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Faces of Success: Biotech Workforce Training Outcomes

A report from the
4th Annual Community College at BIO
May 6, 2007 / Boston, Massachusetts

Boston – The last time the Biotechnology Industry Organization (BIO) convention was held in Boston back in 2000, about 10,000 people attended. Twice that many attended in 2007—more than 20,000 people from across the United States plus 60 countries around the globe. The industry's bottom line has also greatly increased: annual revenues of $24 billion reported in 2000 more than doubled to nearly $50 billion by 2005, according to BIO. Years of labor in biotech have brought the world rewards in health care and other industries. Many of these benefits—including results from productive partnerships fostered by the National Center for the Biotechnology Workforce—were in evidence at the international event. The Fourth Annual Community College Program held on Sunday, May 6, in conjunction with BIO, highlighted strengthening education and training programs that are helping more and more graduates advance in high-paying biotech careers.

The full day's program began with leaders presenting reports on innovations and collaboratives underway in Utah, Indiana, Wisconsin, Pennsylvania, the northeast US, Ireland and Puerto Rico. Then it turned a focus on intern and apprenticeship programs, culminating in "Faces of Success," introducing successful graduates working in biotech companies—the "products" of the community college programs promoted by the National Center for the Biotechnology Workforce and Bio-Link—to the attentive stakeholders in the nation's biotech training and education network.

The need for skilled workers to manufacture in-demand new medicines (and many other biotech materials) prompted the creation of the National Center for the Biotechnology Workforce (NCBW) in 2004. This need for workers is increasing. In 2000, there were 125 biotech drugs on the market; today, there are 254, with several hundred more coming up in the development pipeline. These innovative therapies and cures mean hope for millions and require much more "biomanufacturing" that will, in turn, keep creating new jobs.

Because many of these biomanufacturing jobs can be performed by workers with two years of training, community colleges are playing a central role in meeting this industry demand. The five member community colleges of the NCBW are instrumental in rolling out new ways for students—as well as incumbent workers and faculty—to gain the skills and real-world experiences required for our 21st century workforce.

Results from the $5 million grant that established the NCBW have produced hundreds of graduates of supported training and education programs now working in the industry. They were recognized at this year's Community College Program as they proudly relayed their experiences to attendees.

Biotechnology Interns and Apprentices

"What better way to learn about the results of our Center's collaborative efforts than to hear about them from the successful interns, apprentices, graduates and employees themselves?" said Russ Read, executive director of the National Center for the Biotechnology Workforce, as he introduced the afternoon program.

The first hour focused on two interns and an apprentice, along with their mentors or teachers. The second portion, moderated by Elaine A. Johnson, PhD, Executive Director, Bio-Link National Center, City College of San Francisco, California, presented five biotech graduates, now successfully employed in the industry.

"We did outcome studies and follow-up on our graduates at Forsyth Tech in North Carolina, and one key success factor we found over and over again was internship," Read told the crowd of about a hundred assembled in Boston's World Trade Center, on the harbor's edge, within sight of the massive new Convention Center hosting BIO 2007.

There is no substitute for interns and apprenticeships in this hands-on, directly mentored teaching approach that combines on-the-job training with classroom participation into one of the best pathways for long-term career growth in biotechnology's advanced manufacturing.

The time-honored method of direct learning from a person who is actually using the skills day-to-day applies to all

industries, levels and age groups, confirmed Read. "We call them 'Pre-K to Gray' lifelong learning opportunities." He also pointed out that setting up hands-on learning situations and labs that mimic real-world industry situations are having unexpectedly positive consequences. "We are seeing 'reverse articulation:' people who have attained master or bachelor degrees in other academic situations are coming back to community colleges for certification."

Read concluded his remarks by remembering an influential person in his own life and career. "One of my mentors, Dr. Gertrude Elion, was a Nobel laureate working with Burroughs Wellcome, now GlaxoSmithKline. Luckily for us, she knew the importance of being a 'cool scientist,' but she also knew it's important to be a mentor to the next generation."

Mica Welsh, a student at Forsyth Technical Community College, stood in front of the CCP program crowd and proudly announced, "In five days I will graduate with a degree in biotechnology and this fall, I will attend Salem College as a junior." She described experiences and choices that led her—thanks in large part to her successful internship—into a promising biotech career.

She spoke of how she was a mom who used to drive an 18-wheel truck. When she developed a lung disorder and could no longer work, she saw an ad about biotechnology careers on television. "What in the world is this?" she thought. "I went to the Web site, saw the types of work, and my doc said, 'Why not?' The people I met at FT were so nice."

Welsh got energized in her community college experience, maintained a 3.98 GPA, ran for council, and was elected Student Government President. Her internship included work at Winston-Salem State University extracting RNA from muscle tissue. The skills she has acquired (and not all of them are strictly technical) present her with many opportunities right now. "At school, I learned independent skills; my internship taught me how to connect them and to use those techniques to find answers in the laboratory," she told attendees.

A 25-year veteran biology teacher, Ellyn A. Daugherty moved into biotechnology education in 1988. She is the author, lead teacher and program administrator for the San Mateo Biotechnology Career Pathway in California. Internships are an important part of this intensive, multiple year program that leads adults and teenagers into the biotech workplace.

"We've had 3000 students since 1995 with 750 internships," Daugherty told the crowd. We do career exploration inside the classroom and outside, including concentration on soft skills that can help get a job. Forty percent of our interns have been hired, many while they are still in the internship." She explained that the program includes visiting students in their internship workplace.

Flexibility is built into the San Mateo program so people of all ages and from all walks of life can take advantage of it. "After their industry internships, students work on sophisticated independent research projects, including the release of biofuel from cellulosic waste, developing bio-insecticides and more."

San Mateo student intern Julia Ying was introduced and she acknowledged the benefit of lab-based, hands-on education. "It's so interesting to work with microbes in industry," said Ying, who first gained an interest in pursuing biotech when she was a high school sophomore, thanks to Daugherty's program. "I spent a summer working full time, 35 hours a week, on projects that included spectrophotometry, PCR, multiple chemical conversions and assays. It ended but it left me with skills and interest in real-time changes in microbes." Ying looks forward to more education and better job opportunities in her new field. "This has made me aware of opportunities in the whole field of producing biological compounds."

New Hampshire Community Technical College in Portsmouth started its biomanufacturing focus in 1994, and Deb Audino, Associate Professor of Biotechnology, presented an update on the program, including the nation's first DOL Registered Biomanufacturing Apprenticeship. "We created it in 2004 in cooperation with the Department of Labor using industry skills standards developed by the Northeast Biomanufacturing Center and Collaborative," Audino explained. Now in its third round of apprentices, the initial grant provides scholarships for students whose work is integrated with academic studies. "The New Hampshire program mimics industry procedures; we follow real SOPs, with operators and verifiers just like in the industry workplace. It slows us down, but this is the way it's done. This realistic feeling is far beyond any other class the students have ever taken," Audino stated.

Katrice Jalbert, a biotech student at New Hampshire Community Technical College, spoke next about her experiences working at Lonza Biologics, Inc. in Portsmouth as part of her Biomanufacturing Apprenticeship. "I saw it all from the bottom up; they rotated me through different positions. I worked a 7-to-7 shift in the summer and had a lot of days off so I could go to the beach. I worked hard, learned a lot and got paid for it," she told the crowd.

"I would recommend community colleges and companies like Lonza work together, it is great," enthused Jalbert, who acknowledged the level of preparation she had received from her teacher Deb Audino's classes. "I worked with some university students at Lonza and the managers would say, 'Katrice, help them out'—they were unfamiliar with handling the glass apparatus."

Jalbert credits a high school science teacher and a special high school biotech program for helping her find and choose the field. She announced she would be graduating and starting full time work at Lonza. "I will be taking classes at UNH soon for a bachelor's and Lonza will help pay for it," said the smiling and accomplished Jalbert, the first young woman in her family to attend college. "Then I will go for a master's and I have dreams of a PhD."

A lively question-and answer-session followed the presentations by the interns, the apprentice, and their mentors.

Faces of Success

Tori Barron of Wisconsin had a good career going after she graduated with a bachelor's degree in psychology with a minor in genetics in 1990. She worked as a human resources manager doing team building and training. In 1995, she told the afternoon CCP crowd, her son was born. "I became a stay-at-home mom and lost my place in the workforce," recounted Barron.

When her second child was born in 1997 with a cleft palate, her interest in genetics resurfaced. "I wanted to re-

enter the workforce in sciences. Even though I had another child in pre-school, I was determined to go back to work," said Barron. She outlined the difficulties and challenges that any working mother faces today, shuffling between classes and childcare. When she found the post-baccalaureate one-year certificate in biotechnology program at Madison Area Technical College, it was a perfect fit. She was one of the pioneers to help create this flexible alternative for those returning to work through the community college.

As Barron learned about bioprocessing, chromatography and molecular biology in her courses, she used her new skills to land a position at Lucigen, a small biotech startup, and did "everything." In 2005 she was accepted in a new master's program in biotechnology at the University of Wisconsin. For the past two years, Barron has pursued the signaling pathways of human embryonic stem cells as a research specialist with the WiCell Research Institute.

Cybelle Mandigo maintained good grades in high school but ended up going into the Army and had a child. She was working a job one day when an engineer arrived. "She started telling me, 'Pick up this box, move this over here.' I thought, 'Hey, she's the same age as me and she's telling me what to do?' I'm going back to school," she told the chuckling crowd.

At the New Hampshire Community Technical College (NHCTC), she discovered that she enjoyed science and enrolled in the Associate in Science in Biotechnology program. "It was hands-on, it was real, it wasn't like studying the weather like we had done in high school," remarked Mandigo. She had to attend class nights and weekends because she had no day care. "But I really wanted it."

She acquired an internship at Redhook Ale Brewery and discovered basic biotech processes are used to brew beer. "It's like a quality control lab," explained Mandigo. She got a job working in fermentation and purification at Wyeth, then a position at Lonza. For the past five years she has been working with Biogen Idec in Cambridge, Massachusetts. "I've also taken an online Bachelor of Science degree at Southern New Hampshire University and now I'm working on an MBA," announced Mandigo, who also credits NHCTC program director Sonia Wallman with helping her to develop a career in biotechnology.

Marlena Jackson's attraction to biotech began with a concern, a wish to help battle threats like cancer. "My mother had breast cancer and I lived through the painful experiences and struggles all cancer patients go through," recounted Jackson in her presentation to CCP. "It gave me the desire to give back."

The Bridge to Biotech program at the City College of San Francisco was the gateway into the industry for Jackson. "Most importantly, it was the faculty, the people who helped me bridge the distances I had to go. They are extraordinary," Jackson said warmly.

An internship with the USDA led to an opportunity to become a co-op student in the DNA purification group at Genentech. She completed her bachelor degree in biology and became a senior research technician at Genentech. She now contributes to research that will lead to new understanding and, with hope, new treatments for cancer. "Mostly it was mentorship that got me here," Jackson told the audience—"Jo-Anne, please stand up"—and Jo-Anne Hongo, also an industry scientist, stood up to applause. "She is one of the people who cares about their students from beginning to end."

James Crawford, 57, has had his share of career changes. For 12 years he worked as a quality assurance manager with a Fortune 100 textile company. He told the CCP audience about the fashion change that contributed to his being laid off. "Sheer hosiery used to be a standard in women's apparel in this country," noted Crawford in his presentation. "But not any more."

A network and computer server position with another Fortune 100 electronics company followed, until an unfriendly takeover accompanied another paradigm shift, resulting in a 30% cut in payroll. "'Now, what do I really want to be doing,' I had to ask myself. And I knew I had a love for sciences and biology," said Crawford.

Forsyth Technical Community College provided the pathway for Crawford's next move. "It allowed me to re-enter a career based on evolving knowledge that will not be captured and eliminated by the global economy," Crawford told the crowd. "The community college enabled me to visualize my goals, allowed mentors to help and energized networking."

An internship at Wake Forest School of Medicine, where Dr. Anthony Atala, Professor and Chair, Department of Urology, and Director, Regenerative Medicine and Tissue Engineering Institute, works reconstructing bladders for children, put Crawford to work in a lab in which 90 researchers work on core tissue culture techniques. He is now employed as a research lab technician for the Wake Forest Institute for Regenerative Medicine. "We have five rooms with 17 hoods, stem cells, tissue repair, everything," he said.

"It was a struggle; the internship was unpaid," Crawford conceded to the CCP program attendees. "But I was able to make the transformation. Forsyth Tech had the vision and foresight to develop a program that enabled me to enter a new and exciting biotech career."

Massachusetts Bay Community College student Kelsey Tynan Ruddick earned the Barry M. Goldwater Scholarship Award, among the most prestigious and competitive of science, math and engineering awards. Her work in forensic DNA analysis is so exciting, she said, because Dr. Bruce Jackson, who runs the program, is an inspiration. "He has us working on real cases," stated Ruddick, who came to the college directly from Shrewsbury High School and now works part-time as a cell culture technician at SBH Sciences in Natick.

She was one of two Massachusetts Bay students to win the Goldwater award this year, one of fourteen Dr. Jackson's students have brought home to the little college on the hill in Wellesley. "Expect to take your place among the best and brightest," the teacher, affectionately known as "Dr. J.," tells his students.

Focusing the techniques and processes of mitochondrial DNA analysis on a cold murder case, called the "Lady of the Dunes," helped energize and motivate Ruddick. In another instance, Ruddick helped analyze 300 bone samples from a Portsmouth, New Hampshire, slave burial ground, confirming a West African origin within the remains.

"I hope to move on to work with the FBI in the fall," Ruddick revealed. At the close of her presentation, the conclusion of the day's program, she went on to pose for pictures, smiling broadly with "Dr. J.," her mentor. ❑

Kelsey Tynan Ruddick and Dr. Bruce Jackson, Massachusetts Bay Community College

Kelsey Tynan Ruddick

Marlena Jackson, Genentech

Mica Welsh, Forsyth Technical Community College

Cybelle Mandigo, Biogen Idec

James Crawford, Wake Forest Institute for Regenerative Medicine

Katrice Jalbert, Lonza Biologics

A panel discussion by educators and industry leaders on finding and cultivating the best candidates for the biotech field.

Date: May 6, 2007

Location: Cityview Ballroom, Seaport World Trade Center, 200 Seaport Blvd., Boston, MA 02210

Panelists

Mica Welsh, AAS (Biotechnology) Degree Candidate, Forsyth Technical Community College, Winston-Salem, NC
Ellyn A. Daugherty, Biotechnology Instructor and Program Administrator, San Mateo Biotechnology Career Pathway, San Mateo, CA
Julia Ying, Intern, San Mateo Biotechnology Career Pathway, San Mateo, CA
Deb Audino, MS, Associate Professor of Biotechnology, New Hampshire Community Technical College, Portsmouth, NH
Katrice Jalbert, AS (Biotechnology); Apprentice, Lonza Biologics, Portsmouth, NH; New Hampshire Community Technical College Candidate
Tori Barron, MS, Research Specialist, WiCell Research Institute, Inc., Madison, WI
Cybelle Mandigo, MS, Biogen Idec, Cambridge, MA
Marlena Jackson, BS (Biology), and MBA Candidate; Senior Research Technician, Genentech, San Francisco, CA
James Crawford, BS, AAS, Research Laboratory Technician, Wake Forest University Institute for Regenerative Medicine, Winston-Salem, NC
Kelsey Tynan Ruddick, Barry M. Goldwater Scholarship Recipient and Science degree option, Massachusetts Bay Community College, Wellesley, MA; Cell Culture Technician, SBH Sciences, Natick, MA
Sonia Wallman, PhD, Director, National Center for Expertise in Biomanufacturing Training; Director, New Hampshire Community Technical College Biotechnology Program, Portsmouth, NH*

Moderators

Russ Read, Executive Director, The National Center for the Biotechnology Workforce, Forsyth Technical Community College, Winston-Salem, NC*
Elaine A. Johnson, PhD, Executive Director, Bio-Link National Center, City College of San Francisco, CA

Biotech Resource Web Sites

www.biomanufacturing.org
www.careervoyages.gov
www.bio-link.org
www.biotechworkforce.org*
www.workforce3one.org

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