c3bc Panel
What did we do & learn?

San Francisco
June 6, 2016

Russ H. Read, Sengyong Lee, Elaine Johnson, Sonia Wallman, Michael Ayers, Steve Dahms
c3bc - Mission

• What did we set out to do?
• What did we accomplish?
• What did we learn?
The Players & Plan
National Approach

- Increase capacity by building new programs - credit & short non-credit programs for technicians

- Build Bioscience Harmonized Skill Standards. Create Medical Device Skill Standards.

- Remove barriers to achieving training (flexible labs, simulations & gaming programs)

- Industry Advisory Council’s input on credentials & program development

- Promote seamless articulations from 2-year schools to 4-year schools = 2+2 and back to 2-year from 4-year schools and beyond for hard skills training

- Promote internships
Accomplishments

- Completed expansion of upgrades on equipment and training capacity at multiple colleges
- Created the first set of industry-validated Medical Device Skills Standards for training entry-level technicians
- Created industry-validated Core Bioscience Skill Standards
- Delivered a modular and open resource approach to learning the biosciences and a novel Science Skills Laboratory
- Well into the process of uploading grant products to the virtual entities of NTER & Skills Commons.org for universal access
- Bioscience training opportunities were provided to over 3,000 displaced workers and students and a successful LAVC Bridge Program
- c3bc colleges created multiple new certificates, programs and degrees to accelerate students completion
- The unique BioNetwork Capstone experience has been offered to 35 students from across the country

Page 1
Accomplishments

• The National Advisory Council has met to review the progress of the grant either virtually or in person several times for guidance and input
• The Manufacturing Institute (MI) has teamed up to produce case histories of work with employers and job training placements of c3bc graduates
• The Abt Evaluation team has been proactive with the sites and has tapped into some of the great partnerships occurring between colleges, workforce and industry
• The grant is actively disseminating information through IMPACT magazine, MI & conference presentations & posters & Skills Commons
• The grant has undergone 6 budget modifications to meet the needs of the twelve participating colleges and two successful site visits by the US DOL
What did we do? What did we learn?

- Medical Devices Skills Standards
Dissemination of Medical Device Skill Standards
San Francisco, CA
June 5, 2016
Funded by DOL #TC-23761-12-60-A-37

Sengyong Lee Ph.D.
Medical Device Hub Leader
Professor & Program Chair
Biotechnology
Ivy Tech Community College Bloomington
The Medical Device Hub Partner Colleges

Anoka Ramsey Community College in MN
Austin Community College in TX
College of the Canyons in CA
Ivy Tech Community College in IN
Moorpark College in CA
Mount Wachusett Community College in MA
Saint Petersburg College in FL
Salt Lake Community College in UT
Southern California Biomedical Council in CA
Ventura County Community College District in CA
William Moor College of Technology in TN

* The Grant Funded Colleges were italicized.
Developing a National Medical Device Skill Standard

ITCC MD Task Matrices
- Identify entry level positions in medical device companies by functional areas
- Identify tasks performed in entry level positions
- Combined input from hub partners and validated with industry partners

Developing Harmonized Medical Device Education Pathways

SPC
- MD Skill Standard
- MD Core Skills
- Academic/training pathways
- Validated task matrices with industry sources who may not have attended March meeting
- Developing a MD advisory board
- Identify the competency levels of skills and knowledge to perform tasks; divided work among hub partners
- Validate skills and knowledge with industry partners; identify the medical device core skills
- Review existing education and training programs and the skills they convey

Identifying Bioscience Core Skills & Credentials

SLCC
- MD Core Skill Standard with CWFs, KAs, PIs, UKs, Assessments were identified
- Education pathways and course content were presented, content sharing using NTER and others
- Course development & modification, alignment to certificates and degree

MD Skill Standards Adopting the Bioscience Core Format

COC
- Cross work between MD courses and MD core skill standard presented
- More discussion on the assessment development and dissemination
- Integration of pathways across all hubs, core bioscience skills and latticed credentials identified
- Disseminate the C3BC meeting results to the hub for integration in pathway development

Dissemination of Project outcomes

Forsyth
- Project progress report, NTER training, evaluation, etc.
- SF
- Report on key outcomes, dissemination, evaluation, etc.

Educating TAA and other Displaced Workers

Year 1

Year 2

Year 3
Main Project Outcomes from the MD Hub

• Development of the first skill standards for the entry level jobs in the Medical Device industry

• Education program alignment and development based on the new skill standards

• Disseminating instructional materials for courses and modules
The Medical Device Skill Standards

• The first skill standards for the entry level jobs in the medical device industry
• Developed by the industry SMEs through so many regional and national meetings
• Describe entry level jobs, critical work functions, key activities, performance indicators, underlying knowledge and assessments
• Provide guidelines to develop education & training programs for medical device industry careers
Education Program Development and Implementation

- Partners colleges utilized the new skill standards in their courses, certificates, and degree programs
  - Austin CC – Framework for a new MD manufacturing program
  - Ivy Tech CC – New RA certificate & plastics program
  - Salt Lake CC – New MD certificate program strongly endorsed by their local employers
  - St. Petersburg C – New Biomedical Equipment Technician I Certificate program highly valued by local hospitals
  - “Course sharing” between Anoka Ramsey CC and Ivy Tech CC
Disseminating Courses and Instructional Resources

• “Courses in a box” project - Disseminate all necessary instructional materials to teach a course or a topic (syllabus, lesson plans, a cross-walk between the course content and the skill standards, lecture slides, assignments, assessments, instructor’s qualification requirement, necessary equipment and supply list, etc.)

  ➢ Quality Practices Course – aligned with ASQ’s CQIA & CQPA
  ➢ Metrology Course – calibration, inspection, quality audits, etc. in the MD manufacturing environment
  ➢ Product Life Cycle Course – MD product life cycle based project scenarios
  ➢ Root Cause Analysis Module – key problem solving tools
✓ **Benefitting Educators and the Industry**

- “The final publication for the c3bc work looks great and has been very helpful. I am preparing to offer the quality class for the first time in the Fall and the course materials help tremendously!” – Emalee MacKenzie, Irvine Valley College

- “It is an excellent publication... our companies will find extremely useful, and administrators of post-secondary education should find invaluable!! Congratulations on successfully completing a monumental task!” – Kathy Heuer, Executive Director, Indiana Medical Device Manufacturing Council, Inc.

- “I know the people involved were happy to help and I am glad their contributions were of help to you. Thanks to you and your team for all the hard work.” – Pete Yonkman, President, Cook Medical
✓ List of Industry Participants

Abt Associates - Judy Alamprese, Hannah Engle
Alfred Mann Foundation - Joe Schulman
Alpha Training & Consulting - John Lee
AMEDICA Corporation - Bill Jordan
Bard Access Systems - Jessica Smith
BayCare Health System - Walter Barrionueve, Randell Orner, Carlos Villafane
BD Medical - Jacob Morrill, Corey Thayer
BioFlorida, Inc. - Michael Van Butsel
BioFire Diagnostics, LLC - Kelly Hunter, Paul Murphy, Quinn Whitlock
BioUtah - Peter Knauer
Boston Scientific Corporation - Brian Sills, Robert Wilson
Bovie Medical Corporation - Dan Cavaliere
Cain Consulting, LLC - Meraleen Cain
Chapman Lake Instrument, Corp. - Mike Kiser
Cook Medical - Ray Amos, Eric Bomba, David Chadwick, RuthAnn Dubois, Jay Freund, Rich Granquist, Jim Koontz, April Lavender, Chris Kilander, Shawn Lawson, Bruce Miller, Dan Peterson, Jim Pope, Jim Ragsdale, Kim Roberts, Don Rodda, David St. John, Alyson Tews, Troy Wingler
Cook Polymer Technology - Spencer Leiter, Deb Schwanke
Echelon Biosciences Incorporated - Xin Morrow
Edwards Lifesciences Corporation - Santosh Bhagat, Karen Jones
Fresenius Medical Care - David Lockridge
Grace Medical - Alfred Chung
List of Participants

Haemonetics Corporation - Jesse Kryger
HDE Technologies, Inc. - Merelee Engel, Simon Engel
ICU Medical, Inc. - Scott Peters
Indiana Medical Device Manufacturers Council - Peggy Welch
Kinamed Incorporated - William Pratt
Lantheus Medical Imaging, Inc. - David L. Hyde
Lumenis - Jace McLane
MasterControl, Inc. - Jeff Brown
Medical Machining Specialists - Tim May, Jeff Shepherd
Medtronic - Stan McKee
Medtronic Minimally Invasive Therapies (formerly Covidien Plc.) - Jan Flegeau
Megadyne Medical Products, Inc. - Balaji Sudabattula
MichBio - Stephen Rapundalo
National Institute for Metalworking Skills, Inc. - James Wall
Nelson Laboratories Inc. - Tina May
Ocular Systems, Inc. - Lynn Knight
Operon Resource Management - Steve Sawin
Rhein Medical, Inc. - Chris Gahles
Second Sight Medical Products, Inc. - Ted Randolf
Southern California Biomedical Council - A. Stephen Dahms
The Calibration Solution - Tom Bartunek
✓ List of Participants

The KPI System - Rai Chowdhary
The Manufacturing Institute - Gardner Carrick
Utah STEM Action Center - Tami Goetz
University of California, Irvine - Mark Bachman
Ventura County Workforce Investment Board - Cheryl Moore
Vivid Ngenuity, LLC - Vivian Ngan-Winward
Wencor Group - Jennifer Bolander
Elaine Johnson- Laboratory Skills Hub

What did we do? What did we learn?

• Bioscience Core Skills Standards
Elaine Johnson, PhD
Lab Skills Hub Leader
Representing
City College of San Francisco
Austin Community College
Madison Area Technical College
Lab Skills Hub Goals

• Produce Revised & Validated Core Lab Skill Standards
• Disseminate Core Lab Skill Standards
• Work with hubs to determine Core Bioscience Skill Standards
• Contribute assessment tools for Core Bioscience Skill Standards
• Tailor Stackable Credentials
• Provide assessment resources for educators available through web-based portal, webinars, workshops, presentations, and publications
• Share information with stakeholders
• Create an environmental monitoring program at CCSF
• Train students
• Place students in jobs and internships
Why this effort to define Core Skills?

- Give educators the tools to develop courses, certificates, modules, etc.
  - Assessments
- Define skills and knowledge necessary for entry level positions
  - Students know and can articulate what they know
  - Industry recognizes what students know
  - Means to measure learning outcomes
- Possibly develop credential based on those core competencies
Draft of Core Skill Standards based on:

2007 Biotechnology and Biomedical Skill Standards; Copyright 2007
http://www.biolink.org/home/shoreline-community-college/biotechnology-standards

Bioscience Competency Model: U.S. Department of Labor

Other Skill Standards served as important references
Organization of Skill Standards

- **Critical Work Functions**
  - Major responsibilities of the job

- **Key Activities**
  - Activities needed to accomplish a critical work function

- **Performance Indicators**
  - Concrete, visible ways that we will know the individual is doing the activity correctly

- **Underlying Technical Knowledge**
  - Knowledge that technician must have to excel

- **Assessment**
  - Determination of proficiency
Critical Work Functions

• Maintain a safe and productive work environment
• Perform routine facility support
• Perform measurements/tests/assays
• Comply with applicable regulations and standards
• Manage and communicate information
• Perform mathematical manipulations
Key activities for one Critical Work Function:
Perform measurements/tests/assays

- Collect samples according to established procedures and applicable sampling plans
- Prepare samples according to established procedures
- Follow appropriate test procedures/instructions
- Document data & results according to established procedures
- Interpret and/or analyze data & results as appropriate
US DOL-TAACCCCT– CCSF – Environmental Monitoring Program

Trade Adjustment Act (TAA) Workers; Other Displaced Workers; Veterans; Other students

Courses in Laboratory Skills/Instrumentation

1. Field Instrumentation/handhelds
2. Environmental Monitoring
3. Microbiology; EPA methods
4. Wet Chemistry; Instrumentation ICP, GC-MS, IC
5. QA/GLP – documentation?
6. LIMS?

Courses in water operations/quality?

1. Math (contextualized to water operations)?
2. Chemistry (contextualized)?
3. Engineering?
4. Test Prep for state certification?

Internships; Job Placement
Laboratory Analysts/Technicians

Internships; Job Placement
Water operator/quality
Reflections and Conclusion:

The Lab Skills Hub (CCSF, MATC, ACC) continue to value collaboration and leveraging resources.

The Bio-Link network, curriculum and instructional materials clearinghouse, and robust interactive web communication tools offer value to TAACCCT.
Core Skill Standards for Bioscience Technicians
Sonia Wallman- Biomanufacturing Hub

What did we do? What did we learn?

• Downstream processing module
The Biomanufacturing Hub People

• Montgomery County Community College (MC3)
  • Sonia Wallman, PhD, Biomanufacturing Hub Lead
  • Margaret Bryans, PhD, Faculty
  • John O’Neill, PhD, Project Director
  • Jason McMillan, BS and MBA, Career Coach and Laboratory Manager

• Bucks County Community College (Bucks)
  • Linda Rehfuss, PhD, Co-PI
  • Ciana Cooper, PhD, Bioscience Grant Coordinator

• Los Angeles Valley College (LAVC)
  • Lennie Ciufo, Job Training Director
  • Chander Arora, PhD and Pamela Byrd-Williams, Co-PIs
  • Keri Luna, Career Coach
  • Sara Lamog,
LAVC People and Program

Los Angeles is home to biopharmaceutical manufacturers Baxter, Grifols, Prolacta, and Baxalta, companies engaged in downstream processing of valuable human products and proteins. These companies are expanding in the LA area; they need local biomanufacturing technician help.

Because of Lennie Ciufo’s connection to industry and understanding of workforce needs plus the use of his proven methods for developing public interest, along with the creation of contextualized training in the form of a (14 unit/150 hour non-credit) Biotechnology/ Biomanufacturing Skills Certificate, the LAVC program placed the greatest number of graduates into the local, growing biomanufacturing industry. The certificate program is co-led by Dr. Chander Arora and Pamela Byrd-Williams, professor in the biological sciences department. Lennie Ciufo oversees the biotech bridge academy in the job training department at LAVC and is aided by Keri Luna, manager and Sara Lamog. instructor
Montgomery CCC People and Program

Margaret Bryans joined MCCC in 2006, serving first as NBC2 Project Manager and from 2009 to 2012 as NBC2 Principal Investigator. Maggie is Assistant Professor and Director of the MCCC Biotechnology program.

John (Jack) O’Neill, c3bc Program Director for the Biomanufacturing Hub, and Jason McMillan, c3bc Laboratory Manager and Career Coach, joined the c3bc Biomanufacturing Hub at MCCC in early 2013.

The new 16 credit Biotechnology and Biomanufacturing certificate program has preferred provider status in Montgomery County. The certificate has served a variety of students including TAA workers, veterans, students with Bachelor’s and Master’s degrees, incumbent workers and those pursuing an Associate’s degree.

The region’s BigPharma industry suffered job losses during the great recession. Contract research, development and manufacturing organizations (CSOs or CXOs) sprouted in the area to work on BigPharma projects. These companies need biotechnicians already skilled in hands-on biotechnology/biomanufacturing in the areas of production and quality control and in the behaviors required in the stringent regulatory environment of biopharmaceutical (bio)manufacturing.
Bucks CC People and Program

Linda Rehfuss, Ph.D. came from a research position in BigPharma to Montgomery County Community College as professor and program director for biotechnology/biomanufacturing. She became Dean of Math and Sciences in 2006.

In 2009, Dr. Rehfuss moved to Bucks County Community College to develop a hands-on biotechnology and biomanufacturing education and training program at the college to help serve Pennsylvania’s BigPharma region.

Cianna Cooper, Program Director, joined the c3bc Biomanufacturing Hub in 2012.

Buck’s new 16 credit stand alone Cell and Tissue Culture certificate program and Biology AA degree has preferred provider status in Bucks County. Students find ready employment because they have skills identified by manager and technician Subject Matter Experts from the biomanufacturing industry. On-the-job skills that have been identified include about 36% hands-on production and analysis, with the majority of skills needed relating to the regulatory environment of the industry: ‘if you didn’t document it, you didn’t do it’.
## Biomanufacturing Hub Program
Montgomery County Community College

<table>
<thead>
<tr>
<th>Biotech and Biomanufacturing Certificate – 16 Credits</th>
<th>Biotech and Biomanufacturing AAS Degree – 60 Credits</th>
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<tbody>
<tr>
<td>BIT 120 (4 Credits) Introduction to Biotechnology</td>
<td>The Certificate is integrated into the Montgomery CCC Biotechnology and Biomanufacturing AAS Degree</td>
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<tr>
<td>BIT 123 (4 Credits) Techniques and instrumentation for</td>
<td>Certificate graduates can be immediately employed without further education.</td>
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<tr>
<td>BIT 220 (4 credits) Biotechnology Research</td>
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<tr>
<td>BIT 232 (4 credits) Biomanufacturing</td>
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The Certificate is integrated into the Montgomery CCC Biotechnology and Biomanufacturing AAS Degree Program.
Biomanufacturing Hub Program
Bucks County Community College

**Cell and Tissue Culture Certificate – 16 Credits**

- BIOT 125 (**4 credits**)  
  Biotech Methods and Techniques

- BIOT 205 (**4 credits**)  
  Cell and Tissue Culture

- BIOT 221 (**4 credits**)  
  Biomanufacturing

- CHEM 121 (**4 credits**)  
  Chemistry 1

**Biotechnology Associate Degree – 60 Credits**

The Certificate is integrated into the Bucks Biotechnology Associate Degree

Certificate graduates can be immediately employed without further education.
Biomanufacturing Hub Program
LA Valley Community College

Biotech Bridge Academy
200 hours non-credit

Biotech Academy

Curriculum Breakdown

<table>
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<tr>
<th>Course</th>
<th>Hours</th>
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<td>Manufacturing Principles</td>
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<td>OSHA SAFETY</td>
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<td>Attitude/Emotional Intelligence/</td>
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<tr>
<td>Preparing for Workplace Success</td>
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<td>Business Writing/Verification</td>
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<tr>
<td>Science for the Workplace/Fractionation</td>
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<tr>
<td>Lab Techniques</td>
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<td>Math for the Workplace</td>
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<td>Biology &amp; Chemistry for the Workplace</td>
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<td>Critical Thinking/Problem Solving</td>
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<td>Effective Communication</td>
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<tr>
<td>Integrity/Values Ethics</td>
<td>6</td>
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<tr>
<td>Stress Management</td>
<td>6</td>
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<tr>
<td>Time Management</td>
<td>6</td>
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<tr>
<td>Cultural Diversity</td>
<td>6</td>
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<tr>
<td>Necessity Employee Application</td>
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<tr>
<td>Process</td>
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<tr>
<td>Interviewing skills/New Hire</td>
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<tr>
<td>Activities</td>
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<td>Graduation</td>
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</tbody>
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Baxter, Baxalta, Shire, Grifols
Manufacturing Tech I

Strong relationship with global biopharmaceutical companies hiring a great many employees as a result of expansion.

Companies such as Baxter (then Baxalta then Shire), Grifols Biologicals and Eastman Chemical are partners.

Relationship Guarantees Employment as Manufacturing Tech I, sometimes Manufacturing Tech 2 or lab, environmental monitoring or quality roles
Biomanufacturing Hub Programs
LA Valley Community College

Biotechnology/Biomanufacturing Skills Certificate – 14 Credits

Biotech 1 (3 Units)
Fundamentals of Bioman & Biotech

Biotech 2 (3 Units)
Biomanufacturing I

Biotech 3 (4 Units)
Biomanufacturing II

Biotech 4 (4 Units)
Biomanufacturing III

or

Biotech 5 (2 Units)
Environmental Control & Support

The Bridge Academy and the Skills Certificate are two different programs. People who have completed the Skills Certificate are either already employed at Baxalta and Grifols or are high school students currently pursuing transferable college credit. The Skills Certificate is for credit; the Bridge Academy is not for credit.
Biomanufacturing Workforce Roundtables Create Partnerships for Education and Jobs

LOS ANGELES, CA LOCALE

LA Valley College c3bc Staff and Faculty
LA Valley Employee Development Department
SoCalBio
WIB (Los Angeles/Orange County)
WIB (LA) Career Services Director
America’s Job Center of California (AJCC)
Salvation Army Haven
Veteran’s Administration
Baxter
Baxalta
Shire
Grifols Biologics
Eastman Chemical
Parexel

PHILADELPHIA, PA LOCALE

Montgomery County CC c3bc CoPI, Staff and Faculty
Project Manager TAACCCT 2 Grant MC3
Director of Testing and Placement MC3 and Bucks
Director of Grant Development MC3
WIB (Montco) Recruitment Supervisor
WIB (Montco) Career Services Director
Montgomery County Development Corporation (MCDC)
Bucks County CC c3bc CoPI, Staff and Faculty
WIB (Bucks) Employer Service Supervisor
WIB (Bucks) Business Service Representative
WIB (Bucks) TAA Specialist
WIB (Bucks) WIA Director
GSK
Merck & Co., Inc.
Teva Pharmaceutical Industries
Rockland Immunochemicals
Rockland Antibodies and Assays
Meso Scale Discovery
KVK Tech
VWR Scientific
Jansen
WuXi AppTec
JLL, Inc.
Biomanufacturing Suite with Equipment

Core Laboratory Equipment
- Pipettors
- Microfuge
- pH/Conductivity Meter
- Stirrer
- Shaker
- Vortexer
- Computer

Production Upstream
- Autoclave
- Biosafety Cabinet
- CO2 Incubator with Magnetic Stir Plate and Spinner Bottles
- Applikon 3L Bioreactor
- Microscope
- UV Visible Spectrophotometer
- Centrifuge
- Tangential Flow Filtration Unit

Production Downstream
- Bio-Rad LP Liquid Chromatography System
- GE AKTA LP Liquid Chromatography System
Biomanufacturing Laboratory Manual

Biomanufacturing Laboratory Manual

Table of Contents

Metrology: SOPs for lab-scale equipment
Validation: SOPs for autoclave
Quality Assurance: cGMP, SOPs, Batch Records, Equipment Logs
Quality Control Microbiology: Environmental Monitoring SOPs
Upstream Processing: CHO recombinant for human Interleukin 8 (IL-8) SOPs Centrifugation SOPs Tangential Flow Filtration SOPs
Downstream Processing: Chromatography of IL-8 from CHO Cell Culture SOPs
Quality Control Biochemistry: SDS-PAGE SOPs IL-8 ELISA SOPs
Virtual Downstream Processing

Monoclonal antibody proteins (or mAbs) are the single largest class of recombinant biological drugs to date and represent about a third of the total biopharmaceutical market. The recent success of monoclonal antibodies for a wide range of disease therapies has led to the development of industrial production operations that manufacture pharmaceutical-grade mAbs both efficiently and safely. The following modules introduce a typical mAb bioprocessing workflow, detailing the equipment and processes used in biomanufacturing within a regulated environment.

http://faculty.mc3.edu/downstreamprocessing/story.html
Online Biomanufacturing Resource
www.biomanufacturing.org/

CHAPTER 1 INTRODUCTION
ENGINEERING UNIT OVERVIEW
CHAPTER 2 FACILITIES
CHAPTER 3 METROLOGY
CHAPTER 4 VALIDATION
CHAPTER 5 ENVIRONMENTAL, HEALTH, AND SAFETY (EHS)
CHAPTER 6 OPERATIONAL EXCELLENCE
QUALITY UNIT OVERVIEW
CHAPTER 7 QUALITY ASSURANCE
CHAPTER 8 MICROBIOLOGICAL CONTROL
CHAPTER 9 QUALITY CONTROL BIOCHEMISTRY
PRODUCTION UNIT OVERVIEW
CHAPTER 10 UPSTREAM PROCESSING
CHAPTER 11 DOWNSTREAM PROCESSING
CHAPTER 12 PROCESS DEVELOPMENT
APPENDIX A MASTER GLOSSARY

Michael Cicio - Today’s Biologics: From Bench Top to Bottle.
Tags: Keynote Speeches, Bioman 2006
Career Pathway Data Collection: Students and Graduates

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<th>STUDENT DATA COLLECTED</th>
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<td>Average Age</td>
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<td>Employed at Start of Class</td>
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<td>Transfer to Higher Education</td>
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<td>Percentage of Placements</td>
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<td>100%</td>
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Career Pathway Data Collection: Job Titles of Some Program Graduates

• Environmental Monitoring Technician
• Laboratory Automation Scientist
• Laboratory Technician
• Manufacturing Associate I
• Manufacturing Tech I
• Manufacturing Tech 2
• Process Improvement Leader
• Quality Assurance Associate
• Quality Analyst
• Quality Control Analyst
• Quality Operations Product Release Coordinator I
• Research Associate
• Research Scientist
• Research Technician
• Senior Laboratory Technician
• Senior Scientist
• Technical Writer
• Technical Writer/Scientist III
Career Pathway Data Collection: Companies Hiring Program Graduates

- WuXi AppTec
- Baxter
- Baxalta
- Shire
- Grifols Biological
- Eastman Chemical
- JLL, Inc.
- NewAge Clinical
- Merck & Co., Inc
- Teva Pharmaceutical Industries
- Rockland Immunochemicals
- Rockland Antibodies and Assays
- Meso Scale Discovery
- KVK Tech
- VWR Scientific
What did we do? What we did learn?

• Science Skill Labs
• Modular Learning
Steven Dahms- NAC Chair

What did we do?
• What did we learn?
• What’s next?