

Biotechnology Industry Intelligence Briefing Human Resource Trends and Projections

Biotechnology is an enabling technology involved in a wide variety of industrial applications. The biotechnology sector is dynamic, growing and global. As developed economies place increasing emphasis on skilled knowledge workers, the success of any industry is becoming more highly dependent upon the ability to attract, supply and retain individual workers with the right skills at the right time. The biotechnology sector is an example of where access to a highly skilled knowledge workforce is a critical factor in the success of the overall industry. As such, understanding the biotechnology labour market and its trends are essential components of a human resources strategy.

The Biotechnology Human Resource Council (BHRC) is in an excellent position to observe and report on issues and trends affecting employment and human resources in the biotechnology sector. Information presented in this Industry Intelligence Briefing is captured from a series of BHRC consultations and review exercises, including *Projections for the Future* - BHRC's online survey of biotechnology employment and skills projections (61 biotechnology organizations participated in this survey, including 46 For Profit Companies and 15 Not-For-Profit organizations). Other sources of data include the ongoing biotechnology compensation and salary survey; the May 2000 Strategic Biotechnology HR Roundtable; findings from BHRC's Biotechnology HR Strategic Planning Consultations; and regular input from the national biotechnology HR network.

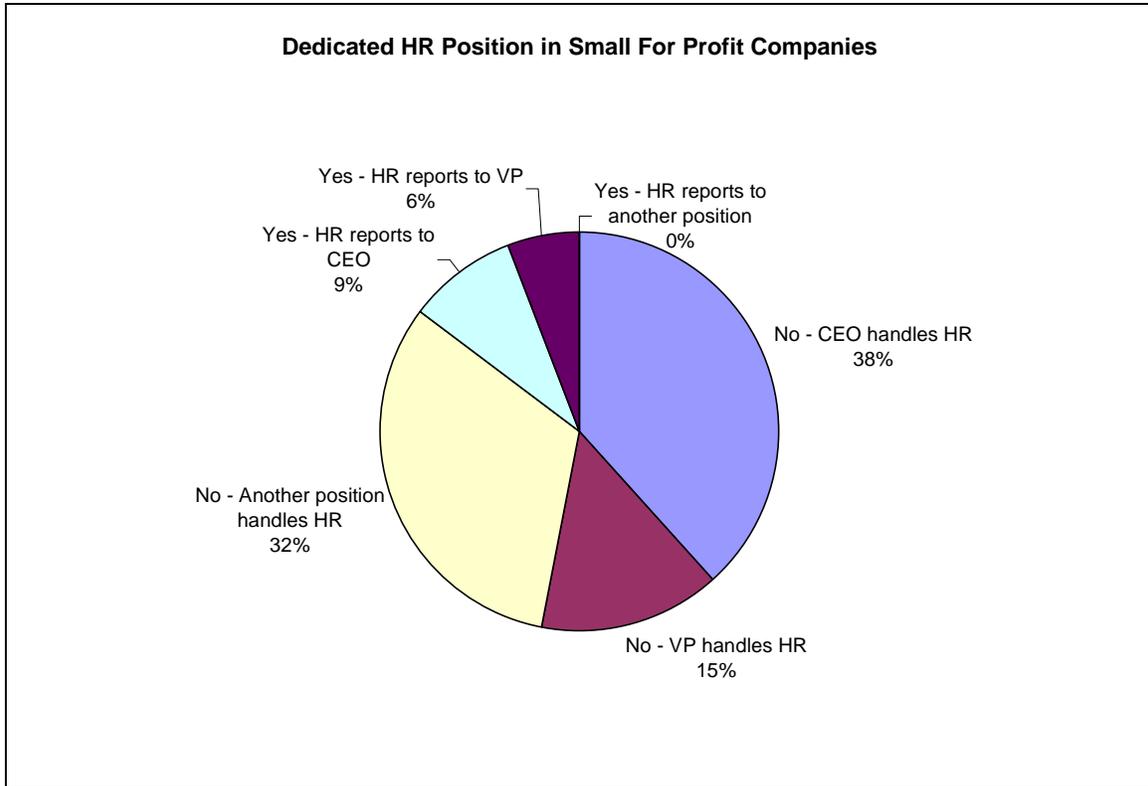
HR PROFILE AT A GLANCE

It is already established that the majority of biotech companies in Canada are small. In fact, 75% of all for profit firms participating in BHRC's *Projections for the Future* survey reported a size of less than 50 Full-Time Equivalents (FTE's)¹. It has also become clear that few Canadian biotech companies have a well defined Human Resources (HR) plan – one that is aligned with the strategic goals of the company, as well as directed by a dedicated HR practitioner. Well over 1/3 of all organizations responding to *Projections for the Future* indicated that they did not have at least one full-time person dedicated to human resource functions. This lack is even more pronounced in small biotech companies – where more than 85% do not have anyone dedicated to the HR role (See Figure 1). Participants at the national Biotechnology Strategic HR Roundtable also voiced their opinion that many biotech organizations, particularly those in early stage, are simply unable to devote sufficient attention to HR aspects of their business as too many other factors take priority. For the most part, they understand the critical need for

¹ In *Projections for the Future*, “Small” organizations are those with less than 50 FTE's, “Medium” organizations have between 51-150 FTE's, and Large organizations have more than 151 FTE's.

HR management – but do not have the resources, tools and assistance to address it.

Figure 1. Small For Profit Company Responses: “Do You Have At least One Full-Time Person Dedicated to HR Functions?”



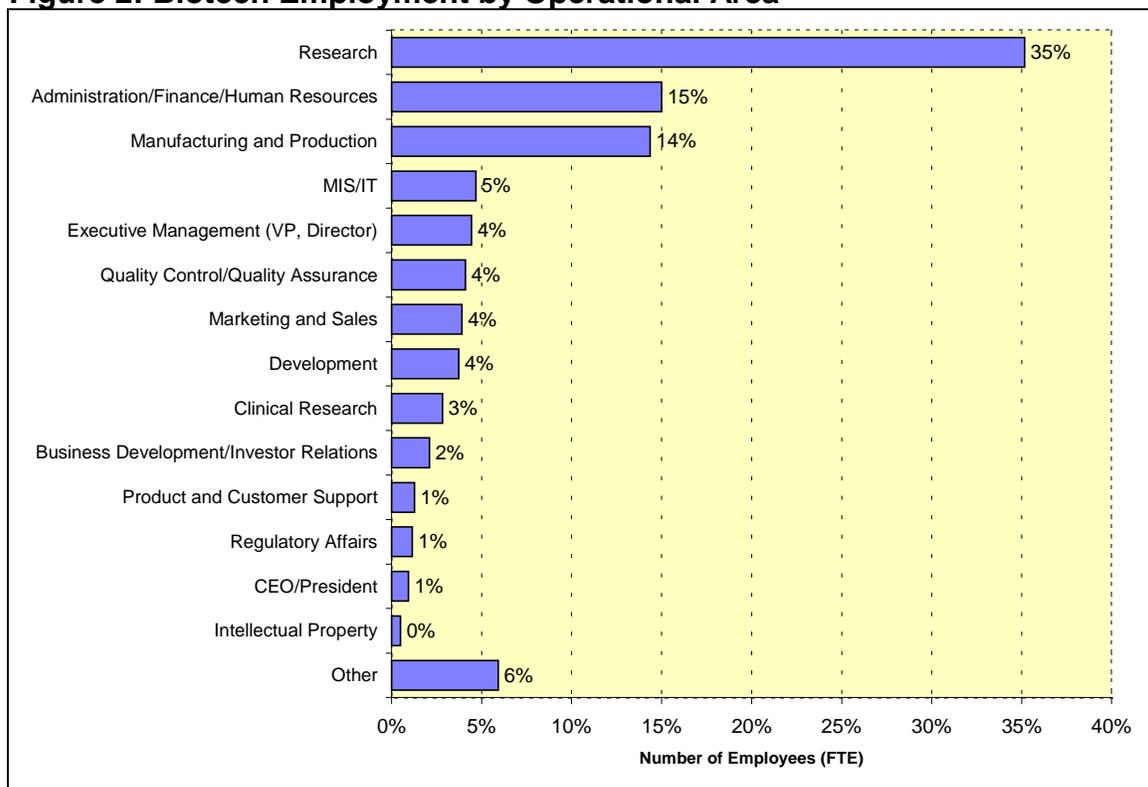
Source: “Projections for the Future”, BHRC 2000

EMPLOYMENT AND GROWTH

The Canadian biotechnology sector is composed of both “core” biotech companies (those applying science and engineering in the direct or indirect use of living organisms or parts of living organisms in their natural or modified forms in an innovative manner in the production of good and services or to improve existing processes) and non-core organizations including research centers, laboratories, government agencies, non-profit organizations or companies using traditional biological techniques. According to BIOTECCanada, there are 282 core biotechnology companies in Canada, while the number of non-core organizations is at least double that. BIOTECCanada also estimates these core companies employ 10,000 individuals. Human healthcare firms dominate the sector, while firms involved in agricultural biotechnology (including plant biotech, food production, and veterinary care) represent the next largest proportion. Both core and non-core biotechnology, biopharmaceutical and other life sciences organizations generally compete for the same limited pool of human resources, therefore, understanding employment trends and skill requirements in both kinds of organizations is absolutely critical towards developing human resource strategies, tools and projections for the industry.

As the majority of Canadian biotech companies are still in early stage, the operational area of **Research** holds the largest share of employment in the industry. *Projections for the Future* examined an employment pool of over 5000 employees – of which more than 1/3 work in the **Research** area. Significant populations of employees also work in **Administration** (including finance and human resources) and **Manufacturing & Production** (See Figure 2). The number of production employees, as well as those employed in other functions necessary for the development and commercialization of products, can be expected to grow relative to other activities as more Canadian firms develop into mature companies with production capability, or outsource their production needs.

Figure 2: Biotech Employment by Operational Area



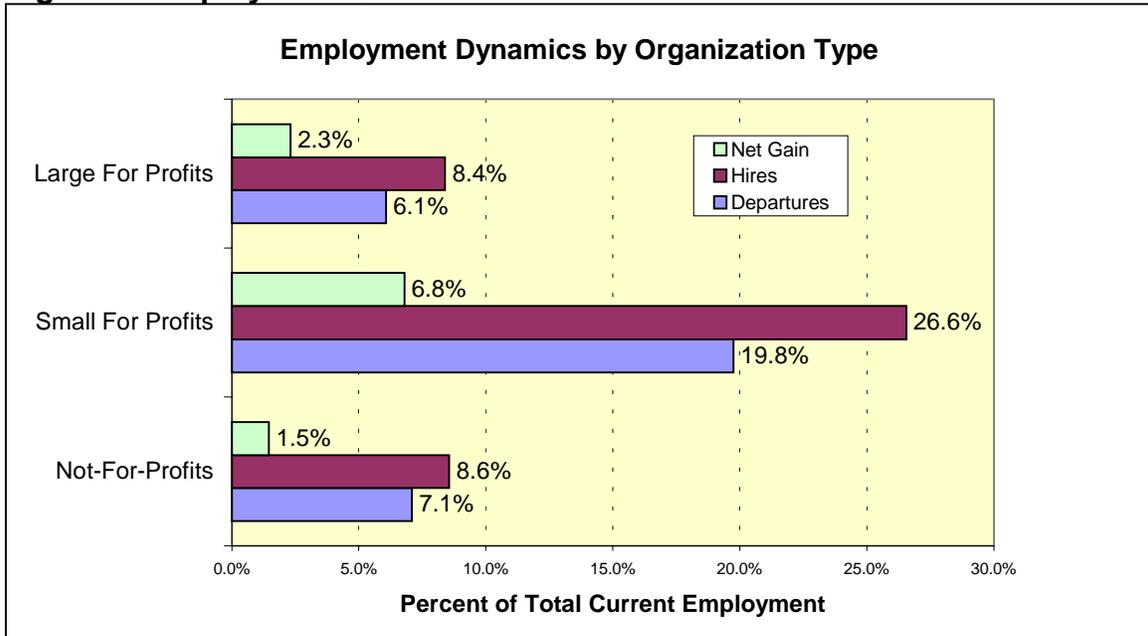
Source: “Projections for the Future”, BHRC 2000

Several recent studies (including the 1996 Paget Report, and the 1999 Statistics Canada Biotechnology Industry Report) have placed high expectations on the overall growth of the biotechnology industry in Canada - citing annual incremental growth anywhere between 10% and 20%. Obviously, industrial growth depends on many factors, and can portrayed in different ways.

BHRC’s *Projections for the Future* provides a snap-shot of employment growth within a selected number of organizations, over a 12 month period. Of these organizations, small biotech firms reported net gains in employment of 6.8%, with

a reported turnover rate of 19.8%. Larger firms reported net employment gains of only 2.3%, with a more reasonable turnover rate of 6.1%. (See Figure 3). While these net employment gains appear to fall short of previously reported growth predictions, these results must be taken into the context of the timing of the reporting period: for the most part, data was reported for employment changes over the course of the 1999 calendar year. We can expect that overall employment for the industry as a whole may be considerably different since this would include changes in employment associated with the birth and death of firms as well as mergers and acquisitions, that were not captured by the methodology used in the snap-shot survey. Moreover, financial analysts agree that the weaker financing and investment climate in early 1999 likely contributed to lower employment growth than earlier statistics have projected. Since the close of that survey, the biotechnology financing landscape has improved dramatically, and companies have become more aggressive with their expansion plans.

Figure 3: Employment Growth in last 12 months



Source: "Projections for the Future", BHRC 2000

A Closer Look at Employment Dynamics

BHRC industry intelligence reports again and again that the industry both urgently requires and is experiencing difficulty in finding, attracting and retaining individuals skills necessary to work in the operational areas of **Regulatory Affairs** (including QA / QC, compliance and validation), **Protection of Intellectual Property**, **Clinical Research** (and clinical project management), **Strategic Alliances and Business Development**, and overall **Sr. Executive Management**. These "hot" employment areas, their high turnover rates and apparent recruiting difficulties are borne out by the results of BHRC's *Projections for the Future Survey* in Figure 4 below:

Figure 4: Employment Growth Dynamics in Selected Operational Areas

	% Departures	% Actual Hires	Actual Net Growth	% Desired Hires*	Expected Net Growth
Business Development	3.9%	16.6%	+ 12.7%	24.5%	+ 20.6%
Regulatory Affairs	11.2%	16.0%	+ 4.8%	30.4%	+ 19.2%
Clinical Research	14.4%	21.6%	+ 7.2%	31.4%	+ 17.0%
Manufacturing	8.5%	17.0%	+ 8.5%	23.9%	+ 15.4%
QA / QC	10.3%	15.5%	+ 5.2%	23.1%	+ 12.8%
Research	5.4 %	10.3 %	+ 4.9 %	14.2%	+ 8.8 %
Administration	13.7 %	7.7 %	- 6.0 %	10.6 %	- 3.1 %

Source: BHRC 2000. NOTES: “Departures” and “Actual Hires” are expressed as a percentage of reported FTE’s lost or hired over the total reported FTE complement in each operational area. “Actual Net Growth” is the difference between the two. “Desired Hires” includes actual new hires plus positions remaining vacant over the reporting period. “Expected Net Growth is the difference between the % of desired hires and % actual departures.

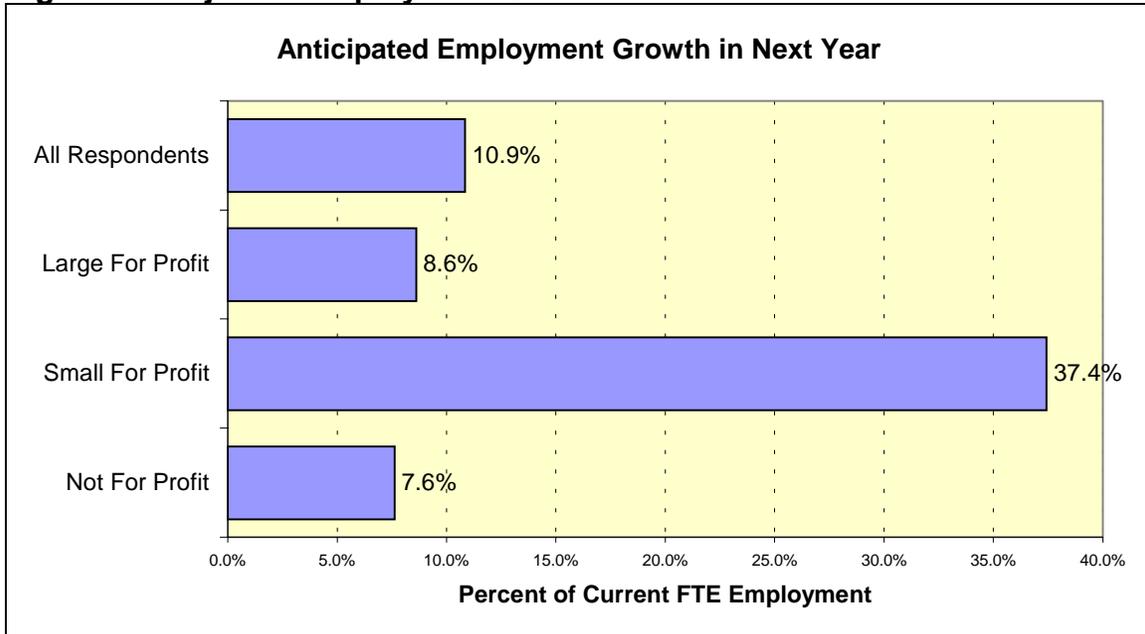
Looking at Actual Net Employment Growth, the greatest rate of employment growth occurred in the operational area of **Business Development** at 12.7 percent. Relatively strong growth was also apparent in **Manufacturing and Production** at 8.5 percent, and **Clinical Research** at 7.2 percent. However, companies also reported numbers of positions in different operational areas that had remained vacant for more than 6 months – areas with high levels of long-term vacancies included **Regulatory Affairs, Clinical Research, Business Development, Intellectual Property** and **QC/CA**. This is indicative of areas where employment growth is being limited by imbalances in the labour market, or in other words, where companies are experiencing recruiting difficulties.

An examination of desired growth, by factoring in the number of positions that have remained vacant for a minimum of 6 months, changes the picture somewhat (Please see Figure 4). For example, though actual net employment in **Regulatory Affairs** positions grew by only 4.8 percent, the employment growth rate would have approached 20 percent had all vacant positions been filled. Similar situations are also observed in **Business Development, Clinical Research, Quality Assurance & Quality Control**, as well as **Manufacturing & Production**. These high rates of desired or expected employment growth over the past year highlight the need for additional skilled human resources in these areas.

The Year Ahead

As the industry moves into the 2000/2001 Fiscal Year, it appears to be both more optimistic and realistic in terms of employment projections.

Figure 5: Projected Employment Growth in Next 12 Months

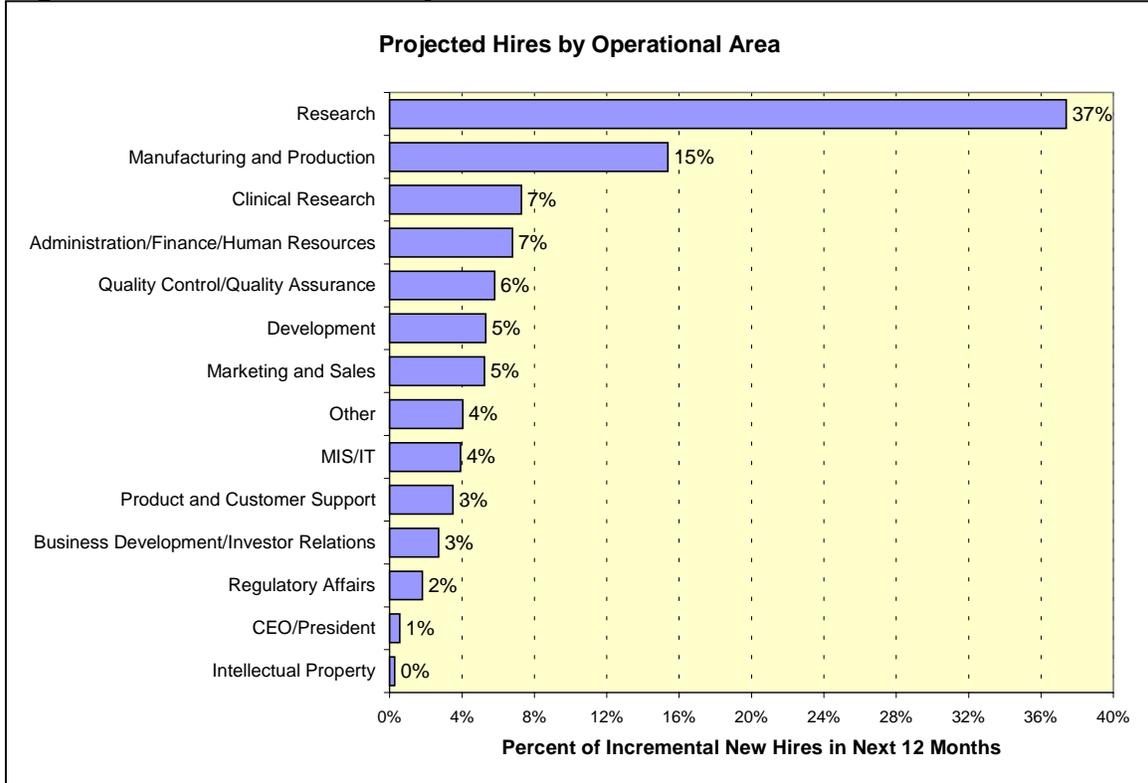


Source: "Projections for the Future", BHRC 2000.

As seen in Figure 5, firms responding to *Projections for the Future* forecasted overall employment growth of 10.9 percent. Small biotech firms were the largest contributors to this overall growth rate, projecting close to 40 percent increases in employment in the coming 12 months. Participants at BHRC's Strategic HR Roundtable also indicated that they will be dramatically increasing employment in many operational areas in the next year. And, as the coming year promises greater amounts of available investment and financing, including government initiatives in research and taxation, one can expect a significant number of new biotech start-ups to contribute to employment growth.

While projected employment growth can serve as benchmark representing the state of the biotech industry, it is probably more reasonable to take a closer look at where future growth will occur, as well as the skills and education that firms will require from their future employees. For the most part, BHRC data show that expected operational/departmental hires in the next year mirror current employment proportions in those same operational areas. For example, over 1/3 of all new hires from *Projections for the Future* will work in the area of **Research**, which already holds 35 percent of current employment (See Figure 6). Similarly, 15 percent of all new hires will be in the **Manufacturing & Production** area, which currently employs 14 percent of the workforce.

Figure 6: Breakdown of Projected New Hires in next 12 Months



Source: “Projections for the Future”, BHRC 2000

However, Figure 6 also shows some important differences. Expected hiring in the **Administration** area, at 7 percent of all new hires, is considerably less than its current employment share of 15 percent. Conversely, the percentage of hires in the **Clinical Research** and **QA / QC** areas are visibly greater than current employment in each of these areas. While this is obviously an indication of increased personnel as more and more firms move their flagship products into all phases of clinical trials, this rate is still lower than one would intuitively expect considering the prevalence of human healthcare firms in the sector. However, many firms are increasingly turning to the services of Contract Research Organizations (CRO’s) to perform and manage their clinical trials – meaning less in-house expertise. Very few CRO’s participated in the *Projections for the Future* Survey.

An overview of job advertisements appearing in national and local recruiting publications demonstrates that the industry is aggressively seeking to fulfill these hiring predictions. Available positions in Research, Development, QA/QC and Clinical Affairs represent more than 60 percent of current job advertisements in the BHRC’s national biotechnology job bank. Advertisements for positions in Regulatory Affairs also occupy a significant proportion of total advertisements.

SKILLS, TRAINING AND EDUCATION

As employment demand in specific operational areas grows, the sector must have access to appropriately skilled, educated, knowledgeable and experienced individuals to meet this demand. BHRC has explored the skills, training and education trends in the industry as evidence of how the industry is responding to these employment challenges.

The Canadian biotechnology industry has not undergone a process of defining and developing occupational descriptions and associated skills standards. Nevertheless, BHRC has identified a series of 15 “Job Related Skill Areas” that are considered to be high priorities, or “hot” within the biotech industry. These areas are:

1. Laboratory Techniques and Instrumentation (*Priority Ranking: 1*)
2. Developing/Managing Strategic Alliances/Investor Relations (*Priority Ranking: 1*)
3. Protecting and Managing Intellectual Property (*Priority Ranking: 1*)
4. Quality Control/Quality Assurance (*Priority Ranking: 2*)
5. Marketing Strategies (*Priority Ranking: 3*)
6. Financial Management (*Priority Ranking: 4*)
7. Good Laboratory Practices (*Priority Ranking: 5*)
8. Market Research (*Priority Ranking: 5*)
9. Product Development Process (*Priority Ranking: 5*)
10. Bioinformatics & Laboratory Software (*Priority Ranking: 6*)
11. Information Technology Management (*Priority Ranking: 7*)
12. Process Development (*Priority Ranking: 7*)
13. Regulatory Submissions and Compliance (*Priority Ranking: 8*)
14. Good Manufacturing Practices (*Priority Ranking: 9*)
15. Business Software (*Priority Ranking: 10*)

There is obviously considerable overlap between these “Hot Skill” areas, as well as differences in the required levels of skills within each area. Neither BHRC nor the rest of the biotech sector has attempted to quantify these levels and measures.

As previously demonstrated, biotech operational areas exhibiting either strong actual employment growth or strong desired employment growth are those of Research, Manufacturing and Production, Clinical Research, QA/QC, Regulatory Affairs and Business Development. Figure 7 compares the priorities the sector places on increasing its capability in these areas, and the percentage of the operational workforce to be trained in the coming year.

Figure 7: Priority Ranking and Training Projections for Selected Skill Areas

Selected Skill Areas	Priority Ranking	Operational / Departmental Area that Requires the Skill	Percentage of Operational Workforce to Be Trained	Percentage of Total Workforce to Be Trained
Protecting & Managing Intellectual Property	1	Intellectual Property	52.1%	0.3%
Good Manufacturing Practices	9	Manufacturing & Production	44.4 %	6.5%
Regulatory Submissions and Compliance	8	Regulatory Affairs	21.0 %	0.3%
QA / QC	2	QC/QA	28.4 %	1.2%
Clinical Trials Management	--	Clinical Research	20.2 %	0.6%
Clinical Trials Design	--	Clinical Research	6.5 %	0.2%
Laboratory Techniques and Instrumentation	1	Research	3.9 %	1.3%
Bioinformatics / Lab Software	7	Research	2.0%	0.7%
Good Laboratory Practices	5	Research	1.3 %	0.4%

Source: BHRC 2000

Given that the skill area of *Laboratory Techniques and Instrumentation* was rated as one of the highest priority skill areas, and given that **Research** occupies about 35 percent of total employment, it is surprising that so few individuals will be trained in this skill area in the next year. Less than 2 percent of the total workforce, and thus just under 4 percent of the Research workforce will be trained. The skill area of *Good Laboratory Practices* was also rated as a very high priority skill area – yet only 1.3 percent of all Research staff will receive GLP training. One reason for this apparent misalignment between priority skills and training plans may be the time-off factor. Given the critical importance of research and laboratory employees to so many biotech companies, these companies may simply not be able to afford to give their employees the time off necessary to be trained in this area. Companies participating in BHRC consultations have indicated that this is indeed the case. Other factors contributing to this may include the cost and availability of training, or lack of training in specialized research and laboratory areas.

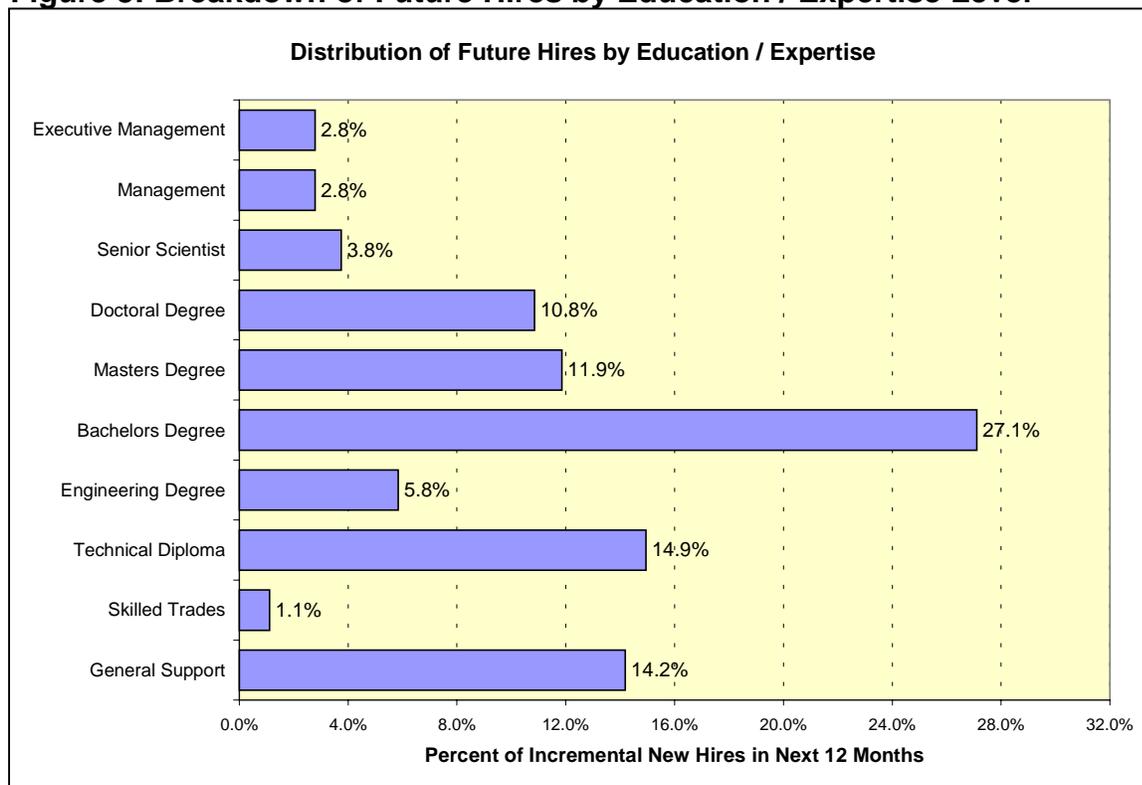
Training plans in the **clinical area** are even more puzzling. Biotech companies did not report high priority on clinical skill areas, including *Clinical Trial Design* and *Clinical Trial Management*. However, a substantial proportion of employees will be trained in these areas in the coming year.

On the other hand, based on BHRC's surveys and consultations, there is a correlation between skill priorities and training plans in some other key areas. *Good Manufacturing Practices* is an area that the industry places a reasonably high priority on increasing their skill capability, and training plans seem to reflect this. Participants in BHRC's *Projections for the Future* report that 6.5 percent of the survey sample workforce will be trained in GMP in the coming year – which translates into an impressive 44 percent of the existing **Manufacturing and Production** workforce. Training plans might again reflect the availability of quality training in this area. Moreover, these participants also report that a significant 52 percent of **Intellectual Property (IP)** personnel will be trained in the *Intellectual Property Management* area in the coming year. While IP staff represents less than 1 percent of the total workforce, both the high priority placed on this area, and the proportion of employees to be trained, make this an important skill area.

The picture is much clearer regarding training and priorities in some of the “soft” skill areas. The biotech industry places a very high priority on such essential skill areas as *Leadership, Communications, Team Work / Team Building, Flexibility & Adaptability* and *Project Management* – and the *Projections for the Future* survey sample reports that between 15 and 22 percent of all biotech employees will receive training in these areas. Clearly, firms recognize these skills as being necessary for superior firm performance. In particular, the importance of Leadership, Flexibility and Team Building have received particular emphasis throughout BHRC consultations, most notably at the Strategic HR Roundtable. In addition to their obvious importance, training in the essential skill areas is applicable over a wide spectrum of employees and departments, and many forms of such training are available.

Looking ahead over the next three years, projections indicate that almost one third of all new hires will require a **Bachelor** degree. (See Figure 8) The next significant proportion of new hires will be at the **Technical Diploma** and **General Support** areas. Given the general trends of strong employment and hiring in the Research and Manufacturing areas, this is not surprising. Smaller proportions of hirings of **Master** and **PhD** level employees are projected overall – although smaller firms project greater proportions of hirings at this level than the overall survey average. Small firms obviously do not have the same level manufacturing, sales or research support activities as do large firms, and do not require large volumes of B.Sc, Technical and General level staff typically employed in these areas.

Figure 8: Breakdown of Future Hires by Education / Expertise Level



Source: "Projections for the Future", BHRC 2000

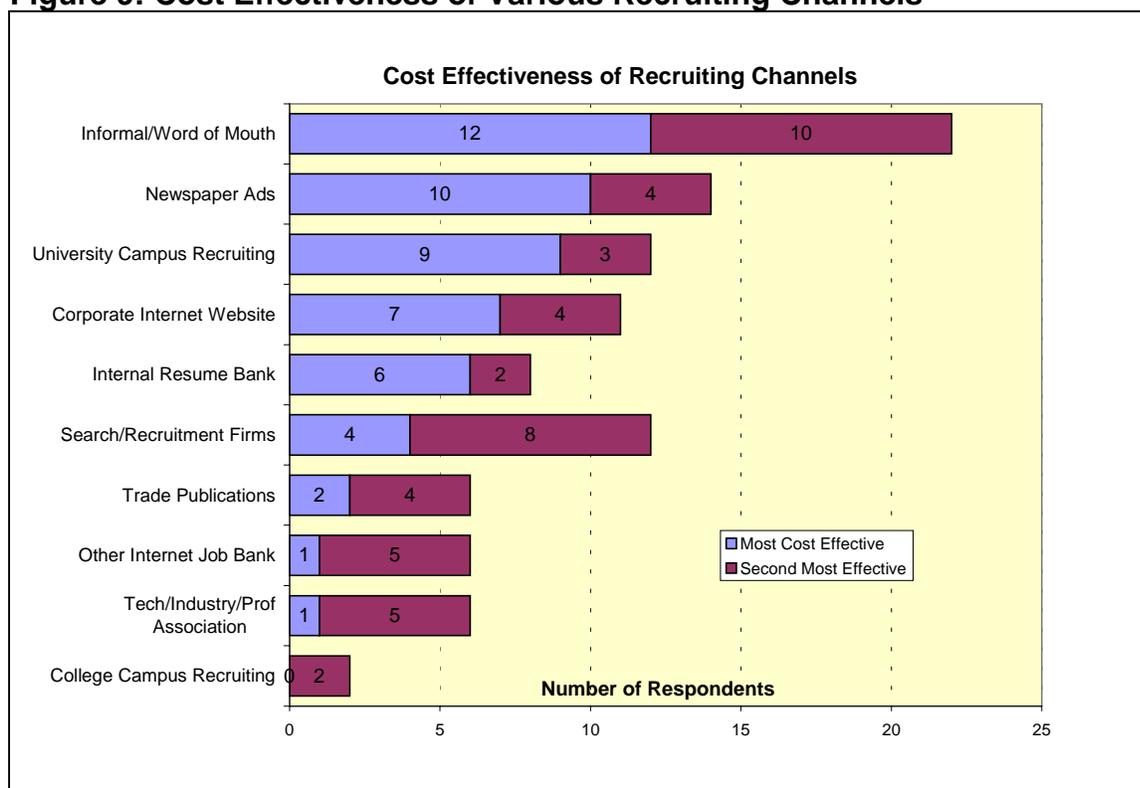
BHRC has also looked at the long-range importance of subject areas / fields of expertise to Biotech companies in the coming 1 – 3 years. (Subject areas / fields of expertise were consistent with known educational programs at universities and colleges.) Although it is very difficult for biotech companies to project their needs at this level, the sector places a strong emphasis on the coming need for **laboratory technicians and technologists** (Diploma and Bachelor levels) as research and clinical activities expand. **Biochemistry** expertise (B.SC, MS and PhD levels) will be particularly important as the industry increases its activities in predicting and modeling protein structure and function. And, as knowledge of structure and function increases, expertise in **bioinformatics** will have a huge impact on the development of the industry.

Other areas noted as future requirements include **Genomics** (at the Doctoral level), **Epidemiology** (necessary for Clinical work) at the Masters level, and all levels of education in **Plant Biotechnology**.

RECRUITING

Perhaps not surprisingly, BHRC finds the preferred recruiting method throughout the biotech industry is that of informal referrals or word of mouth – both in terms of use and cost-effectiveness. Search Firms are also widely used, but there is a general impression that they are not the most cost effective method of recruiting. (See Figure 9) Many organizations also place an increasingly high value on recruiting via their own corporate Web Site. Companies, for the most part, appear to avoid internet resume banks, citing concerns including receipt of out-of-date resumes and the unsuitability of large volumes of resumes received this way. Given the scarcity of HR professionals in the biotech sector, both existing HR staff and the companies themselves are turning towards recruiting methods that can save valuable time screening inappropriate resumes. Two new approaches to recruiting are the increased use of agencies to handle all resume screening and hiring activities, as well as BHRC’s *Biotech HR Pulse*, a niche market target recruiting vehicle that is receiving positive feedback from the sector.

Figure 9: Cost Effectiveness of Various Recruiting Channels



Source: “Projections for the Future”, BHRC 2000

Biotech Firms also place a high priority on the value of student employment programs. Participants at BHRC's HR Roundtable extolled the advantages and high return on investment (ROI) in such programs. Moreover, over 80 percent of firms responding to BHRC's Projections for the Future use co-op or summer students. In absolute numbers, surveyed firms reported placing over 500 students in the last twelve months, with slightly more expected to be placed in the coming 12 months.

IN CONCLUSION

This report represents a synthesis of biotechnology industry data and observations during a snapshot in time and cannot claim to be a 100% accurate representation of the HR landscape for the biotech sector as a whole. Nevertheless, one can safely conclude that there will continue to be a growing need for skilled workers in this rapidly changing sector of the Canadian economy. This also implies increasing demand for training and education in most areas and an acute need for specialized training in hard-to-staff niches. It is also apparent that more work has to be done to strengthen HR functions within biotech companies, particularly those in early stages of development, in order to stimulate a more methodical approach to dealing with downstream skilled labour constraints. Some effort must also be made in order to help companies systematically align training schedules with actual priorities. To this end, BHRC will continue to work with all segments of the biotech industry in an effort to meet these challenges in a proactive fashion.