

# Pipeline Study for Florida's Biotechnology Industry

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Prepared for



Prepared by

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**EMPLOY FLORIDA**  
**BANNER** Center  
**Biotechnology**

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Center of Excellence for Regenerative Health Biotechnology  
13706 Innovation Drive  
Alachua, FL 32615

## **Project Staff**

**Center  
Director**

Dr. Richard Snyder  
Director  
Center of Excellence for Regenerative Health Biotechnology

**Center  
Coordinators**

Ms. Tamara Mandell  
Coordinator of Education and Training  
Center of Excellence for Regenerative Health Biotechnology

Ms. Amanda Lowe  
Assistant Coordinator of Education and Training  
Center of Excellence for Regenerative Health Biotechnology

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## Summary

Florida's Biotechnology industry shows a steady growth that is the result of the infrastructure that has been put into place over the last few decades. With incentives from the government and the establishment of new institutes state-wide, this growth will not only continue but more than likely expand into something larger. Florida's commitment to the industry is strong which has generated both national and international attention. The addition of Scripps Florida, Torrey Pines, and the Burnham Institute to the existing cutting edge research from the state university system will only increase this growth already in place. At this time, many of Florida's existing biotechnology companies are in the start-up or growth stage (over 50%) according to the companies who participated in our survey. Many of these companies have been in business for less than five years and predict additional growth over the next five years. A critical factor in the continual growth of the industry is the availability of skilled workers.

These employees need knowledge and skill sets specific to industrial biotechnology, which are not typically taught in colleges as part of traditional academic programs. When asked what skills will make an applicant qualified for their positions, 100% of the companies responded that technical skills are the most important, followed by hands-on processes. The most common skills and knowledge bases identified include hands-on experience with production and laboratory equipment, the use and application of computers, the ability to work in a controlled environment (including cleanrooms), how to work under cGMP conditions, following Standard Operating Procedures, applications in Quality Assurance and Quality Control, and understand the regulations of the industry.

Biotechnology companies desire training programs that are flexible and that will fit with the employee's schedule. Small companies prefer part-time, long-term courses because of their limited resources and fact they can only tolerate employee absence for short periods of time. The established, or larger companies, prefer courses that can be completed full-time, in a condensed time frame. Online curricula should also be developed to provide low cost, easy access training state-wide. Off-site training programs are of value to the industry, because it is risky and time consuming for companies to allow new employees hands-on practice without close supervision, and it takes time for new employees to subscribe to the mind-set that is required for regulatory compliance. However, some companies did express a preference for on-site training when larger groups of employees are involved.

Continual communication practices must be developed and maintained to ensure that state-wide training programs understand and meet the demand of Florida's Biotechnology and to ensure that industry (both current and future) is aware of training opportunities. Lines of communication between academic and industry partners can be streamlined with the utilization of semi-annual state-wide focus groups and collaboration with Florida's biotechnology organizations. A structure needs to be in place to help companies find the trained employees they need and for trained workers to find the job they desire.

## Introduction

### *Purpose*

The Employ Florida BANNER Center for Biotechnology is one of the leading programs created by Workforce Florida, Inc. to provide up-to-date training for the workers in industries that are critical for Florida's economy. This is a state-wide collaborative effort of the University of Florida's Center of Excellence for Regenerative Health Biotechnology (CERHB) working with our partners: UF's Center for Pre-collegiate Education and Training (CPET), Santa Fe Community College (SFCC), Florida Community College at Jacksonville (FCCJ), Indian River Community College (IRCC), Embry-Riddle Aeronautical University (ERAU), and the International Society for Pharmaceutical Engineering (ISPE). Biotechnology is a rapidly growing sector of Florida's industry, resulting in an increased demand for trained employees. The mission of our BANNER Center is to:

- Assist in providing a pipeline of workers, entry level to advanced, for biotechnology;
- Ensure that programs within Florida's educational institutions are relevant and meet the biotechnology industry's needs and standards;
- Establish such centers as leaders of industry training and programmatic expertise with consulting capability to direct other Florida institutions to programs and practices of industry responsiveness and relevance;
- Maximize lifelong learning in settings demanded by today's marketplace; i.e., on-campus, virtual and on-site (business) training;
- Allow industry on-going access to research and educational developments
- Promote economic development in the biotechnology industry.

The Center has performed this pipeline study to evaluate the future needs of Florida's Biotechnology industry. This study will be utilized in the development of the curricula for Year 2 and future courses. The pipeline study addresses the following topics:

- Predicted demand for future biotechnology industry workers as well as the anticipated gap between supply and demand.
- Knowledge and skill development techniques/requirements as outlined by industry.
- Most effective methods of retraining or advanced training of the biomanufacturing workforce.
- Cost-effective and accessible training.

- Communication practices that can be employed to streamline the workforce pipeline to a more seamless connection between the components of the system responsible for producing a skilled workforce and the demands of the manufacturing industry.

### *Background*

Biotechnology is defined as the technological application of biological systems, living organisms, or their derivatives, to make or modify products or processes. Before the 1970's, biotechnology was primarily used in the food processing or agricultural industries, with ethanol fermentation being one of the first forms of biotechnology. Today, one of the fastest growing biotechnology-based product classes is biopharmaceuticals, which encompass proteins, cells, small molecules and genes with therapeutic or diagnostic value.

Florida has become one of the fastest growing states for the biotechnology industry. In Ernst & Young's 2007 report, Florida is among the nation's top biotechnology states and is ranked 3<sup>rd</sup> among the Southern states. And the state also took top honors in the Milken Institute's *Mind to Market: A Global Analysis of University Biotechnology Transfer and Commercialization*. According to eFlorida's web site, Florida is committed to building a world-class biotechnology sector by investing in research facilities, fostering the growth of local biotech companies, and welcoming progressive newcomers to the state. Additionally, Florida has fostered nearly 100 biotech companies specializing in therapeutics, diagnostics, industrial biotech and other areas. In 2006, the Florida Legislature passed several laws that created new initiatives or expanded existing programs to help develop the biotechnology industry.

### *Approach*

The Center held three state-wide focus groups, conducted industry/labor market surveys, and interviewed regional representatives of industry. Feedback from the trainees of the first year's course offerings has also been included to reflect the views and needs of the current/future workforce. The results of a state-wide phone survey conducted during the 2007 Needs Assessment were incorporated into the data from a web-based survey that was conducted in the Spring of 2007. The combined total of surveyed companies was 50, which is a return rate of approximately 38% of the 130 identified by the Center in the Needs Assessment. The focus groups were strategically hosted in Gainesville, Jacksonville, and Port St. Lucie, which are growing regions of biotechnology-based industry.

# Predicted Demand for Future Biotechnology Industry Workers, Outlining the Anticipated Gap between Supply and Demand

## Company Profiles

One of the challenges in the continual development of new curricula will be addressing the diversity of the companies, particularly in terms of their stage of development. The diversity leads to different capabilities of what the Employ Florida BANNER Center for Biotechnology can achieve. Small, start-up companies are looking for employees with a broad range of skills, who can wear many hats. Established companies are seeking employees with more specialized skill sets.

### *Company Maturity*

Specific questions were asked in the survey to develop the profile of each company, this assists in predicting future needs of the industry. The first question asked was the length of time each company has been in business in Florida. The majority of the responding companies have been in Florida less than five years. The largest group was three to five years, with 37% of the companies falling into this time frame. Only 16% of the companies surveyed have been in Florida for more than 15 years.

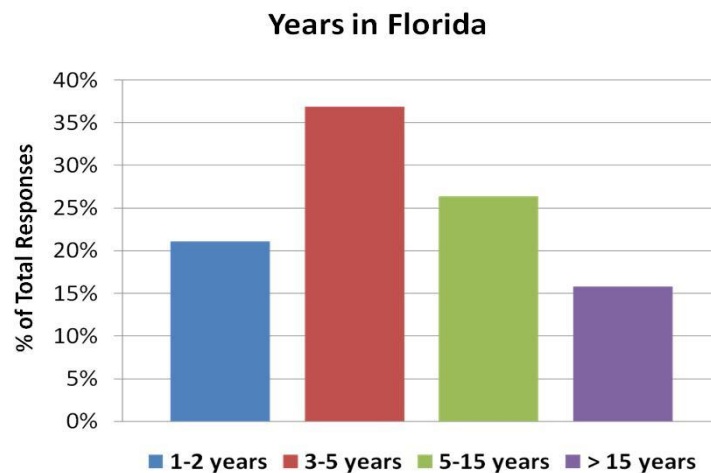


Figure 1: Companies were asked to state how many years they have been in Florida. We put the years stated into categories to present a visual representation.

### *Company Developmental Phase*

The companies participating in the survey were asked to assign a developmental stage to their company given the choices of: 1) Start-up, 2) Growth, 3) Commercial, 4) Not for Profit, and 5) Clinical. Start-up companies are defined as the early stages of development, with funding primarily from grant or angel sources. The growth phase is

the transition from a primarily research and development base to product development, with funding coming from venture capital. Commercial phase is the full development and launch of a commercially viable product.

The majority of the companies classified themselves as either start-up or in the growth phase. Only 31% of the companies surveyed stated that they were in commercial operation. The majority of Florida's biotechnology companies are young and in rapid growth, companies that in the future will grow from research and development to manufacturing. This growth will increase the demand for highly trained workers that are capable of working in the regulated environment of sector. With the addition of Scripps Florida, several world-renowned research institutes have made the decision to move to Florida and, with these institutes, more companies will continue to be established and grow in Florida. According to eFlorida's Market Brief, Scripps Florida generated 29 patents and 14 technology licenses in the fiscal year 2006 and also had its first spin-off company, Xcovery Inc., open in West Palm Beach. These two events (established companies growing and new companies forming) will create a need for workers in the biomanufacturing sector and a continual need for multi-disciplinary workers in the development stage companies.

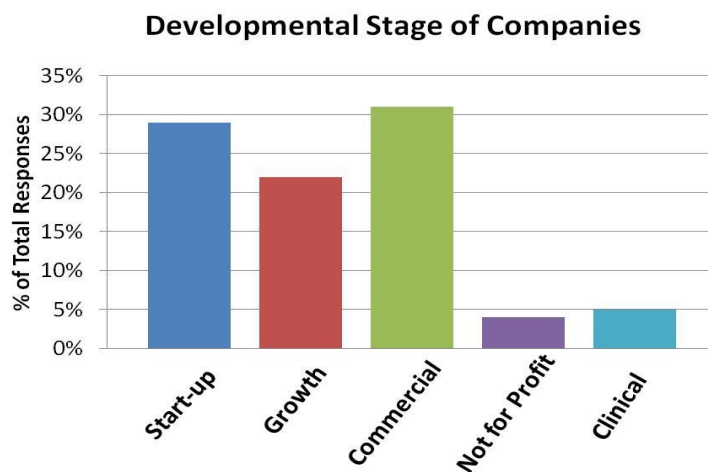


Figure 2: Companies were asked to classify themselves as either start-up, growth, commercial, not for profit, or clinical.

### *Industry Classification*

To gain a better understanding of the employment needs of the industry, we divided the companies participating in the survey into industry sectors. The biotechnology industry encompasses a broad spectrum of commodities and services that fall under the umbrella of biomanufacturing. Biomanufacturing involves the controlled production of biotechnological or biomedical products including biopharmaceuticals; diagnostic test materials; enzymes, antibodies, and other protein products; transgenic plants and animals; and biomedical implants and devices. Each of these sectors requires unique,



specialized training that the workforce will need to have to meet the demands of the growing companies. The companies classified as follows:

- **BioPharmaceutical** – Companies that develop or manufacture therapeutic biological pharmaceuticals, including regenerative and stem cell-based products.
- **Pharmaceutical** – Companies that develop or manufacture non-biological pharmaceutical products.
- **BioProduct** – Companies that develop or manufacture biological products, including but not limited to; enzymes, antibodies, and bacteria not used in human therapy.
- **Diagnostic** – Companies that utilize biotechniques to perform or manufacture diagnostic assays for the detection/identification of genetic material, microbes, or diseases.
- **Device** – Companies that develop or manufacture implants or surgical devices; specifically biological devices or synthetic devices with regenerative properties.
- **Agriculture/Marine Biotechnology** – Companies that utilize biotechnology to improve the product/quality of materials pertaining to Agriculture or Marine.
- **Bioinformatics** – Companies that develop and market biological software or provide biological informational services.

The largest group surveyed was BioPharmaceutical, making up 24% of the companies in Florida, followed by Diagnostic with 20%. Device and Bioproduct companies were almost equally represented with 17% and 15% respectively. Pharmaceutical companies comprised only 13% of the companies surveyed, which is an under-representation compared to the total number of pharmaceutical companies located in Florida. The smallest sectors were Bioinformatics and Agricultural/Marine biotechnology.

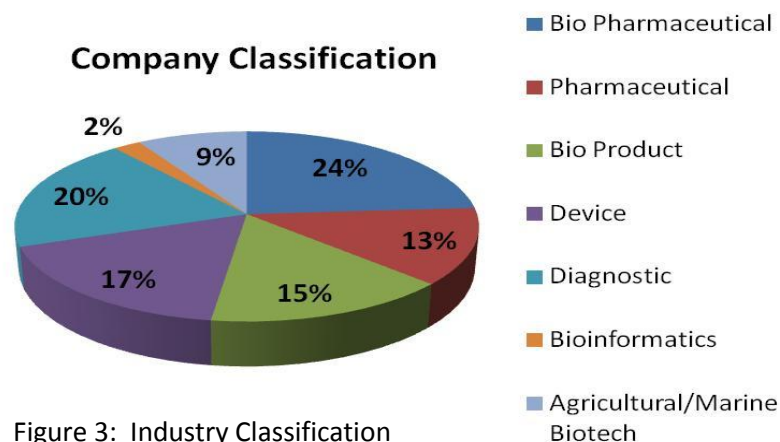


Figure 3: Industry Classification

## *Regions of Growth and Industry Clusters*

As Florida's incentive programs attract more companies to develop in the state, clusters of biotech companies will continue to form in South Florida, as well as along the Florida High Tech Corridor, which include the Tampa, Orlando, Gainesville, and Treasure Coast areas. According to eFlorida's Market Brief, "Florida is building an environment where the life sciences companies of the future can innovate and thrive". With the addition of the Burnham Institute to Orlando and the Torrey Pines institute to Port St. Lucie, these regions will have a greater demand for skilled workers that were not present in the past. These two regions also have science-based research parks, Central Florida Research Park in Orlando and Treasure Coast Research and Education Park in Port St. Lucie, which will be a bed of growth for more biotech companies.

Looking into the future (in the next three to five years) representatives from Scripps Florida and Torrey Pines both referred to what they see as a "surge" of demand for workers. Representatives that participated in the regionally hosted focus groups stated there will be recruiting at all levels, beginning with laboratory heads and facility operators, and then moving down the ranks. Other companies attending the focus groups indicated projected growth, and stated they would like to promote their existing employees to the higher positions, and recruit locally for the more entry level jobs.

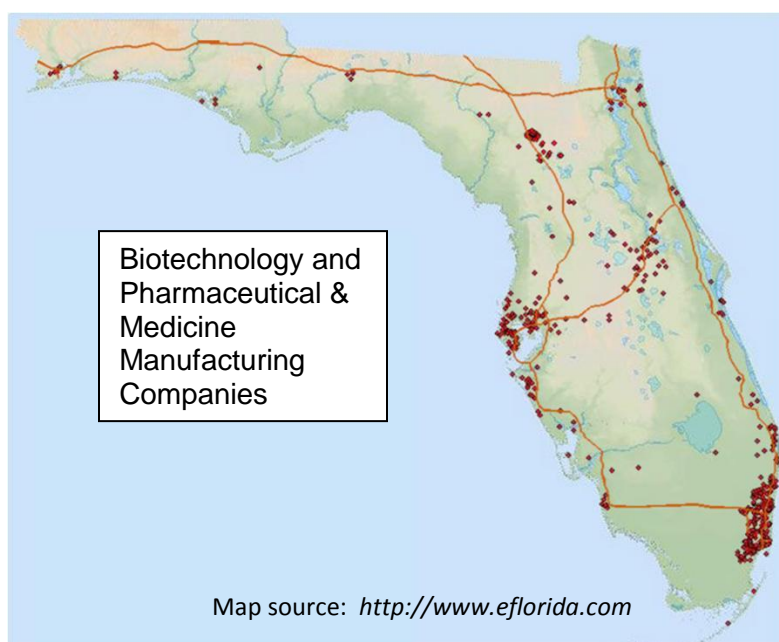


Figure 4: Industry Map

The Gainesville area has received a lot of attention from the industry with the recognition of University of Florida's Sid Martin Biotechnology Development Incubator (BDI) at both national and international levels. In a national survey by the U.S. Department of Commerce, the BDI ranked first in the amount of intellectual property licensed into client company operations and the BDI was also recognized by the National Business Incubation Association as being the #2 incubator for technology in

the world. In a May 16, 2007 Gainesville Sun article it stated that venture capitalists are “taking note” and have invested \$150 million in local biotech companies. In a May 2007 edition of BusinessWeek, it recognized the University of Florida in the same league as MIT and Caltech in the number of spin-off companies and technology licensing.

In addition to the Research Parks mentioned above, Florida is home to six more parks located around the state; Florida Atlantic Research and Development Park (Boca Raton), Florida Gulf Coast Technology and Research Park (Ft. Myers), First Coast Technology Park (Jacksonville), Innovation Park (Tallahassee), International Space Research Park (Cape Canaveral), and University of South Florida Research Park (Tampa). Most of these parks also host technology and business incubators. Listed below is the projected growth that will occur:

### **Projected Growth in 2007:**

#### **Scripps Research Institute**

- Break ground at Florida Atlantic University’s Jupiter campus
- Three buildings are scheduled to open in 2009.
- Have 247 to 267 employees at Scripps by end of year
- State and local investment: \$650 million

#### **Burnham Institute for Medical Research**

- Will reside in temporary quarters at Florida’s Blood Centers in Orlando
- Hire 30 scientists and technicians.
- Break ground on its Lake Nona site this year.
- State and local investment: \$310 million
- 300 new jobs over seven to ten years

#### **Torrey Pines Institute for Molecular Studies**

- Will reside in temporary quarters at Harbor Branch Oceanographic Institution
- Hire 15 to 20 people by end of year
- Have 25 to 30 by the end of 2008.
- Break ground in March on a new headquarters.
- 189 new jobs over ten years
- State and local investment: About \$100 million

#### **SRI International**

- Opens its new marine technology research facility in St. Petersburg,
- Staffed by 40 researchers from USF’s Center for Ocean Technology.
- A permanent research facility will come on line in 18 months.
- State and local investment: \$47.5 million

*Data from Florida Trend magazine January 2007*

## Employment Growth

### Number of Current Employees

The companies participating in this survey were asked to give their total number of current employees. The 50 companies in our survey employ almost 2,000 workers. To gauge the growth of employment in the biotechnology industry, companies were asked to choose a range of employees hired in the past year and then the last three to five years. The majority of the companies (58%) had only hired 0 to 4 employees in the past year. Whereas, in the past three to five years, 40% of the companies surveyed had hired 5 to 15 employees, with 8% of the companies hiring over 50 employees spanning that time period. This shows a steady trend of employment growth for the responding companies, which corresponds to the traditional trend of companies that are in start-up or growth phase.

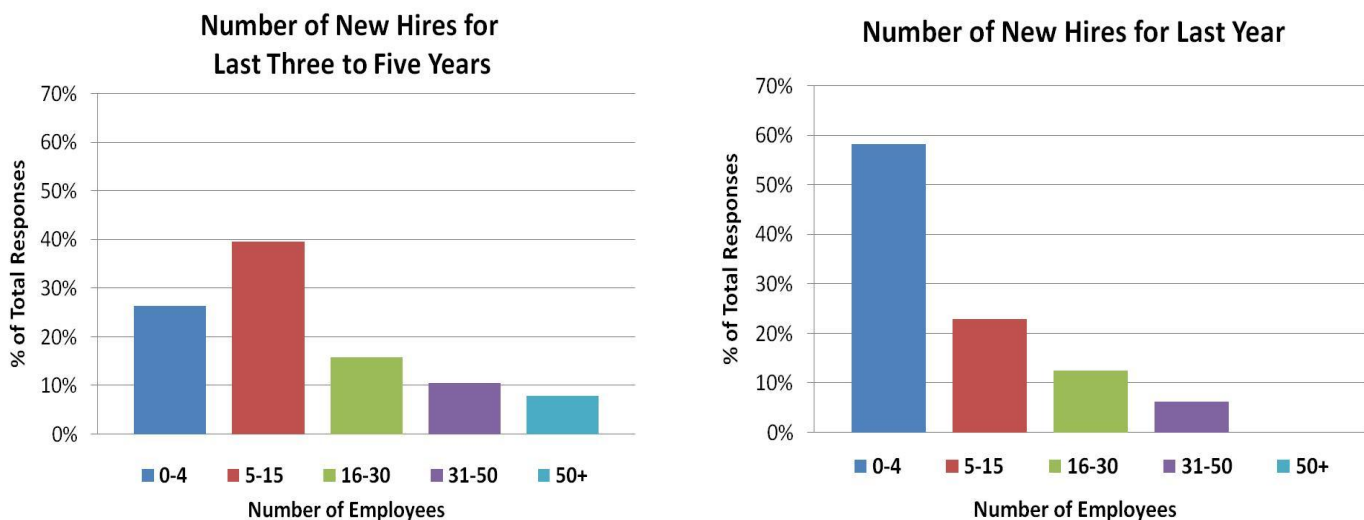


Figure 5 and 6: Companies were asked to choose a range of employees hired in the past year and the past three to five years. Free responses from the 2007 Needs Assessment survey were assigned categories.

### Current Employees Job Types

To determine the areas in which the greatest number of employees work, the companies were asked to provide a breakdown of their employees by job type. The majority of employees were in the area of “Research and Development” (30%), which is not surprising considering the large percentage of companies in the start-up or growth phase. The second largest group was “Production”, making up 20% of the employees. At this time, there is more demand for employees in the research and development departments of the small start-ups, but as these companies mature into commercial operations, there will be an increased demand for production workers.

Areas such as Quality Control, Quality Assurance, and Regulatory Affairs make up a small percentage, about 10% combined of current employees, which may be due to the large number of companies at the start-up stage. But as companies grow, and more companies relocate into Florida, these professions will also increase in demand. Quality Systems and Regulatory Assurance positions encompass knowledge and skill sets that need specialized training, which is difficult to learn “on the job”. Additionally, most start-up companies lack the personnel to train the new employees.

### Current Employees by Job Type

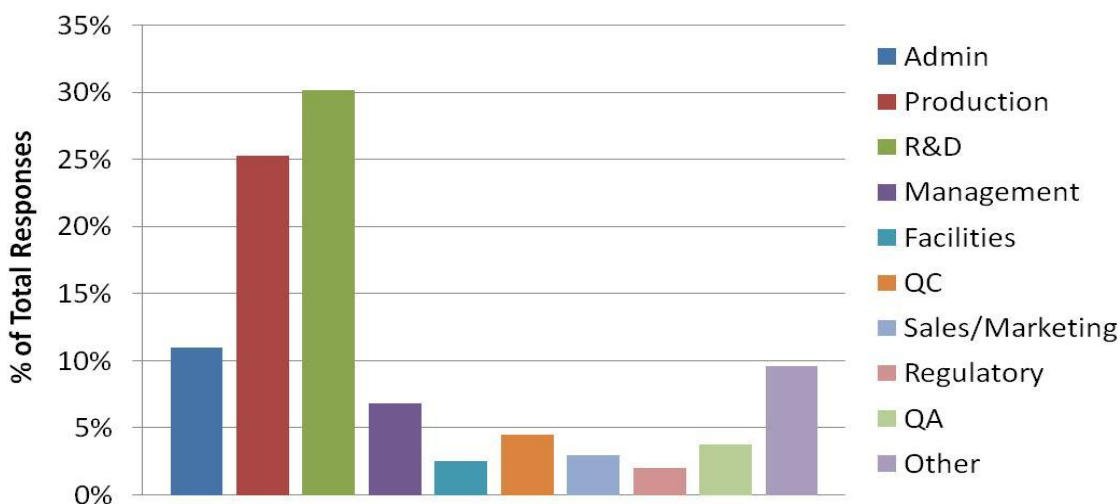


Figure 7: Companies were asked to classify their current employees by job types. The percent is based on total responses not total employees.

### Future Employees

Survey participants were asked to project the estimated number of new hires for next year (2007) and then for the next three to five years. The majority of the companies projected their number of new hires for next year to be between 0 and 4, but 30% stated that they plan to hire between 5 and 15 new employees. A minority (6%) projected that they would have 16 to 50 new hires next year, and no company is planning to hire over 50 workers. Projecting out three to five years reveals a different trend. The majority predict they will hire between 5 to 15 new employees. With a greater percent projecting the number of new hires to being the 31-50 and 50+ range (16% and 13% respectively). It is hard to estimate the effect that Scripps Florida, Torrey Pines and the Burnham Institute will have on the demand for biotechnology employees with the formation of spin-off companies.

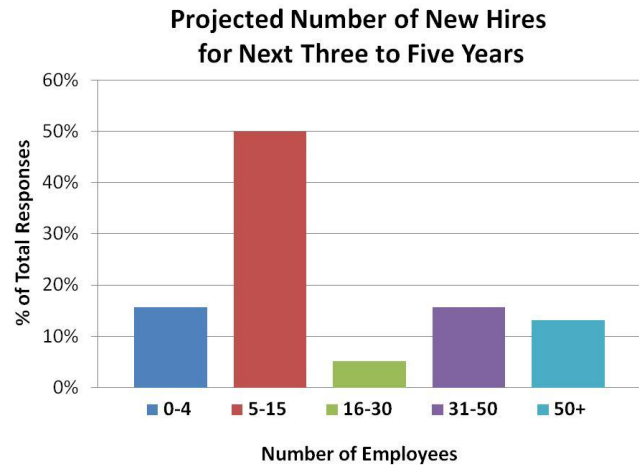
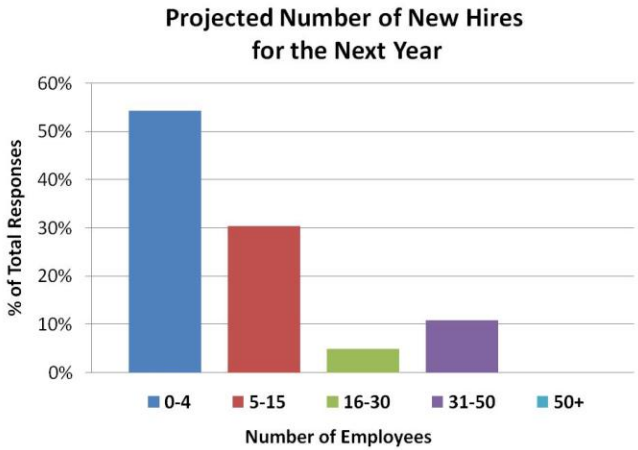


Figure 8 and 9: Companies were asked to choose a range of projected new hires for the next year and the next three to five years. Free responses from the 2007 Needs Assessment survey were assigned categories.

### Projected New Hires by Department and Educational Level

Companies were asked to designate the department and corresponding educational level that best fit the projected new hires in the next three years. A list of departments and educational levels was provided, and there was an option to choose more than one educational level per department. The percentages represent the number of times each educational level was chosen for that department, the number was divided by the total responses in that category.

### New Hires by Department and Education Level

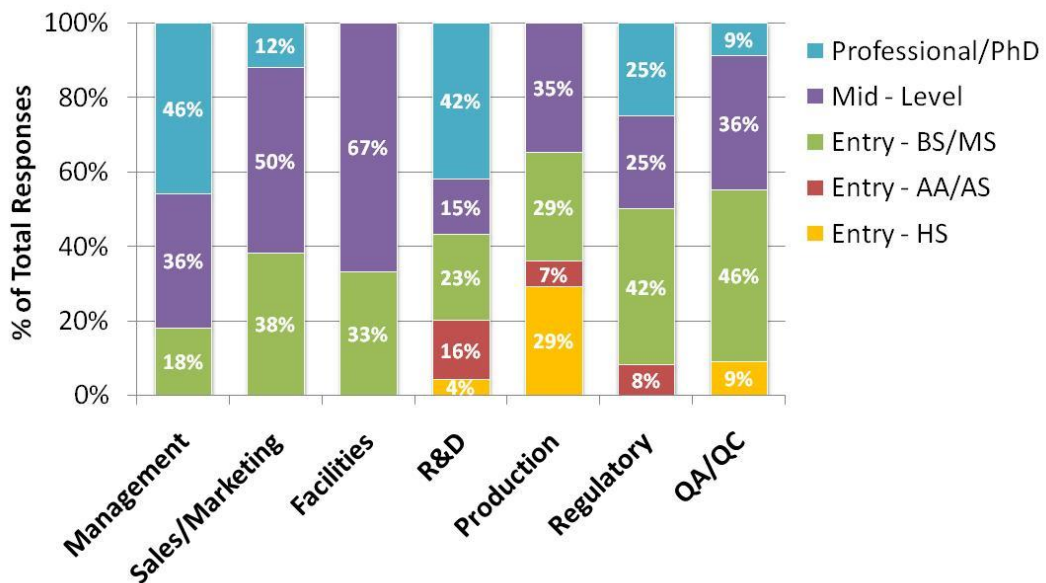


Figure 10: Companies were asked to categorize the projected new hires into departments and educational levels. This chart displays the responses by educational level within each department and does not reflect the number of new employees.

Research and Development department was the most diverse in the terms of the educational level being represented, although the majority of the new hires will be mid-level or professional/PhD hires (57% combined). One company indicated that some of their new hires for R&D would be at the high school, entry level. Production had the largest group of new employees at the entry level, with a total of 65% from high school to the BS/MS level, with the largest portion being employees without a post-secondary degree.

The QA/QC department also anticipated a large number of new hires at the entry level (55%). Within the entry level hires in the QA/QC department, AA/AS level employees were not selected. The majority was at the BS/MS level (46%), with only 9% being entry out of high school.

Lastly, Regulatory had a large percentage of new hires at the entry level (50%). Eight percent indicated that an AA/AS level new hire would be considered for QA/QC. No survey respondents stated they would hire a worker out of high school to work in this department.

Total selections for each educational level were tallied and divided by the total number of responses. This percentage reflects the frequency for that educational level, not the total employees that will be hired. As shown by the graph, Entry BS/MS, Mid-level, and Professional/PhD were chosen at about the same frequency (approximately 30%), while Entry HS and AA/AS were chosen each about 7% of the time. This might reflect the fact that most of the companies are in the start-up or growth phase and need employees with higher degrees that are capable of performing multiple tasks. This perception may change as more students graduate from the community college's biotechnology programs.

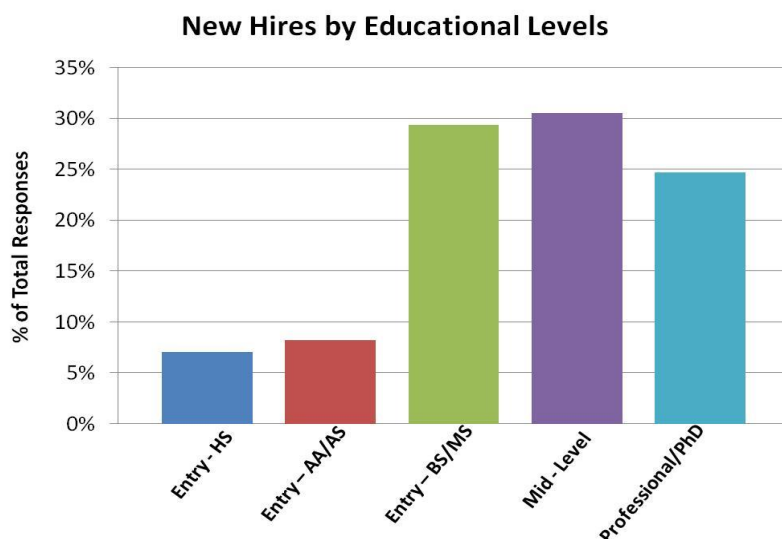


Figure 11: Projected new hires were tallied by their educational levels. This chart displays frequencies of the responses by educational level and does not reflect the number of new employees.

## Recruitment Methods

Companies were asked what recruitment methods have been most effective for hiring new employees. They were allowed to choose more than one response. The largest category was “referrals”, with 50% of the responding companies stating that this is a successful way to hire new people. The other two methods most often selected were “company web sites” and “internet job sites”. This is not extraordinary considering the number of internet job sites available and the fact that biotech is an advanced technological industry. Only 17% of the companies stated that they have had effective results with local one-stop centers. This could be result of the misconception that individuals trained in biotech are not found at the local workforce centers. This misconception changed at the regional focus groups when companies were informed of the Employ Florida Marketplace, and how it had been revamped to connect employers with qualified job seekers.



Figure 12: Companies were asked to choose all the recruitment method that has been most effective. Respondents were allowed more than one choice.

## Length to Fill Vacancies

Surveyed companies were asked the amount of time it takes to fill vacancies by department. Very few positions required less than 2 weeks to fill and the majority of jobs take longer than one month to fill. Regulatory, Management, and Sales/marketing are the hardest departments to find qualified employees, with most companies taking longer than 2 months to fill these positions. It was indicated in the statewide focus groups that many companies have to look outside Florida to find candidates for their higher level positions, which could account for the increased length of time. Companies did mention however that it is not difficult to convince candidates to move to Florida.



## Length of Time to Fill Vacancies

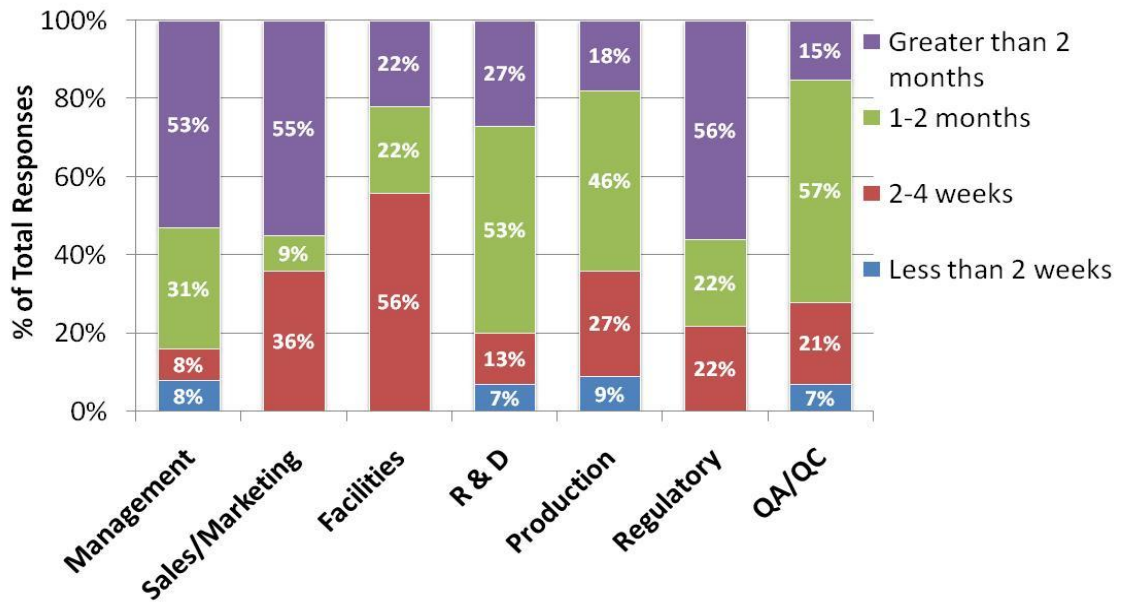


Figure 13: Companies were asked to select the time frame needed to fill vacant positions for each department. Respondents were only allowed to choose one category per department.

## Knowledge and Skill Development Techniques and Requirements as Outlined by Industry

### *Applicant Competencies*

Companies were asked what type of skills the current applicants possess which makes them qualified for job openings. As represented by the graph, 100% of the jobs in the industry require potential employees to exhibit good work habits and possess technical skills. Other skills that rated high on the list of qualifications include the ability to read and write, verbal communication, and computer skills.

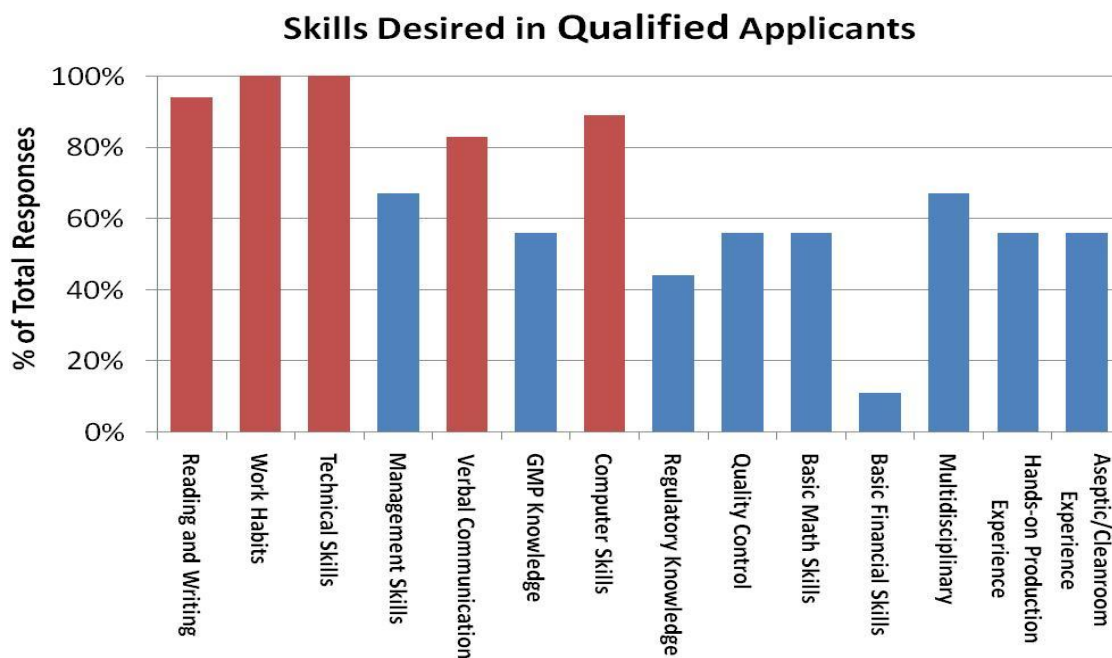


Figure 14: Companies were asked to choose all the skills current applicants possess that make them qualified for job openings. Responses over 80% are represented in orange. Respondents were allowed more than one choice.

Companies were surveyed to determine which competencies were lacking in their current pool of applicants. Once again technical skills topped the list with 57% of the responding companies stating this as a common deficiency among recent job applicants. This does not contradict the previous graph where technical skills make an applicant desirable in the eyes of 100% of survey companies. Instead it shows that while technical skills will make candidates hireable, the companies are seeing this skill lacking in the applicant pool most often.

The next highest deficiency is hands-on production experience, which corresponds to the feedback received at the state-wide focus groups. Some of the hands-on skills desired are aseptic technique, liquid handling, and the ability to be accurate and

precise. Companies want to hire workers that already have worked in the industry, however the worker pool for experienced personnel is small. Some companies admit that they end up hiring experienced personnel from other companies in the area.

It is not surprising that the next two highest categories from the survey are cGMP and Regulatory Knowledge. These are two skills that are typically learned on the job. Since the industry is young in Florida and the majority of companies are in the Start-up/R&D phase, experienced workers in the industry are still deficient in these skills.

Soft skills were high on list during all three of the state-wide focus groups. Employers find that present employees are deficient in time management/organizational skills. Workers that are highly motivated with a sense of purpose and a good work ethic are hard to find and most desired by companies.

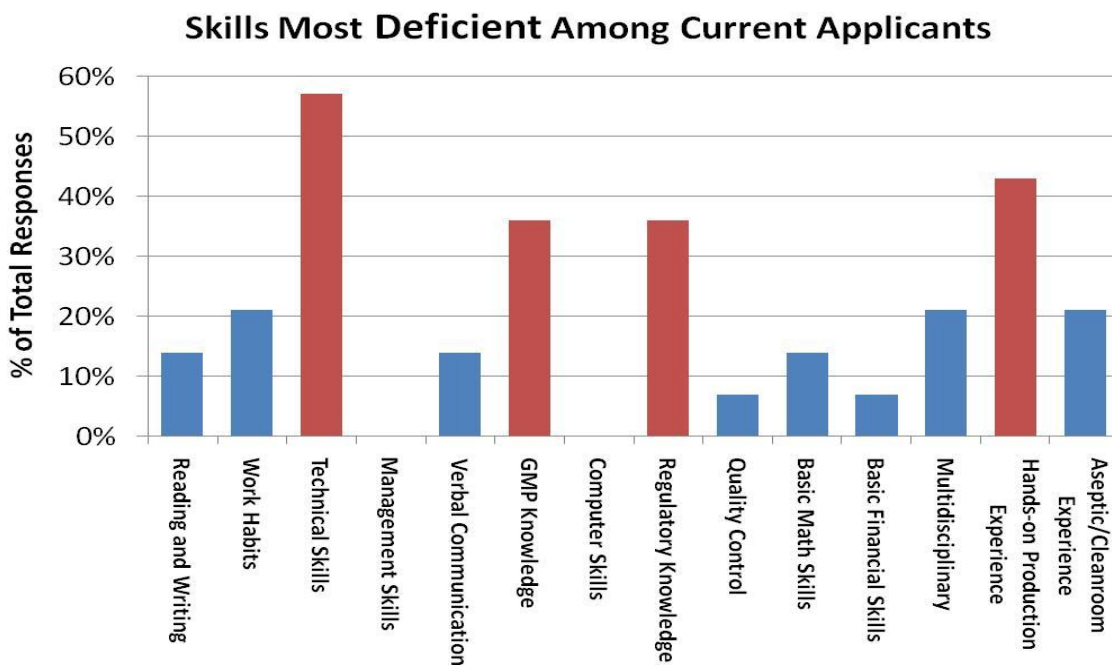


Figure 15: Companies were asked to choose all the skills in which current applicants are deficient. Responses over 35% are represented in orange. Respondents were allowed more than one choice.

### Training Needs

In correlation with developing a skilled workforce, the training needs of existing employees is a critical indicator of what knowledge and skills are most in demand by the industry. In our survey and focus groups, companies were asked to identify the skills and topics of training they would most desire in their current or future employees. Industry respondents noted a need in all the categories illustrated in the chart below. The greatest training needs from the survey were hands-on processes and computer applications at 65%. This held true in the focus group responses as well. When asked to list the skills desired in workers, participants stated computer skills as being very

important. These included applications for data entry and analysis, preparation of presentations, internet searched such as BLAST, and maintaining spreadsheets. In the most recent focus group “Good Hands” was at the top of list of skills demanded. This concept ties into the pattern noticed in the survey, which was a need for hands-on processes training. An employee trained in hands-on processes will be able to perform variety of tasks and display a core expertise in the lab.

Because the biotechnology industry is highly regulated by the FDA, skills that include working in compliance with “Good Manufacturing Practices” (GMP) are also in demand, as well as an aptitude for Regulations, and QA/QC skills and processes. Feedback from our industry-driven Focus Group supported these identified needs, with many start-up companies stating that they need employees that can multi-task in several of the areas, as the start-up funds can not afford separate personnel to conduct QA and QC.

Lastly, companies participating in this survey had a strong need for training their employees in “Standard Operating Procedures” (SOP’s). This held true with the focus groups, which also listed that employees should be taught to follow SOP’s explicitly. This ties into the need for employees that have good record keeping skills and are able to communicate through written and oral reports.

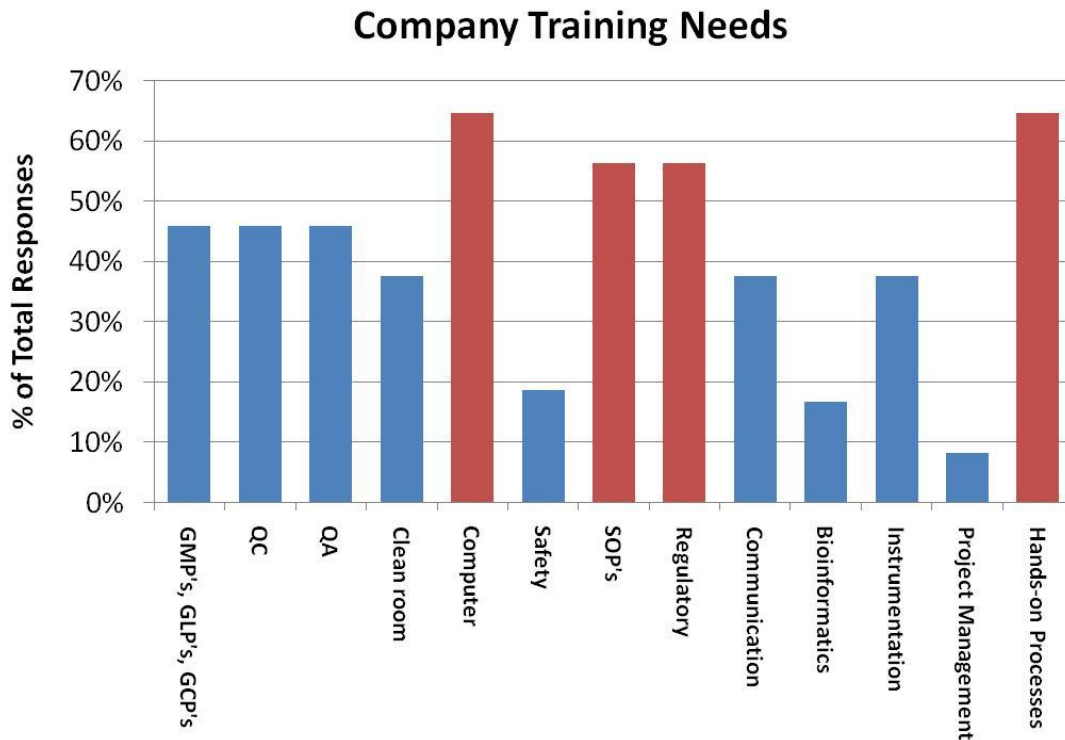


Figure 16: Companies were asked to choose all the skills for their current and future needs. Responses over 50% are represented in orange. Respondents were allowed more than one

## Most Effective Methods of Training the Biotechnology Workforce, Including Cost-effective Training

### Current Training Methods

It is important to assess how the surveyed companies currently train their current employees. The majority of the companies (94%) do all of their training on the job. A smaller percent (33%) have staff dedicated to training their employees.

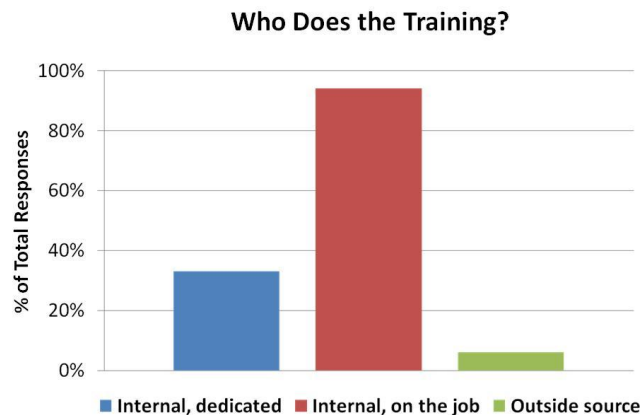


Figure 17: Companies were asked to choose the method of training for their current employees. Respondents were allowed more than one choice.

### Training Course Length

According to the state-wide focus groups, start-up companies cannot afford to have an employee absent for long periods of time and prefer part-time, long-term courses. The established, or larger companies, prefer courses that can be completed full-time, in a condensed time frame. Similar to the survey responses, there was no strong consensus in the focus groups regarding the time of training. Unlike the survey, the focus groups were more adamant that weekend and night training should be available as not to interrupt work hours. Thirty-four percent of the surveyed companies stated they preferred training that is part time, a few hours a day up to a week in duration. This was followed closely by day long sessions for up to three days.

To determine the best way to structure the curricula, it was necessary to resolve the preferred method of training. Survey participants were given the choice of 1) Via Web, 2) Off Site (at a training center), 3) On Site, and 4) a Hybrid. They were allowed to choose more than one. Sixty-three percent selected on-site as preferred method, followed by 45% of the surveyed companies choosing a web based training program. It was stated in the May focus group, that if a limited number of employees were attending training, the companies preferred for it to occur off-site, however if it is company-wide training they preferred on-site.

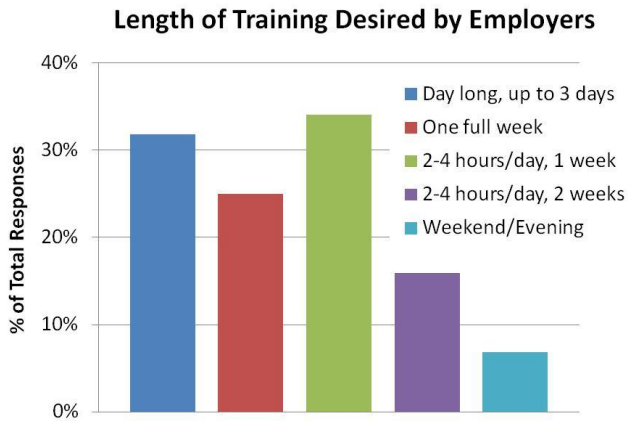


Figure 18: Companies were asked to choose the desired length of training for their current employees. Respondents were allowed more than one choice.

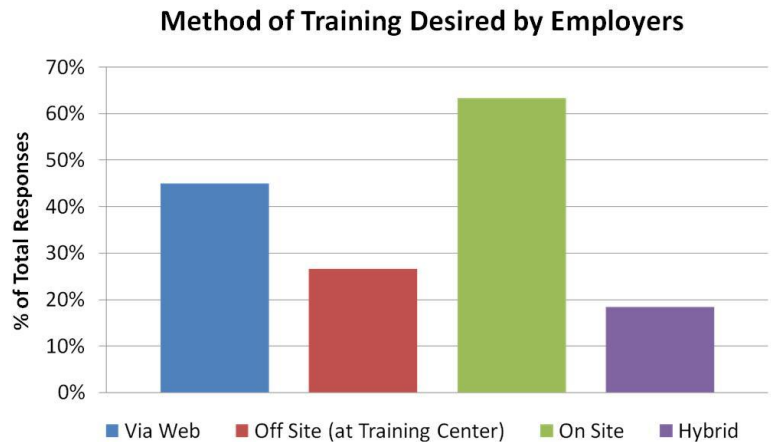


Figure 19: Companies were asked to choose the desired method of training for their current employees. Respondents were allowed more than one choice.

We conducted interviews with local industry representatives to capture information regarding the most effective means of training/retraining the workforce. A lab manager, within of one of the start-up companies in Alachua, stated, “It must be a hands-on class in scientific and laboratory methods. Anyone who can follow a cookbook can “do” science, they just need to be exposed to it. The real learning takes place on the job, when they start asking and answering questions, reading about the particular research topics/interests of the company and of their role. But, they have to be able to do basic skills or no one will want to hire them.” Other interviewees’ statements agreed, and in addition, stated that online courses were also beneficial. Most agreed however that the best means for training was face-to-face, in the classroom or in-house, with hands-on techniques being taught.

### *Cost Effective Training*

A primary means of keeping the training cost low is to have training centers throughout the state, thus reducing the cost of travel and time spent away from the work environment. This year the training was offered at three centers located in Gainesville, Jacksonville, and Ft. Pierce. In the following years, courses will be offered to cover more areas of Florida and target regions with the largest growth and demand.

One CEO stated that for his company the way to make training cost effective was the ability to access free training, utilization of all entities that are currently training the workforce in Florida, and to insurance that the employee is not absent from work for an extended period while training. Another interviewee suggested the use of internet and satellite courses as a way to keep training costs low. Additionally, one group of interviewees stated that the use of in-house training or a center close to their company was a way to keep training costs low.

## **Communication Practices to Streamline the Workforce Pipeline from the System Producing a Skilled Workforce to the Biomanufacturing Industry**

Participants of the May focus group conducted in Fort Pierce noted that one of the existing barriers for employers in filling job vacancies is that the available workforce does not know where to search for industry jobs in Florida. Along these same lines, many students stated on their course evaluations that they would like to have more information on types of jobs and where to find jobs in the industry.

The surveyed companies were asked to state the best method for streamlining communication between industry and academics for preparing students for careers in Biotechnology. One responder recommended a mixture of short-term and summer jobs in the work environment, and vice versa, so both ends understand the challenges of each job (academic and industry). Listed below are the compiled results of the responses:

- Communication with email, websites, newsletters, seminars and surveys
- Regular meetings (every six months) between academic planners and industry representatives
- Information sharing between companies and the students
- Internships and summer jobs in the industry
- Statewide training programs

Local representatives from industry were asked who the key players should be in communicating the needs of the industry and available training programs to the general workforce. One answer was; “This really changes from company to company. In my opinion, this type of communication should come from directors of manufacturing and R&D. However, CEO and VP may have some value depending on the type of infrastructure of the company.” Others suggested to utilize Workforce Investment Boards, and to form a consortium representing different parts of industry working together with the Workforce Boards.

Industry representatives also advised to keep in touch with private firms or state agencies that place people in jobs (public and private employment agencies). BioFlorida was mentioned as an important source of communication with the Florida Biotechnology Companies. Several mentioned contracting outside agencies for specific training for specialized needs but all still preferred to use the local community colleges and universities in our region when appropriate and available.

## Conclusion

According to the 2004 Milken Report on “Biopharmaceuticals Industry Contributions to State and U.S. Economics,” the Department of Labor ranks biopharmaceutical manufacturing among the fastest-growing manufacturing industries in the nation, and it is projected that the demand for biopharmaceuticals will remain strong regardless of fluctuations in the economy. As start-up biotechnology companies grow and transition from research and development to manufacturing and commercialization of their products, they become further defined by the regulations and manufacturing processes that they employ, and by their products and business markets. As these companies mature into commercial operations, a gap of trained industrial biotechnology production workers is likely to appear. In addition, with the presence of Scripps Florida, Torrey Pines, and the Burnham Institute, more spin-off companies will exist that will require trained employees capable of multitasking and progressing to working in a regulated environment.

The Biotechnology sector in Florida is rapidly growing and as new companies emerge, their needs will need to be assessed with curricula developed to meet their subspecialties. One major area of need, identified in both the industry survey and state-wide focus groups, was the training of technical skills. Along with technical skills, hands-on production skills are demanded in future employees, and companies have expressed there is a lack of experienced workers to meet their needs at this time. As companies move from the start-up stage to biomanufacturing, they will need to have personnel trained in “Good Manufacturing Practices” and have knowledge in working in a regulated environment. Along the same lines, more companies need employees trained in aspects of Quality Systems. In addition to the above skills, employers need their future employees to be computer literate, possess time management skills, and display good communication.

Companies are split in the amount of time employees can be away for training. Small companies prefer short-time, long-term courses, whereas larger companies can allow for full-time, condensed courses. The curricula will continued to be developed in modules so that parts can be taught in combination or separately, allowing for flexible training for the student and the Center doing the instruction. This flexibility should keep the cost low and the time flexible for the students and the training centers by customizing the training to the regional industry and student needs. Additionally, the current and future curricula will be developed in coordination with the WFI online biotechnology curricula, which enables a greater reach to potential students.

Good communication practices between academia and industry is essential for the success of the Employ Florida BANNER Center for Biotechnology’s training programs. Various methods will be utilized to establish a continual open-line of communications. The Center will promote this exchange with state-wide focus groups, a Center web page, and newsletters. State organizations, like BioFlorida, are an important source of communication with industry and relationships will be maximized. The most vital line of



communication is helping trainees locate existing and future jobs in Florida, and industry to find the trained employees they require.

# Appendix A: Employ Florida BANNER Center for Biotechnology Pipeline Survey

## Florida Biotechnology Industry Survey

Company Name: \_\_\_\_\_

Contact Person: \_\_\_\_\_ Title: \_\_\_\_\_

Contact Info: email: \_\_\_\_\_ phone: \_\_\_\_\_

1. How many years has your company been in operation in Florida? \_\_\_\_\_

2. What is the current stage of your company?

- |   |   |
|---|---|
| <input type="checkbox"/> Start-up               | <input type="checkbox"/> Growth         |
| <input type="checkbox"/> Commercial Operational | <input type="checkbox"/> Not for Profit |
| <input type="checkbox"/> Clinical               |   |

3. How would you define your company?

- |  |   |
|--|---|
| <input type="checkbox"/> Bio Pharmaceutical          | <input type="checkbox"/> Pharmaceutical |
| <input type="checkbox"/> Bio Product                 | <input type="checkbox"/> Device         |
| <input type="checkbox"/> Diagnostic                  | <input type="checkbox"/> Bioinformatics |
| <input type="checkbox"/> Agricultural/Marine Biotech |   |

4. How many employees does your company currently employ? Total \_\_\_\_\_

5. How many of your current employees work in the following areas, please count each employee only once for the department they spend the majority of their time.

Administration _____	Production _____	R&D _____
Management _____	Facilities _____	QC _____
Sales/Marketing _____	Regulatory _____	QA _____
Other _____		

6. By how many employees did your company increase in the past year?

- 0-4       5-15       16-30       31-50       50+

How many in the last three years?

- 0-4       5-15       16-30       31-50       50+

7. What is your estimated number of new hires for the next year?

- 0-4       5-15       16-30       31-50       50+

Estimated number of new hires for the next three years?

- 0-4       5-15       16-30       31-50       50+

8. Check the department and educational level that best fit your estimated new hires in the next three years. (Check all that apply)

**Management**

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> Entry – HS | <input type="checkbox"/> Entry – AA/AS    | <input type="checkbox"/> Entry – BS/MS |
| <input type="checkbox"/> Mid-Level  | <input type="checkbox"/> Professional/PhD | <input type="checkbox"/> Other _____   |

**Sales/Marketing**

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> Entry – HS | <input type="checkbox"/> Entry – AA/AS    | <input type="checkbox"/> Entry – BS/MS |
| <input type="checkbox"/> Mid-Level  | <input type="checkbox"/> Professional/PhD | <input type="checkbox"/> Other _____   |

**Facilities**

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> Entry – HS | <input type="checkbox"/> Entry – AA/AS    | <input type="checkbox"/> Entry – BS/MS |
| <input type="checkbox"/> Mid-Level  | <input type="checkbox"/> Professional/PhD | <input type="checkbox"/> Other _____   |

**Research and Development**

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> Entry – HS | <input type="checkbox"/> Entry – AA/AS    | <input type="checkbox"/> Entry – BS/MS |
| <input type="checkbox"/> Mid-Level  | <input type="checkbox"/> Professional/PhD | <input type="checkbox"/> Other _____   |

**Production**

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> Entry – HS | <input type="checkbox"/> Entry – AA/AS    | <input type="checkbox"/> Entry – BS/MS |
| <input type="checkbox"/> Mid-Level  | <input type="checkbox"/> Professional/PhD | <input type="checkbox"/> Other _____   |

**Regulatory**

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> Entry – HS | <input type="checkbox"/> Entry – AA/AS    | <input type="checkbox"/> Entry – BS/MS |
| <input type="checkbox"/> Mid-Level  | <input type="checkbox"/> Professional/PhD | <input type="checkbox"/> Other _____   |

**Quality Assurance/ Quality Control**

- |                                     |   |  |
|-------------------------------------|---|--|
| <input type="checkbox"/> Entry – HS | <input type="checkbox"/> Entry – AA/AS    | <input type="checkbox"/> Entry – BS/MS |
| <input type="checkbox"/> Mid-Level  | <input type="checkbox"/> Professional/PhD | <input type="checkbox"/> Other _____   |

9. What recruitment methods have been effective? (Check all that apply)

- |  |   |                                     |
|--|---|-------------------------------------|
| <input type="checkbox"/> Newspaper   | <input type="checkbox"/> Hire from within     | <input type="checkbox"/> Referrals  |
| <input type="checkbox"/> Company web site                                  | <input type="checkbox"/> Internet - job sites | <input type="checkbox"/> Recruiters |
| <input type="checkbox"/> Local One-Stop Centers /State employment services |   |                                     |
| <input type="checkbox"/> School placement offices                          | <input type="checkbox"/> Other _____          |                                     |

10. How long does it take to fill a vacancy for the following areas?

	Less than 2 Weeks	2-4 Weeks	1-2 Months	Greater than 2 Months
Management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sales/Marketing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Facilities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
R&D	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Production	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Regulatory	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
QA/QC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. What skills do current applicants possess that make them qualified for your job openings? (Check all that apply)

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Reading and Writing            | <input type="checkbox"/> Work habits                  | <input type="checkbox"/> Technical skills  |
| <input type="checkbox"/> Management Skills              | <input type="checkbox"/> Verbal Communication         | <input type="checkbox"/> GMP Knowledge     |
| <input type="checkbox"/> Computer Skills                | <input type="checkbox"/> Regulatory Knowledge         | <input type="checkbox"/> Quality control   |
| <input type="checkbox"/> Basic Math Skills              | <input type="checkbox"/> Basic Financial Skills       | <input type="checkbox"/> Multidisciplinary |
| <input type="checkbox"/> Hands-on Production Experience | <input type="checkbox"/> Aseptic/Cleanroom Experience |  |

12. What skills would you consider to be the most common deficiency among recent job applicants? (Check all that apply)

- |   |   |  |
|---|---|--|
| <input type="checkbox"/> Reading and Writing            | <input type="checkbox"/> Work habits                  | <input type="checkbox"/> Technical skills  |
| <input type="checkbox"/> Management Skills              | <input type="checkbox"/> Verbal Communication         | <input type="checkbox"/> GMP Knowledge     |
| <input type="checkbox"/> Computer Skills                | <input type="checkbox"/> Regulatory Knowledge         | <input type="checkbox"/> Quality control   |
| <input type="checkbox"/> Basic Math Skills              | <input type="checkbox"/> Basic Financial Skills       | <input type="checkbox"/> Multidisciplinary |
| <input type="checkbox"/> Hands-on Production Experience | <input type="checkbox"/> Aseptic/Cleanroom Experience |  |

13. Who does the training for you company? (Check all that apply)

- Internal, dedicated       Internal, on the job       Outside source

14. What skill sets do your current or future employees need to be trained in? (Check all that apply)

- |   |                                     |   |
|---|-------------------------------------|---|
| <input type="checkbox"/> GMP's, GLP's, GCP's        | <input type="checkbox"/> QC         | <input type="checkbox"/> QA                 |
| <input type="checkbox"/> Clean room                 | <input type="checkbox"/> Computer   | <input type="checkbox"/> Safety             |
| <input type="checkbox"/> SOP's                      | <input type="checkbox"/> Regulatory | <input type="checkbox"/> Communication      |
| <input type="checkbox"/> Bioinformatics             | <input type="checkbox"/> Instrument | <input type="checkbox"/> Project Management |
| <input type="checkbox"/> Hands-on Processes - _____ |                                     | <input type="checkbox"/> Other _____        |
- (Fill in specific needs)

15. Which training schedule would work best for your company and employees? (Check all that apply)

- |   |   |
|---|---|
| <input type="checkbox"/> Day long, up to 3 days | <input type="checkbox"/> One full week          |
| <input type="checkbox"/> 2-4 hours/day, 1 week  | <input type="checkbox"/> 2-4 hours/day, 2 weeks |
| <input type="checkbox"/> Weekend/Evening        | <input type="checkbox"/> Other _____            |

16. What is the preferred method of training for current or future employees? (Check all that apply)

- |                                  |  |
|----------------------------------|--|
| <input type="checkbox"/> Via Web | <input type="checkbox"/> Off site (at Training Center) |
| <input type="checkbox"/> On site | <input type="checkbox"/> Hybrid                        |

17. What is the best method for streamlining communication between industry and academics for preparing students for careers in Biotechnology? \_\_\_\_\_

\_\_\_\_\_

## Appendix B: Bibliography

eFlorida. *Florida Life Science Market Brief*, 2007

Milken Institute. *Biopharmaceutical Industry Contributions to State and U.S. Economies*, October 2004.

Clark, Anthony. *County biotech boom gaining attention, funds*, May 16, 2007. Gainesville Sun.

Arndt, Michael. *MIT, Caltech – And The Gators?*, May 21, 2007, BusinessWeek.

### Web Sites

Central Florida Research Park

<http://www.cfrp.org/>

UCF Technology Incubator

<http://www.incubator.ucf.edu/>

UF Sid Martin Biotechnology Incubator

<http://www.biotech.ufl.org/>

Progress Corporate Park

<http://www.progresscorporatepark.com/>

Tampa Bay Technology Incubator

<http://www.incubator.usf.edu/>

USF Research Park

<http://isis.fastmail.usf.edu/researchpark/>

Florida Atlantic Research and Development Park

<http://www.research-park.org/index.html>

Innovation Park

<http://www.innovation-park.com/>

St. Lucie County Education and Research Park

<http://www.tcerda.org/index.shtml>