



BIOTECHNOLOGY AND BIOTERRORISM RESPONSE

TRAINING AND EDUICATION CENTER

This report found that more than three years after 9/11 and the anthrax tragedies, we've only made baby steps toward better bioterrorism preparedness, rather than the **giant leaps** required to adequately protect the American people,..."

Commenting on the 2004 report released from TFAH
Lowell Weicker, Jr.
Board President and former three-term US Senator
and Governor of Connecticut
Trust for America's Health

Can Illinois Leap Forward?

In the last few years, Illinois and the Midwest, have emerged as a fast growing leader in biotechnology. Illinois commands:

- An annual capital investment of \$14 billion for scientific research and development,
- Five biotechnology/bioscience incubators,
- The nation's largest Federal Agriculture Laboratory,
- Eight biodefense research centers targeted to receive \$350 M over five years:
 - University of Chicago
 - Argonne National Laboratories
 - Batelle Memorial Institute
 - Illinois Institute of Technology
 - Northwestern University
 - University of Illinois at Chicago
 - University of Illinois at Urbana-Champaign
- Two national labs
- Large number of research universities

Leaping Forward –Challenge Forces:

Globalization of the economy

Information technology, networking, and the information infrastructure

Burgeoning ethnic, age, and gender diversity

The structure of the workforce in the year 2010 and the changing meaning of work

Biotechnology and bioinformatics

Bioterrorism Response

Leaping Forward – Challenge Focus:

- Insufficient bioterrorism lab response capability
- Poor visibility and awareness of biotechnology
- Inadequate numbers of laboratory scientists and personnel to respond to biological threats
- Growing population and lack of awareness of biotechnology and public health preparedness
- Moving from an manufacturing based economy (unskilled workers) to non-manufacturing high tech based economy (skilled workers)

Picking our Battles - Challenges to Meet:

Illinois is growing dramatically in the areas of biotechnology/biosciences/health/homeland security.

Illinois now faces a demand for highly trained personnel and non-degreed but technically skilled workers.

Increase in technically trained jobs are not being filled at the rate expected.

Growing need for bioterrorism response and homeland security education in academia, industry and government.

The Role of Community Colleges in Leaping Forward to Meet the Challenge:

- There are 1,700+ community colleges in the U.S. and 42 percent of all undergraduates were enrolled at these institutions.
- Only 29 percent of community college students transfer to 4-6 year institutions
- Occupations requiring a vocational postsecondary certificate or an Associate's degree accounted for 29 percent of all jobs in 2000.
- These occupations will account for 42 percent of total job growth by 2010.
- 80 percent of new jobs created over the next two decades will require some postsecondary education and/or training short of 4-year degree.

Truman College's Role in increasing the Workforce in Biotechnology, Biosciences and Emergency Response:

Harry S Truman College, one of the City Colleges of Chicago, is a comprehensive community college that provides the first two years of baccalaureate degree courses as well as vocational/technical and adult education programs.

Truman is a Hispanic-Serving Institution that serves the most diverse student body in Illinois, and has the highest low-income population (70%) of any of the City Colleges (City Colleges of Chicago Office of Research and Evaluation Report MISF6505A).

Snapshot of Truman College Student Body			
<i>African-American</i>	<i>Latino</i>	<i>White</i>	<i>Asian</i>
13%	51%	33%	11%
<i>English is Second Language</i>		<i>Low-Income</i>	<i>Academically Disadvantaged</i>
74%		70%	89%

Truman College's Resources for Biotechnology and Emergency Response Workforce Training:

- **Biotechnology Technician Training Program (1994)**
- **Bioinformatics Technician Certificate Program (2004)**
- **Tissue Culture Facility**
- **Affordability and accessibility**
- **Experience and success with developing and delivering blended, online learning.**
- **Truman has successfully created and implemented blended courses for incumbent workers in the health care sector, and is a recognized leader in Illinois in this area.**

Biotechnology and Bioterrorism Response Training and Education Center

Truman College has been funded by the Department of Commerce and Economic Development (DCEO) to build its capacity to bring needed training to underemployed and unemployed workers.

This program will address the state's need to dramatically increase the number of residents prepared for current and emerging jobs in the biotechnology and bioterrorism sectors.

Building the college's capacity to develop and sustain programs will lay the groundwork for using the college's existing expertise, programming and facilities effectively to address workforce development issues that inhibit growth in the focus sectors.

The following strategies will be implemented. They are three parts that work together and form a comprehensive capacity-building plan.

Strategy 1: Build strong, constructive partnerships with the private sector.

Strategy 2: Develop clear career paths in concert with partners from biotechnology and related industries.

Strategy 3: Expand curricular offerings to include short term and advanced certificate programs.

BASIC CERTIFICATE

Bioinformatics Technician
•Introduction to Bioinformatics
•Special Topics in Bioinformatics
•Computer Information Systems
•Data, Records and Patents

ADVANCED CERTIFICATE

Bioinformatics Technician
•PERL for Bioinformatics
•Bioinformatics I – DNA/Protein
•Bioinformatics II – Biochemistry
•Intro to Molecular Techniques

AAS DEGREE

Bioinformatics Technician
•Capstone Projects
•Industry Internship
•Bioinformatics in R&D

**First Semester
Core Courses**

Math Statistics

Molecular Biology/
Bioinformatics

Chemistry 205/206

Biochemistry

Survey of
Biotechnology and
Bioterrorism

Perspectives on
Bioterrorism and
Emergency
Response



BASIC CERTIFICATE

ADVANCED CERTIFICATE

AAS DEGREE

**First Semester
Core Courses**

Math Statistics

**Molecular Biology/
Bioinformatics**

Chemistry 205/206

Biochemistry

**Survey of
Biotechnology and
Bioterrorism**

**Perspectives on
Bioterrorism and
Emergency
Response**

Biological Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Basic Separation Techniques
- Data Records and Patents

Biological Technician

- Tissue Culture I
- Microbiology/Immunology
- Safety Issues and Techniques
- Molecular Biology II

Biological Technician

- Capstone Projects
- Industry Internship
- Regulatory Guidelines/QC
- Bio and Chem Agents of Terrorism

BASIC CERTIFICATE

ADVANCED CERTIFICATE

AAS DEGREE

**First Semester
Core Courses**

Math Statistics

**Molecular Biology/
Bioinformatics**

Chemistry 205/206

Biochemistry

**Survey of
Biotechnology and
Bioterrorism**

**Perspectives on
Bioterrorism and
Emergency
Response**

Forensics Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Basic Separation Techniques
- Data Records and Patents

Forensics Technician

- Tissue Culture I
- Criminal Justice 211
- Microbiology
- Regulatory Guidelines/QC

Forensics Technician

- Capstone Projects
- Industry Internship
- Criminal Justice 222
- Bio and Chem Agents of Terrorism

BASIC CERTIFICATE

ADVANCED CERTIFICATE

AAS DEGREE

**First Semester
Core Courses**

Math Statistics

**Molecular Biology/
Bioinformatics**

Chemistry 205/206

Biochemistry

**Survey of
Biotechnology and
Bioterrorism**

**Perspectives on
Bioterrorism and
Emergency
Response**

Stem Cell Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Tissue Culture I
- Data Records and Patents

Stem Cell Technician

- Basic Separation Techniques
- Molecular Biology II
- Tissue Culture II
- Regulatory Guidelines/QC

Stem Cell Technician

- Basic Separation Techniques
- Microbiology/Immunology
- Industry Internship
- Tissue Culture III

BASIC CERTIFICATE

ADVANCED CERTIFICATE

AAS DEGREE

**First Semester
Core Courses**

Math Statistics

**Molecular Biology/
Bioinformatics**

Chemistry 205/206

Biochemistry

**Survey of
Biotechnology and
Bioterrorism**

**Perspectives on
Bioterrorism and
Emergency
Response**

Biological Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Basic Separation Techniques
- Data Records and Patents

Forensics Technician

- Tissue Culture I
- Criminal Justice 211
- Microbiology
- Regulatory Guidelines/QC

Forensics Technician

- Capstone Projects
- Industry Internship
- Criminal Justice 222
- Bio and Chem Agents of Terrorism

BASIC CERTIFICATE

ADVANCED CERTIFICATE

AAS DEGREE

**First Semester
Core Courses**

Math Statistics

**Molecular Biology/
Bioinformatics**

Chemistry 205/206

Biochemistry

**Survey of
Biotechnology and
Bioterrorism**

**Perspectives on
Bioterrorism and
Emergency
Response**



Stem Cell Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Tissue Culture I
- Data Records and Patents



Biological Technician

- Tissue Culture I
- Microbiology/Immunology
- Safety Issues and Techniques
- Molecular Biology II



Biological Technician

- Capstone Projects
- Industry Internship
- Regulatory Guidelines/QC
- Bio and Chem Agents of Terrorism



BASIC CERTIFICATE

ADVANCED CERTIFICATE

AAS DEGREE

Bioinformatics Technician

- Introduction to Bioinformatics
- Special Topics in Bioinformatics
- Computer Information Systems
- Data, Records and Patents

Bioinformatics Technician

- PERL for Bioinformatics
- Bioinformatics I – DNA/Protein
- Bioinformatics II – Biochemistry
- Intro to Molecular Techniques

Bioinformatics Technician

- Capstone Projects
- Industry Internship
- Bioinformatics in R&D

First Semester Core Courses

Math Statistics

Molecular Biology/
Bioinformatics

Chemistry 205/206

Biochemistry

Survey of
Biotechnology and
Bioterrorism

Perspectives on
Bioterrorism and
Emergency
Response

Biological Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Basic Separation Techniques
- Data Records and Patents

Biological Technician

- Tissue Culture I
- Microbiology/Immunology
- Safety Issues and Techniques
- Molecular Biology II

Biological Technician

- Capstone Projects
- Industry Internship
- Regulatory Guidelines/QC
- Bio and Chem Agents of Terrorism

Forensics Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Basic Separation Techniques
- Data Records and Patents

Forensics Technician

- Tissue Culture I
- Criminal Justice 211
- Microbiology
- Regulatory Guidelines/QC

Forensics Technician

- Capstone Projects
- Industry Internship
- Criminal Justice 222
- Bio and Chem Agents of Terrorism

Stem Cell Technician

- Laboratory Instrumentation I
- Molecular Biology I
- Tissue Culture I
- Data Records and Patents

Stem Cell Technician

- Basic Separation Techniques
- Molecular Biology II
- Tissue Culture II
- Regulatory Guidelines/QC

Stem Cell Technician

- Basic Separation Techniques
- Microbiology/Immunology
- Industry Internship
- Tissue Culture III

Bioterrorism Response Technician:

This program exists in three stages each results in the student receiving a certificate or an AS degree after successful completion beginning with the first year

Basic Certificate: This certificate is awarded after the first two semesters.

Advanced Certificate: This certificate is awarded after the third semester of study.

Associates in Applied Science Degree: This degree is awarded after the fourth semester of study.

Bioterrorism Response Technician Program Flowchart

Basic Certificate

Second Semester

**Biological and Chemical
Agents of Terrorism**

**Terrorist Agent
Monitoring and Detection**

**Facility Security and
Deterrents to Terrorism**

Microbiology

**Introduction to Mass
Fatalities**

Advanced Certificate

Third Semester

Basic Separation Techniques

Laboratory Instrumentation

Specimen Collection

Applied Microbiology

***Biological Safety:
Issues and Techniques***

AAS Degree

Fourth Semester

Industrial Internship

***Introduction to
Tissue Culture***

***Agricultural Agents: Threat
and Response***

Truman College is pursuing membership in the Community & College Consortium for Health and Safety Training (CCCHST) is sponsored by the Hazardous Materials Training and Research Institute (HMTRI)

The CCCHST one of 20 model worker training programs recognized by the National Institute of Environmental Health Sciences (NIEHS)

The CCCHST is the only community college based NIEHS program

The CCCHST and the HMTRI are based at Kirkwood Community College in Cedar Rapids, IA

Through membership in the CCCHST we will be provided with access to the existing training modules as well as those modules currently under development

This access is crucial to the rapid implementation of the BBRTEC as many key courses have already been developed and several are under development for release within the next year

Courses currently completed:

Emergency Response to Terrorism

A Perspective on Terrorism

Biological Agents of Terrorism

Agricultural Agents Threat & Response

Courses currently under development:

Chemical Agents of Terrorism

Facility Security and Deterrents to Terrorism

Terrorist Agent Monitoring and Detection

Second semester courses – Online blended format with limited in class time

Incorporating online coursework approach will provide students an opportunity to pursue an education while also maintaining a regular work schedule and family responsibilities

Allow for flexible scheduling and convenience of not having to travel to campus on a regular basis

Ensuring that those who are determined to obtain an education have the opportunity to do so

Currently the Chicago Community Colleges offers a number of online and video courses that have seen much success

Advanced and laboratory courses will be given in the traditional classroom setting

We are currently in the process designing new courses that will complete the core courses in the Bioterrorism and Response Technician AAS degree

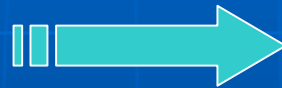
Essential to the success of these courses is the linkage of courses in this area of study

Basic Certificate

Second Semester

**Terrorist Agent
Monitoring and Detection**

provide the background information on the techniques used to track and test for potential terror agents



Advanced Certificate

Third Semester

Laboratory Instrumentation
Specimen Collection

these techniques will be put into practice by the students

AS Degree

Fourth Semester

Industrial Internship

*Introduction to
Tissue Culture*

**Agricultural Agents: Threat
and Response**

The majority of the final semester is reserved for independent study in the form of an industrial fellowship –

Implementation of their practice

This opportunity should not be limited to the private sector, but all areas: government, academic, as well as private industries are encouraged to participate

From Practice to Implementation – Challenge of the Real World

This portion of the program is crucial to the success of the BBRETC as a whole due to the fact that this provides our students with valuable experience and at the same time reinforces claims that individuals with an AAS degree can be valuable team members to technological industries

Challenges along the way:

Resistance from neighboring industries in hiring qualified individuals with an AAS degree

Neighboring industries and even governmental institutions are hesitant to hire individuals to fill skilled labor positions with an AAS degree due to unnecessary bias

Relatively unknown field of study to students

Many of our students are unaware of the other potential careers that exist to them outside of the health care field

Lack of direct career path

Due to the afore mentioned challenges many students are reluctant to begin a course of study with not clear job outlook

Overcoming these challenges:

Partnering with the public and private sector:

By forming partnerships with these sectors we can better understand the needs of each area and also provide our students with opportunities for industrial internships

Reaching out to area middle and high schools with:

By introducing these areas of study earlier to students we are hoping to open students' minds to other branches of science besides the health sciences

Both of these steps will serve to better educate our students and potential employers of the benefits of an AS degree in Biotechnology and related fields

Bridges to Biology & Biotechnology

The Bridges to Biology and Biotechnology program will function as a “gateway” program:

- to prepare GED, adult education, and ESL students for matriculation
- to regular credit track Truman College Biology Department courses, and
- to Bridges to Biotechnology Program courses.

The Bridges to Biology gateway courses will be delivered in a M³U (multi-media, multi-use) classroom which is a hybrid between a “multi-media” studio classroom and a traditional lecture / wet lab.

A standard lecture classroom is being reconfigured:

- for formal, didactic lectures
- for small group discussions
- for wet lab procedures,
- for digital technology requiring high bit rate data transfer capabilities (100 Gb/sec)
- for digital projection and recording capabilities.

The Bridges to Biology gateway courses are being designed specifically for delivery in the M³U classroom. The courses must have:

- Narrowly focused lectures
- Group activities which flow from the lectures
- Computer/internet-based dry labs and animations which flow from the group activities
- Wet labs which reinforce or are a natural extension of the dry labs/animations

The Bridges to Biology gateway courses are not only being designed specifically for delivery in the M³U classroom, but also specifically designed for the “Bridges” program.

- The classic introductory biology course
- Math in support of biology
- Chemistry in support of biology, and
- English in support of biology.

BBRTEC Development Team

Yvonne Harris – Molecular and Cellular Radiation Biology – yharris@ccc.edu

James Onoda - Radiation Oncology – jonoda@ccc.edu

Adrienne Driver – Microbiology – adriver1@ccc.edu

Akbar Ebrahim – Medicine – aebrahim@ccc.edu

Mahesh Gurung – Ecology – mgurung@ccc.edu