs or introducing new programs that support work-readiness in students. Government intermediaries ensure that public policy supports talent preparation, facilitates and encourages industry – post-secondary partnerships and collaboration, and provides the necessary resources to support the talent preparation.

5.2 Metrics for Measuring Progress

While measuring success of the HQP Alliance in bridging the talent gap requires a longer-term view, it is necessary to monitor progress regularly and refine the priority actions based on results. Not only must the progress of the proposed actions be assessed, but also the anticipated impact of those actions on the desired future state. Therefore, the following metrics should be considered.

5.3 Enabling Outcomes

<table>
<thead>
<tr>
<th>Enabling Outcomes</th>
<th>Performance Metrics</th>
</tr>
</thead>
</table>
| Enhancements to program requirements and extracurricular education and training are aligned with life sciences industry talent needs. | ➢ Expanded PSI-industry networks  
➢ Industry talent needs identified, communicated to and negotiated with PSIs  
➢ Number of jointly developed, relevant extra industry focused certificate programs |
| Work-based learning opportunities are incorporated into life sciences related programs; and work-placements are readily available in life sciences companies | ➢ Number of internship placements  
➢ Number of soft-skill learning opportunities  
➢ Number of available spots for internship placements |
| PSI faculty actively support their students in work-based learning and are themselves involved in company projects, development and growth | ➢ Number of faculty externship opportunities  
➢ Number of faculty involved with life sciences companies |
<table>
<thead>
<tr>
<th>Enabling Outcomes</th>
<th>Performance Metrics</th>
</tr>
</thead>
</table>
| Public policy supports and is aligned with talent development for the life sciences industry | ➢ Number of students involved in internship placements  
➢ Funding resources to implement programming  
➢ Policy support for work-based learning at PSIs |

### 5.3.1 Medium Term Outcomes

<table>
<thead>
<tr>
<th>Medium-Term Outcomes</th>
<th>Performance Metrics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Life sciences companies are able to recruit from Alberta well-trained, knowledgeable, and competent high-quality people to meet their demands</td>
<td>➢ Increasing proportion life sciences company hires are Alberta graduates.</td>
</tr>
</tbody>
</table>
| PSIs are better able to understand the life sciences industry talent requirements, expand their knowledge about, and connections to the industry, and provide students with relevant skills, competencies and experience for obtaining employment | ➢ Number of soft skill training opportunities within course requirements  
➢ Number of soft skill training opportunities in work-based learning opportunities. |

### 5.3.2 Long-Term Outcomes

<table>
<thead>
<tr>
<th>Long-Term Outcomes</th>
<th>Performance Metrics</th>
</tr>
</thead>
</table>
| Life sciences companies are thriving, providing employment to local talent and bringing social and economic benefit to Alberta | ➢ Number of life sciences companies  
➢ Number of life sciences companies launched successfully  
➢ Growth in annual revenues generated by life sciences companies  
➢ Growth in the number of local graduates employed |
| Alberta PSIs and companies are known globally for their forward-looking approach to life sciences education and training | ➢ Number of students attracted to Alberta PSIs in life sciences  
➢ Reputation as a key global centre for education and training for the life sciences industry |
6 CONCLUSION

Alberta’s life sciences industry is an important emerging industry and vital to the economic diversification and prosperity of our province. The ability to attract and retain talent is a critical challenge facing a strong, growing and dynamic industry. Immediate action is needed to address a growing urgency in the sector to close this gap. Strong, coordinated leadership by industry, post-secondary institutions and government can ensure that today’s students are important contributors to the growth of Alberta’s life sciences sector.

The insights of key leaders from stakeholder organizations across the sector has identified a range of simple to complex actions that can be taken to make quick and sustained progress in closing Alberta’s life science talent gap.
7 APPENDICIES

7.1 Logic Model

![Logic Model Diagram]

**Key Organizations:**
- BioAlberta
- Post-Secondary Institutions (Universities, Polytechnics, Colleges)
- Life Sciences Industry/Companies
- Students
- Government Intermediaries
- Investor Community
- Non-profit sector

**Industry Data:**
- Life Sciences labor force data
- Industry hiring needs and skill sets
- Space availability for industry internship placements

**Principles:**
1. Build on strengths
2. Be provincial in scope
3. Be flexible to accommodate local needs and structures
4. Be inclusive of all stakeholders
5. Strive for quick wins at the outset

**Actions:**
As indicated in Section 5.1 in the Report

Life sciences companies are able to recruit well-trained, knowledgeable, and competent high-quality people to meet their demands.

PSIs are better able to understand the life sciences industry talent requirements, expand their knowledge about, and connections to the industry, and provide students with relevant skills, competencies and experience for obtaining employment

Alberta PSIs and companies are known globally for their forward looking approach to life sciences education and training

Life sciences companies are thriving, providing employment to local talent and bringing social and economic benefit to Alberta

Life sciences program requirements at PSIs: Enhancements to program requirements and extracurricular education and training are aligned with life sciences industry talent needs.

Experiential learning: Work-based learning opportunities are incorporated into life sciences related programs, and work placements are readily available in life sciences companies

Supportive Industry Culture: PSI faculty actively support their students in work-based learning and are themselves involved in company projects, development and growth.

Public Policy: Public policy supports and is aligned with talent development for the life sciences industry
7.2 Alberta’s Life Sciences Labour Force Landscape

7.2.1 Current Alberta Labour Force

Alberta had 2,331,000 employed individuals in 2018 according to figures from Statistics Canada, which makes Alberta the fourth largest employment base in the country behind British Columbia (2,466,800), Quebec (4,223,300), and Ontario (7,128,000). Of this figure approximately 279,100 are employed in what can broadly be categorized as the life sciences. The life sciences include positions ranging from registered nurses and veterinarians to social policy researchers and biologists; a line-by-line breakdown of the occupations can be found in the attached tables at the end of this appendix. These figures show that approximately 12% of Alberta’s labour force is employed in the life sciences, with approximately 4.4% being in high demand positions. Alberta had an overall growth in employment of 1.8% in 2018 and had an employment rate of 66.7%, compared to Canada’s average of 61.6%. Alberta had an unemployment rate of 6.6% in 2018, which was down from 7.8% in 2017, but still above the Canadian average of 5.6%. According to Statistics Canada in 2016 Canada had 2,145 companies, with a minimum of one employee, in the Physical, Engineering and Life Sciences with Alberta being home to 209 of these companies.

7.2.2 Growth Rate of Industry

A report published on the life sciences in Alberta in 2017 by BioAlberta and Deloitte demonstrated that over 50% of the companies surveyed were founded in the past eleven years. Of these survey respondents 48% reported being in a growth phase and 35% classified themselves as being in an emerging phase. This, coupled with the fact that over 60% of companies identified themselves

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4 https://www.ic.gc.ca/app/scc/app/cis/businesses-entreprises/54171
as being at an R&D, pilot or demonstration plant level in 2017, is a strong indication that the life science sector in Alberta is poised to grow. Another study by Deloitte and BIOTECanada found that the majority (67%) of companies in the biotechnology sector across Canada are in the discovery or emerging phase of development, over 50% of the companies in this sector employed 0-10 staff with an expectation by 2021 that 80% of these companies will be employing >10 staff. Furthermore, in 2017 59% of these companies reported revenues below $500,000 with the expectation that by 2021 57% of these companies will have revenue greater than $5 million with only 15% generating revenue below $500,000. Statistics Canada figures for 2016 show that Alberta based companies in the life sciences carry fewer than 99 employees, with the split between micro (1-4 employees) and small (5-99) being 112 and 96, respectively. These small, flexible and adaptive businesses are spending large sums on R&D and are well positioned to expand, while bringing on new hires and accounting for a larger portion of Alberta’s labour force. Medium (100-499) and large (500+) firms are almost exclusively (96%) located in Ontario, Quebec and British Columbia. Biopharmaceuticals is the largest investor in life science R&D, having invested $1.2 trillion globally in the past 10 years. With approximately 27% of Alberta based life science companies categorizing themselves in the “health biotechnology and pharma” sub-sector this is another strong indication that R&D expenditures will drive impressive growth in Alberta’s life science sector.

The pharmaceutical industry can be reviewed as an appropriate case study of the wider life science industry. According to Statistics Canada from 2012 to 2017 the manufacturing portion of the pharmaceutical sector has grown by 10.7%, albeit with the industry clustered in the metropolitan areas of Toronto, Montreal and Vancouver. Conversely, R&D activities have fallen by 13% from 2001 to 2016. However, this is reflective of a changing landscape for pharmaceutical businesses that are pushing R&D to external partners, which has resulted in increased investment in SME’s – which is the vast majority of firms operating in Alberta. The top ten pharmaceutical companies comprise half the total sales for the sector and although these firm’s operations are centralized in the B.C., Quebec and Ontario, their shifting focus away from internal R&D work is a potential windfall for SME’s operating in Alberta. According to an article from BioTalent Canada, Alberta had 80 life science companies in 2005, with that number reaching close to 230 in 2017. This translates into an average growth rate of 9.2% over that 12-year period. Statistics Canada asserts that Canada’s aging population will continue to put demands on the life science sector and specifically the health fields.

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10 [https://www150.statcan.gc.ca/n1/daily-quotidien/171129/dq171129a-eng.htm](https://www150.statcan.gc.ca/n1/daily-quotidien/171129/dq171129a-eng.htm)
7.2.3 Required Growth Rate of HQP

There are two clear methods for ensuring that the number of high quality personnel keeps pace with the growing life science sector in Alberta. The first is through Canadian and specifically Alberta based post secondary institutions’ graduates and the second is through migration and internationally educated professionals. According to Statistics Canada women represent the majority in the health fields and account for 92.7% of young nursing graduates aged 25 to 34 at the bachelor’s level and 64.4% of young graduates with medical degrees.\(^\text{11}\) This should be interpreted in the context of registered nurses and licensed practical nurses representing close to half of the high demand jobs in the life science sector in Alberta – with specialists and physicians representing another significant portion of the high demand positions. Consequently it is imperative that women are continually pursued for positions in the life science field, with a special focus on the health fields. According to the figures found on the government of Alberta’s Alis website, jobs in the life science field that are in the lowest demand can be generalized as STEM and certificate positions – not exclusively but they represent a good portion of the low demand positions. Statistics Canada figures show that 20% of men with bachelor level degrees are in the STEM fields.\(^\text{12}\) Furthermore, young men are nearly four times more likely than young women to pursue careers in apprenticeship certificates, that would encompass many of the low demand technologists fields. From this it can be concluded that women are an integral part of the life science sector today and will continue to be essential as the sector grows and that there is an opportunity to drive male students into fields the traditionally they have not gravitated towards.

According to Statistics Canada there were 12,549 and 29,166 students enrolled in “physical and life sciences and technologies” and “health and related fields” in 2016/2017, respectively in Alberta post secondary institutions.\(^\text{13}\) If the 9.2% growth holds steady through the next year than the life sciences will hire approximately 25,000 to 30,000 new employees. Should this growth rate increase to 15%, which in the context of the above discussed small size of most companies in Alberta this is very plausible, then the industry will require approximately 42,000 to 45,000 new employees. With roughly \(\frac{1}{4}\) of enrolled students graduating each year both a 9.2% and 15% growth rate for the sector significantly outpace the volume of prospective graduates from Alberta based PSI’s. Therefore, not only should Alberta based PSI’s emphasis the life science fields to prospective high school and continuing education students, but migration from the rest of Canada as well as from the international marketplace should be pursued.

According to figures from the Alberta government in 2018 Alberta welcomed 11,292 net international migrants and 3,222 net interprovincial migrants.\(^\text{14}\) Over half of recent

\(^{11}\) https://www150.statcan.gc.ca/n1/daily-quotidien/171129/dq171129a-eng.htm
\(^{12}\) https://www150.statcan.gc.ca/n1/daily-quotidien/171129/dq171129a-eng.htm
\(^{13}\) https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3710001101&pickMembers%5B0%5D=1.10&pickMembers%5B1%5D=2.1&pickMembers%5B2%5D=6.1
\(^{14}\) https://open.alberta.ca/dataset/6882bbddd-10b1-4b71-8a14-7de250f925fb/resource/05d0a831-2a4a-4c49-a8d2-783765402747/download/2019-0104-alberta-economy-indicators.pdf
immigrants from 2011 to 2016 who landed in Canada had a bachelor’s degree or higher, according to Statistics Canada. These educated professionals can play an important role in serving the growing life science sector. A survey report from BioTalent Canada’s website states that biotechnology and bio-health R&D are the most common fields for new immigrants.15 Barriers preventing new immigrants with backgrounds in the life science sector from entering the field in Canada and Alberta include:

1. Education and experience not recognized once they arrive in Canada,
2. Standardized candidate pre-screening methodologies are not readily available,
3. 50% of the IEP’s surveyed were unemployed because of their inability to navigate the hiring process,
4. New immigrants are not aware of the immigrant serving agencies that are available,
5. Low paying research jobs were the most obtainable for new immigrants, discouraging them from pursing positions in their fields and;
6. Employers do not always trust credential recognition programs. 16

The combined effort of bolstering student enrolment and successful graduation from Albertan and Canadian PSI’s coupled with obviating the above listed problems identified by internationally educated professionals will provide a steady stream of prospective employees for the continually growing life science sector.

7.2.4 Outsourcing and Wage Subsidy Programs

Outsourcing key functions within early stage life science companies to third parties is an important strategy. With limited funding and/or expertise to fully embrace new technologies such as; advanced genomics, combinatorial chemistry, high-throughput screening, among others, leads to these companies utilizing contracted research organizations (CRO) or academic institutions capable of providing knowledge domain expertise. Six key principles to ensure that outsourcing is effective for life science companies aiming to maximize their viability while overall increasing the talent pool of high quality personnel in the sector include: (1) selecting the right partner, (2) maintaining a clear objective, (3) compatible corporate cultures, (4) internal staff must have appropriate experience to manage partnership effectively, (5) routine improvements to service-level commitments should be carried out, and finally (6) it is important to be cognizant of the fact that outsourcing can present risks to a company.17 By understanding and adhering to these principles when outsourcing early stage and emerging life science companies can generate a wealth of tangible value with limited funds and without a complete suite of in-house expertise. With a large pool of life science companies in the R&D or emerging phases of development, outsourcing is a viable component to this

growing sector and will lead to the maturity of companies in the field ultimately resulting in an increased demand on high quality personnel across the sector.

As these early stage companies expand and look to increase their internal labour force wage subsidy programs, such as those available through organizations like BioTalent Canada and Alberta Innovates have an integral role to play. Wage subsidies can help offset the cost of orientation, integration and the competency of new hires. According to a BioTalent report there were 556 placements from 2013 to 2017 through their wage subsidy programs. Employers and new hires benefit from wage subsidy programs in a variety of ways. Employers can meet staffing needs with little financial risk, can grow their businesses in an expedited fashion, can gain access to eager new hires, and can develop new talent internally. While the new hires gain real world experience soon after graduation, establish a presence in the life science network early on in their career, benefit from personal and professional development, and, in some instances, can approach life science companies with a pre-approved wage subsidy program in hand. According to the BioTalent report, since 2013 84.7% of wage subsidy program participants were employed full time following the completion of their program. A 2013 report titled “Sequencing the Data” found that lack of practical, non-academic skills among new hires was the second biggest obstacle faced by bio-economy companies. These wage subsidy programs can be leveraged to obviate this obstacle by allowing companies to hire and train more staff early in their careers to tailor their competencies to the specific companies they are working for. This will also result in an overall increase in the hiring of younger staff - coupled with the utilization of CRO’s and academic institutions for outsourcing at early stages these two mechanisms can be fully deployed to dramatically increase the volume of highly skilled and highly competent full time personnel in the life science industry.

7.2.5 Alberta Life Sciences Workforce

7.2.5.1 High Demand Jobs in Alberta \(^{19}\)

<table>
<thead>
<tr>
<th>Occupation</th>
<th>National Occupation Classification</th>
<th># Employed</th>
<th>Similar Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registered Nurses and registered psychiatric nurses</td>
<td>NOC 3012</td>
<td>41,600</td>
<td>Community health nurse; infection control professional; psychiatric nurse; occupational health nurse; RN</td>
</tr>
<tr>
<td>General Practitioner and family physicians</td>
<td>NOC 3112</td>
<td>7,700</td>
<td>Family physician</td>
</tr>
<tr>
<td>Specialist physicians</td>
<td>NOC 3111</td>
<td>6,700</td>
<td></td>
</tr>
<tr>
<td>Licensed practical nurses</td>
<td>NOC 3233</td>
<td>7,400</td>
<td></td>
</tr>
<tr>
<td>Pharmacists</td>
<td>NOC 3131</td>
<td>7,300</td>
<td></td>
</tr>
</tbody>
</table>


\(^{19}\)https://alis.alberta.ca/occinfo/occupations-in-alberta/occupations-in-demand/
## Occupation | National Occupation Classification | # Employed | Similar Occupations
--- | --- | --- | ---
Business Development officers & marketing researchers and consultants | NOC 4163 | 5,400 | Economic development officer; market research analyst
Advertising, marketing and public relations managers | NOC 0124 | 5,000 | Marketing manager
Medical administrative assistants | NOC 1243 | 4,200 | Medical Office assistant unit clerk
Agriculture Service contractors, farm supervisors and specialized livestock workers | NOC 8252 | 2,900 | Swine technician
Managers in Health Care | NOC 0311 | 3,200 | Health service admin.
Dental hygienists and dental therapists | NOC 3222 | 3,300 | dental hygienist
Nursing co-ordinators and supervisors | NOC 3011 | 2,700 |
Medical sonographers | NOC 3216 | 1,700 |
Cardiology technologists and electrophysiological diagnostic technologists | NOC 3217 | <1,500 |
Dentists | NOC 3113 | <1,500 |
Other wood processing machine operators | NOC 9434 | <1,500 |

### Medium Demand Jobs in Alberta

| Occupation | National Occupation Classification | # Employed | Similar Occupations |
--- | --- | --- | ---
Administrative Assistant | NOC 1241 | 19,800 | Arbitrator, mediator, training & development professional
Human Resource professionals | NOC 1121 | 12,800 |
Managers in natural resources production and fishing | NOC 0811 | 8,400 |
Process control and machine operators, food, beverage and associated products processing | NOC 9461 | 4,500 | Agricultural products processing machine operators, feed mill production worker
Other medical technologists and technicians | NOC 3219 | 5,300 | Prosthetic and orthotic technician, prosthetics and orthotics, pharmacy technician

<table>
<thead>
<tr>
<th>Occupation</th>
<th>National Occupation Classification</th>
<th># Employed</th>
<th>Similar Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical and electronics engineering technologists and technicians</td>
<td>NOC 2241</td>
<td>3,400</td>
<td>Biomedical engineering technologist, catholic protection technician, electrical engineering technologist, instrumentation engineering technologist, telecommunications technologist</td>
</tr>
<tr>
<td>Health policy researchers consultants and program officers</td>
<td>NOC 4165</td>
<td>3,100</td>
<td>Policy analyst</td>
</tr>
<tr>
<td>Medical laboratory technologists</td>
<td>NOC 3211</td>
<td>2,900</td>
<td>Combined laboratory and x-ray technologist, cytotechnologist</td>
</tr>
<tr>
<td>Medical radiation technologists</td>
<td>NOC 3215</td>
<td>2,900</td>
<td></td>
</tr>
<tr>
<td>Respiratory therapists, clinical fusionists and cardiopulmonary technologists</td>
<td>NOC 3214</td>
<td>2,900</td>
<td></td>
</tr>
<tr>
<td>Psychologist</td>
<td>NOC 4151</td>
<td>2,500</td>
<td></td>
</tr>
<tr>
<td>Chemists</td>
<td>NOC 2112</td>
<td>2,400</td>
<td>Biochemist</td>
</tr>
<tr>
<td>Occupational therapist</td>
<td>NOC 3143</td>
<td>2,400</td>
<td>Biotechnologist, interpretive naturalists, ecologist, entomologist, food scientist, geneticist, microbiologist, pharmacologist, physiologist, toxicologist</td>
</tr>
<tr>
<td>Biologists and related scientists</td>
<td>NOC 2121</td>
<td>1,600</td>
<td></td>
</tr>
<tr>
<td>Optometrists</td>
<td>NOC 3121</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>Dental technologist, technicians and laboratory assistants</td>
<td>NOC 3223</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Denturists</td>
<td>NOC 3221</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Dieticians and nutritionists</td>
<td>NOC 3132</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Forestry technologists and technicians</td>
<td>NOC 2223</td>
<td>&lt;1,500</td>
<td>Timber scaler</td>
</tr>
<tr>
<td>Other professional occupations in health diagnosing and treating</td>
<td>NOC 3125</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Practitioners of natural healing</td>
<td>NOC 3232</td>
<td>&lt;1,500</td>
<td>Acupuncturist, herbalist, homeopath, reflexologist</td>
</tr>
</tbody>
</table>

7.2.5.3 Low Demand Jobs in Alberta

<table>
<thead>
<tr>
<th>Occupation</th>
<th>National Occupation Classification</th>
<th># Employed</th>
<th>Similar Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managers in agriculture</td>
<td>NOC 0821</td>
<td>32,500</td>
<td>Beekeeper, dairy producer, grain and forage crop producer, livestock and poultry producer, market gardener</td>
</tr>
<tr>
<td>Post secondary teaching and research assistants</td>
<td>NOC 4012</td>
<td>11,300</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inspectors in public and environmental health and occupational health and safety</th>
<th>NOC 2263</th>
<th>7,900</th>
<th>Environmental auditor, hazardous waste management technologist, public health inspector, occupational health and safety advisor/officer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geoscientists and oceanographers</td>
<td>NOC 2113</td>
<td>6,000</td>
<td>Exploration geophysicist, geologist, hydrologist, oceanographer</td>
</tr>
<tr>
<td>Natural and applied science policy researchers, consultants and program officers</td>
<td>NOC 4161</td>
<td>5,200</td>
<td>Ergonomist, occupational hygienist</td>
</tr>
<tr>
<td>Medical laboratory technicians and pathologists assistants</td>
<td>NOC 3212</td>
<td>4,000</td>
<td></td>
</tr>
<tr>
<td>Education policy researchers, consultants and program officer</td>
<td>NOC 4166</td>
<td>2,800</td>
<td></td>
</tr>
<tr>
<td>Chemical Technologists and technicians</td>
<td>NOC 2211</td>
<td>2,300</td>
<td>Biofuels processing technician, chemical engineering technologist, chemical technologist, food science technologist, forensic laboratory analyst, pollution control technologist</td>
</tr>
<tr>
<td>Other professional engineers</td>
<td>NOC 2148</td>
<td>2,300</td>
<td>Agricultural engineer, biomedical engineer, engineering physicist</td>
</tr>
<tr>
<td>Social policy researchers, consultants and program officers</td>
<td>NOC 4164</td>
<td>2,100</td>
<td>Human ecologist</td>
</tr>
<tr>
<td>Agricultural representatives, consultants, and specialists</td>
<td>NOC 2123</td>
<td>1,700</td>
<td>Agrologist</td>
</tr>
<tr>
<td>Chemical engineers</td>
<td>NOC 2134</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>animal health technologists and vet technicians</td>
<td>NOC 3213</td>
<td>1,500</td>
<td></td>
</tr>
<tr>
<td>Agricultural and fish products inspectors</td>
<td>NOC 2222</td>
<td>&lt;1,500</td>
<td>Agricultural commodity inspector</td>
</tr>
<tr>
<td>Biological technologists and technicians</td>
<td>NOC 2221</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Government managers - health and social policy development and program administration</td>
<td>NOC 0411</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Oil and solid fuel heating mechanics</td>
<td>NOC 7331</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Senior managers - health, educational, social and community services and membership organizations</td>
<td>NOC 0014</td>
<td>&lt;1,500</td>
<td></td>
</tr>
<tr>
<td>Veterinarians</td>
<td>NOC 3114</td>
<td>&lt;1,500</td>
<td></td>
</tr>
</tbody>
</table>
7.3 Jurisdictional Scan

A jurisdictional scan was completed of Quebec and Ontario, the two largest life science sectors in Canada as well as the Greater Boston area in Massachusetts, the largest life science sector in the world. Throughout our consultation, several important initiatives were identified as potential models for further study.

7.3.1 Quebec, Canada

The province of Quebec utilizes public/private partnerships to foster innovation and growth in the life science sector leading to opportunities for businesses and employees. Quebec is home to more than 450 life sciences companies, employing over 25,400 skilled workers. There are an additional 10,000 researchers in the life sciences sector and each year over 10,000 students graduate from health-related programs.\(^{22}\) Three initiatives driving the growth of the life sciences in Quebec will be discussed.

1. **Partnerships for Personalized Medicine in Cancer (PMPC)**

   Stakeholders in this partnership include Caprion Proteomics, Oncozyme Pharma, Pfizer, Sarnoff, TELUS Health, and the Quebec Government. The objective of the PMPC is to develop and validate biomarkers and encourage their use in medical practices. According to their website, “the PMPC encompasses a broad network of partners and collaborators from various disciplines such as molecular biology, genomics, proteomics, medical imaging, clinical management, pharmacy economics, ethics, bioinformatics, and information technology.” This wide range of stakeholders and focus areas creates an integrated network to support the deployment and practice of personalized medicine in Quebec while delivering novel methods that can be efficiently implanted in the healthcare system. Projects administered by the PMPC are projected to have a quantifiable effect on clinical diagnosis and therapeutic management of various cancers as well as the efficiency and costs to the health care system.

2. **MEDTEQ**

   MEDTEQ has a broad number of stakeholders that include: the Quebec Government, Quebec’s five University hospital centers, Ubisoft, ORS, Emovi and TSO3, as well as global life sciences companies like Medtronic, Roche Diagnostic, and Siemens. The core objective for MEDTEQ is to accelerate the development of innovative technological solutions. This objective translates into viable opportunities for businesses and their associated employees. MEDTEQ provides resources and networks to drive promising technologies to market and help de-risk investments in these technologies through their due diligence. By working with industry, universities, healthcare centers, research centers MEDTEQ helps innovative companies to navigate the complex process of gaining access to healthcare players.

There are 170+ members in MEDTEQ ecosystem with projects valued at $55+ million and over 90% of members are involved in collaborative projects.

3. **Quebec Consortium for Drug Discovery (CQDM)**

The CQDM has a directive to stimulate pharmaceutical research and accelerate the discovery of new drugs and does so through broad network of stakeholders that include: AstraZeneca, Pfizer Canada, Merck Canada, Boehringer Ingelheim, Eli Lilly, GlaxoSmithKline, Novartis, Sanofi Canada, and the Quebec Government. Through the funding the development of innovative tools and technologies CQDM is accelerating the discovery and development of safer and more effective drugs for the wider healthcare sector. The CQDM has funded 64 projects, involving 69 research institutions, with $44 million invested in R&D, $24 million in co-financing, and $194 million in follow-on investments.

7.3.1.1 **HQP Development Models**

Specific HQP Strategies identified during our consultation as important enablers of producing high quality talent relevant to industry’s growth needs include:

1. Concordia University has developed a biotechnology executive program to assist junior biotechnology executives in startups and growth companies with international mentors. This approach has accelerated industry insights and improved the development and success of industry receptor capacity for new graduates.

2. The Sanofi Biogenius: Biotechnology Competition has nurtured young minds and fostered great talent for the future over the past 20 years by challenging high school students to carry out groundbreaking research projects in the field of biotechnology. Those students selected for the BSC are matched with local mentors in their region, which provides students with hands-on research experience in a professional lab setting. This program is carried out across Canada with regional winners taking part in a national event, with the chance to participate in the International Biogenius Competition, held annually at the BIO International Convention.

3. StartupExperience.Ca is a program that has partnered with leading accelerators and community champions, including Concordia University, in Montreal to host international startups for a period of 3 months. This program attracts international recent graduates and incorporates industry, academia and government in the development of startup businesses and provides an opportunity to expose students and recent graduates to professional work environments.
7.3.2 Ontario, Canada

Ontario is the largest center for the life sciences industry in Canada and is eighth in North America. According to Statistics Canada there are 5,645 life sciences companies in Ontario employing 82,737 highly skilled workers who earn 26.5% more than the provincial average.\(^{23}\) It is estimated that the total number of direct and indirect life sciences jobs in Ontario is just fewer than 200,000. Three areas of focus for future growth of the sector outlined by a report from Life Science Ontario include: (1) access to capital, (2) R&D investment, and (3) transition of young talent into the workforce. Six of Ontario’s Universities have associated medical schools with approximately 40,000 graduates in science, engineering, mathematics and related technologies each year; in addition to the four top Canadian research hospitals in Ontario.\(^ {24}\) Three initiatives in Ontario driving development in the life sciences sector are aimed at collaboration and innovation.

1. **Life Science Venture Capital Fund Initiative**

   The Ontario Capital Growth Corporation (OCGC) is aimed at assisting and promoting the development of a long term, sustainable venture capital industry in Ontario to strengthen Ontario’s economy and create job opportunities. This initiative arranged limited partnerships to establish a new or bolster existing life science venture capital funds. A focus on high potential, innovative Ontario-based life sciences companies attracts investment, businesses, and attracts/retains highly skilled employees.

2. **Life Science Ontario**

   Life Science Ontario is an advocacy association for the life science sector in Ontario. With the overarching goal of fostering commercial success this association advocates and educates to promote the industry locally, nationally, and internationally. They specifically advocate for public policy action, access to capital, and alignment with provincial life sciences strategy. Life Science Ontario is a centralized hub delivering unparalleled educational, networking, mentorship, and thought leadership connects the life sciences sector’s diverse cluster to facilitate a strong, aligned sector. Stakeholders in this group range from life sciences companies to academia and service providers. The life sciences companies include: biopharmaceuticals, agriculture, agri-food, the bio-economy, medical devices, animal health, and environmental technologies.

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\(^{24}\) https://www.investinontario.com/life-sciences#talent
3. Mississauga Life Science Cluster Strategy

Mississauga is home to over 500 life sciences companies with approximately 24,000 employees. The Economic Development Office of Mississauga developed a cluster strategy and implementation plan identifying short, medium and long-term priorities over a five-year period from 2017-2021. Nine observations were gleaned from their strategy development process:

1. Varying perceptions of the local business climate. Mississauga must be inclusive of early startups and SMEs to create a cohesive group to stimulate sector growth.
2. Support for early stage life sciences companies.
3. Business to business collaboration is essential.
4. Talent/skills gaps need to be addressed. PSIs need to continually update workforce training requirements, which requires a need for increased mentorship opportunities, and must be balanced against a lack of in-house training resources as well as loss of talent to other sectors and hubs.
5. Attraction and retention of talent through appropriate transit infrastructure for the City.
6. Collaborative measures to mitigate duplication of services.
7. Mississauga Economic Development office acts as integrator and enabler for the sector.
8. Collaboration between industry stakeholders and non-industry stakeholders is key.
9. Transition into an innovation district and innovation ecosystem that has a mix of uses for available space (ex. offices, research, co-working space, incubation space, etc.).

7.3.2.1 HQP Development Models

Specific HQP Strategies identified in our consultation as important enablers of producing high quality talent relevant to industry’s growth needs include:

1. McMaster Life Science 4 year Undergraduate Program actively engages entrepreneurial and industry experiences early and frequently in the educational program experience. It include a 6 month secondment to industry and joint industry and academic projects across the biosciences industries.
2. JLabs – a J&J initiative managed as a distributed network but with a notable presence at MaRS in Toronto provides access to mentorship and support or enterprising student or recent grads focused on challenges relevant to J&J.

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3. Clinician led hospital incubator like St. Michaels Hospital in Toronto present ways of aligning incentives and motivating recent entrepreneurs to advance their ideas closer to market needs.

7.3.3 Boston, Massachusetts

The Greater Boston area is the most productive life sciences ecosystems in the world. Two initiatives will be reviewed to glean some insights into the success of the area. The total Boston area employs 12,000 people in the life sciences sector with the state of Massachusetts showcasing more employment in biotechnology R&D than any other US state, with close to 28,000 people.26

1. Massachusetts Life Science Center27

Through public-private funding initiatives, the MLSC supports innovation, R&D, commercialization and manufacturing activities in the fields of biopharma, medical devices, diagnostics, and digital health. Over the past 12 years MLSC has strategically deployed over $700 million through a combination of grants, loans, capital infrastructure investments, tax incentives and workforce programs. Five open programs that the MLSC has listed on their website include:

1. Bits to Bytes provides grants for capital projects that support the life sciences ecosystem by enabling and supporting the generation and analysis of large datasets to answer pressing life science questions and to attract and train data scientists.

2. High School Apprenticeships Challenge facilitates and funds paid internships for high school students as well as offering an after school laboratory training program for select school districts during the spring that aims to better prepare student for summer internships. Over 3 years this program has supported 220 internships with 63 companies.

3. Internship Challenge is a workforce development program focused on enhancing the talent pipeline for the Massachusetts life sciences companies. Each year the program creates over 500 new internship opportunities for college and recent graduates. Over the past 10 years the program has supported 3,850 internships with more than 750 companies.

4. Massachusetts Next Generation Initiative is a five year, over $2 million commitment to ensure greater gender parity in the life sciences sector. This is a public-private partnership that provides non-dilutive capital to women-led early-stage life sciences companies.

5. Tax Incentive Program provides tax incentives to companies working in life sciences sector R&D, commercialization and manufacturing in the state.

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26 https://www.siliconrepublic.com/companies/boston-life-sciences-sector
27 http://www.masslifesciences.com/
2. **Life Science Corridor**

The Life Science Corridor is composed of Somerville, Cambridge, Boston, Quincy, and Braintree. With 730 companies, this is home to the largest cluster of life sciences and biotech companies in the world. The MBTA Commuter Rail system plays an integral role in keeping this cluster connected. LSC is sustained by skilled labor availability, access to leading universities, the existence of established R&D districts, major research hospitals and venture capital resources. There are 27.7 million square feet of R&D space and 15 million square feet of lab space available. The Corridor has more square feet for academic and research institute facilities than any other cluster in the nation. The LSC is also home to the largest startup completion and accelerator, MassChallenge. Since 1995 Boston has received $27 billion in National Institute of Health funding that has bolstered the LSC. With over 80 colleges and universities the Corridor has the largest percentage of college students in the nation.

7.3.3.1 **HQP Development Models**

Specific HQP Strategies identified as important enablers of producing high quality talent relevant to industry’s growth needs include:

1. **International Genetically Engineered Machine Competition (iGEM) Foundation** is an independent, non-profit organization dedicated to education and competition, the advancement of synthetic biology, and the development of an open community and collaboration. The iGEM Foundation runs three main programs: the iGEM Competition, which involves international team of undergraduate students interested in the field of synthetic biology; the Labs Program, which allows academic labs to use the resources made available to the competition teams; and the Registry of Standard Biological Parts, which is a growing collection of genetic parts used for building biological systems. This Foundation was formed in 2003 at the Massachusetts Institute of Technology and has expanded to 310 teams in 2017. The head office for iGEM is located in Cambridge, Massachusetts.

2. **The Harvard Undergraduate Biological Sciences Society** is a student-run organization that focuses on students in the life sciences. This Society hosts career-oriented speaker events, engages in outreach through a variety of events and initiatives aimed at raising awareness of the biological sciences, and host relaxed study sessions throughout the year to foster interactions and build relationships.

3. **Women In Bio (WIB)** has a Greater Boston chapter that leverages the strength of the region’s biotechnology supercluster to promote leadership and entrepreneurship for women in the life sciences. Aimed at fostering the growth of the biotechnology community in New England while providing essential mentoring and professional development opportunities – ranging from students

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28 [https://lifesciencescorridor.com/](https://lifesciencescorridor.com/)
and recent graduates to industry veterans. The Mentorship Advisors, Peers, and Sponsorship (MAPS) Program brings together small groups of 4 or 5 mentees and 2 women with accomplished careers as mentors. Educational and networking opportunities are also available to industry members, students, and recent graduates.
8 Bibliography


