IBCs: Promoting Optimal Practice Now and in the Future
Biosafety Training for High Containment Researchers

Joe Kanabrocki, Ph.D., C.B.S.P.
University of Chicago
Great Lakes RCE
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Universal Biohazard Symbol

Biosafety
Biological Terrorism
Emerging Diseases

Examples of new and reemerging diseases.
BioSAFETY Post-9/11
Expansion of Containment Laboratories

- **Before 2001:**
  - only a handful of BSL4 labs
  - NIH, CDC, USAMRIID, ?

- **As of 2008:**
  - 13 BSL4 labs on 11 sites
  - 1356 BSL3 labs registered with CDC/APHIS Select Agent Programs
    - 336 registered entities
    - 14,612 registered lab researchers and support staff
NIAID National (2) and Regional (13)
Biocontainment Labs
Growing Prevalence of IBCs
## Biosafety Training Programs in the U.S.


<table>
<thead>
<tr>
<th>Agency/Institution</th>
<th>Program Title</th>
<th>Program Objectives</th>
<th>Format</th>
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</thead>
<tbody>
<tr>
<td>American Association for Laboratory Animal Science</td>
<td>AALAS Learning Library</td>
<td>The Animal Care and Use Library has courses on certification, regulatory mandates, bioethics, biomethodologies, biosafety, and management.</td>
<td>On-Line Modules</td>
</tr>
<tr>
<td>American Biological Safety Association</td>
<td>Working at Animal BSL-1, BSL-2, BSL-3</td>
<td>Training in worker safety and laboratory practices when working with animals</td>
<td>Online videos</td>
</tr>
<tr>
<td>American Biological Safety Association</td>
<td>Principles &amp; Practices in Biosafety</td>
<td>Describe potentially hazardous biological materials, the risks associated with their use, and the means to minimize risk and to protect against or prevent release or exposure; discuss ways to provide technical expertise in situations involving potentially hazardous biological materials; and identify, locate, and efficiently use key biosafety resources.</td>
<td>Five-day, Forty-hour biosafety course</td>
</tr>
</tbody>
</table>
## Biosafety Training Programs in the U.S. (cont’t)


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<tr>
<td>American Biological Safety Association</td>
<td>Spring Seminar and Review Course</td>
<td>Understand 65 biological safety task areas that will be covered in the exam; review all critical subject matter under each of the tasks; provide an overview of regulations and critical biological safety reference materials with which they must be familiar; recognize the exam structure and format based on topics covered, create awareness of specific subject areas</td>
<td>Two-day, Sixteen hour course</td>
</tr>
<tr>
<td>Centers for Disease Control and Prevention</td>
<td>Laboratory Biosecurity</td>
<td>Differentiate biosafety and biosecurity, conduct risk assessment, develop biosecurity plan</td>
<td>Online modules</td>
</tr>
<tr>
<td>Colorado State University</td>
<td>Biosafety and Biosecurity Training Course</td>
<td>Training in general biosafety and biosecurity, training in animal and plant handling</td>
<td>Eight-day classroom workshop</td>
</tr>
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## Biosafety Training Programs in the U.S. *(con’t)*


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<tr>
<td>Control of Biohazards, Inc</td>
<td>Control of Biohazards in the Research Laboratory</td>
<td>Introduction to biosafety for new biosafety professionals, researchers and lab managers</td>
<td>Five day course with lab activity</td>
</tr>
<tr>
<td>Department of Health and Human Services</td>
<td>Integrated Medical, Public Health, Preparedness and Response Training Summit</td>
<td>Skills development, knowledge enhancement, and information sharing</td>
<td>Lecture sessions followed by question and answer sessions</td>
</tr>
<tr>
<td>Eagleson Institute</td>
<td>Custom courses, seminars, and conferences</td>
<td>Various biosafety and biosecurity concepts</td>
<td>Varies</td>
</tr>
<tr>
<td>Emory University</td>
<td>ALERT Training Program BSL-2, BSL-3, BSL-4</td>
<td>Strengthen internal relationships and partnerships with first responders</td>
<td>Onsite customized training</td>
</tr>
<tr>
<td>Emory University</td>
<td>Behavioral-Based Biosafety Trainer Preparation Program</td>
<td>Training in laboratory practices and safety concerns for appropriate lab safety level</td>
<td>Five-day classroom and laboratory course</td>
</tr>
<tr>
<td>Emory University/Elizabeth R Griffin Research Foundation</td>
<td>Leadership Institute for Biosafety Professionals</td>
<td>Training trainers, building leadership skills</td>
<td>Four-day workshop</td>
</tr>
<tr>
<td>Frontline Healthcare Worker Safety Foundation</td>
<td>On-Site Training</td>
<td>Biosafety, Biosecurity, Laboratory practices, Animal, bio</td>
<td>Client site, Custom</td>
</tr>
<tr>
<td>Lovelace Respiratory Research Institute</td>
<td>BSL-3 &amp; ABSL-3 Training</td>
<td>Provide scientific, technical, animal care, facilities, and security staffs with knowledge and skills for level 3 work</td>
<td>Forty-hours, lectures and practicum exercises</td>
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<tr>
<td>Midwest Research Institute - Center for Biological Safety and Security (CBS2)</td>
<td>National and International training programs in Biological Safety and Security Principles and Practices; Compliance with established standards and regulations; Biosafety Levels 3 and 4 and Animal Biosafety Level 3.</td>
<td>Tailored awareness and skill-based training in biological safety and security principles and practices.</td>
<td>On-site classroom laboratory-based and field site; Train-the-trainer.</td>
</tr>
<tr>
<td>National Institutes of Health/Frontline Healthcare Worker Safety Foundation</td>
<td>National Biosafety &amp; Biocontainment Program</td>
<td>Operations &amp; Maintenance or Biosafety &amp; Biocontainment Certificate</td>
<td>Ten courses, final project, work practicum</td>
</tr>
<tr>
<td>National Institutes of Health/Frontline Healthcare Worker Safety Foundation</td>
<td>National Biosafety &amp; Biocontainment scholarship</td>
<td>Prepare biosafety and biocontainment professionals</td>
<td>Two-year scholarship</td>
</tr>
<tr>
<td>Sandia National Laboratory</td>
<td>International Biological Threat Reduction</td>
<td>Teach scientists, managers, and policy makers on importance of biosafety and biosecurity</td>
<td>Scheduled workshops and meetings</td>
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<tr>
<td>University of Chicago</td>
<td>GLRCE Cognitive and Practical Biosafety Education</td>
<td>Train researchers in latest biosafety principles and practices</td>
<td>Four-day classroom and laboratory course</td>
</tr>
<tr>
<td>University of Texas Medical Branch</td>
<td>Laboratory Biosafety Training Program</td>
<td>Establish base of laboratory skills and apply biosafety principles</td>
<td>Lectures and practicum courses</td>
</tr>
<tr>
<td>Washington University in St. Louis</td>
<td>MRCE Biosafety for the Research Scientist</td>
<td>Train researchers in latest biosafety principles and practices</td>
<td>Five-day classroom and laboratory course</td>
</tr>
</tbody>
</table>
The RCE Beginning: The RFA

- REGIONAL CENTERS OF EXCELLENCE FOR BIODEFENSE AND EMERGING INFECTIOUS DISEASES RESEARCH (RCE)
- RELEASE DATE: August 1, 2002
- RFA: AI-02-031
- National Institute of Allergy and Infectious Diseases (NIAID)
- LETTER OF INTENT RECEIPT DATE:
  - November 15, 2002
- APPLICATION RECEIPT DATE:
  - January 15, 2003
Regional Centers of Excellence
Original RCE Strategic Goals

To accomplish this the Centers will receive support to:

1) to develop and conduct programs of investigator-directed research;
2) to train researchers and other personnel for biodefense activities;
3) to develop and maintain comprehensive core facilities to support the research and training activities of the RCE;
4) to develop translational research capacity for testing and validating vaccine, therapeutic and diagnostic concepts for biodefense and emerging infectious diseases;
5) to maintain and make available core facilities and other support to qualified investigators from academia, biotech companies, the pharmaceutical industry, and other appropriate entities in the region for the purpose of performing basic research and for testing and evaluating vaccines, therapeutics and diagnostics for CDC Category A-C Agents;
6) to be ready and available to provide facilities and scientific support to first-line responders in the event of a national biodefense emergency.
Career Development Projects

“The RCE must include a consistent and significant commitment to career development with the goal of increasing the availability of researchers for biodefense..... The training must be an integral part of the strategic plan, and complement the research activities. The long-range goal of the training component is development of an expanded cadre of new researchers, clinicians, and technical personnel who can help lead the national biodefense mission into the future.”

WHAT ABOUT BSO’s?
What about facility operations?
GLRCE Biosafety Training Core

- **Integrated approach to Biosafety education**
  - coordinating and synergizing the educational experiences for research investigators and support staff, Biosafety professionals and biocontainment facility engineers.

- **Didactic and hands on training** in all areas of the safe use of pathogenic microorganisms at BSL3 and ABSL3, including Select Agents.

- **Synergistic Involvement of the University of Chicago Howard T. Ricketts Regional Biocontainment Laboratory (HTRL) at Argonne National Laboratories**

- **Biosafety scholarship program**
  - Will train scientist yearly to become biosafety officers, capable of establishing and supervising biosafety programs, with focus on high containment facilities.
  - Biosafety scholars will be expected to: (1) assist with the preparation and delivery of Biosafety training courses and resources, and (2) contribute to GLRCE research endeavors in areas of applied Biosafety research (e.g aerosol biology/biosafety) via collaboration with other GLRCE investigators, particularly investigations conducted at the HTRL.

- **Engineering internship**
  - Will be provided to facility engineers and maintenance staff responsible for the operation and maintenance of the physical infrastructure needed for BSL3 and ABSL3 research activities, particularly the NBLs and RBLs.
  - Takes advantage of the HTRL laboratory and GLRCE infrastructure.
GLRCE
Biosafety Training Core

Biosafety Course
(Group Development Program)

Individual Career Development Program

Biosafety Scholarship
(PhD, DVM, MD)

Engineering Internship
# Cognitive and Practical Biosafety Education for Host-Pathogen Investigators

Joseph Kanabrocki, Lauriane Quenee, Nancy Ciletti, John Bivona, Lois Zitzow

<table>
<thead>
<tr>
<th>Monday, Feb. 18</th>
<th>Tuesday, Feb. 19</th>
<th>Wednesday, Feb. 20</th>
<th>Thursday, Feb. 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 - 8:30</td>
<td>Welcome &amp; Introductions</td>
<td>Primary and Secondary Containment: BSC</td>
<td>Biological Toxins</td>
</tr>
<tr>
<td></td>
<td>Joe Kanabrocki</td>
<td>Selection &amp; Use John Bivona &amp; Joe Kanabrocki</td>
<td>NBBTP Biosafety Training</td>
</tr>
<tr>
<td>8:30 - 9:00</td>
<td></td>
<td>(1) Biological Containment/Properties of Biological Agents</td>
<td>Bob Hawley</td>
</tr>
<tr>
<td>9:00 - 9:30</td>
<td>Safe Science is Good Science (or variation)</td>
<td>(2) Risk Assessment of Biological Agents</td>
<td>Select Agent Program Management</td>
</tr>
<tr>
<td></td>
<td>Jim Welch</td>
<td>(2) LAI Epidemiology/Exposure Sources/ Routes of infection</td>
<td>Joe Kanabrocki, Steve Beaudoin, John Bivona</td>
</tr>
<tr>
<td>9:30 - 10:00</td>
<td>Intro to Biocontainment: The OUTBREAK Lessons</td>
<td>Decontamination/Disinfection Techniques</td>
<td>Emergency Response</td>
</tr>
<tr>
<td></td>
<td>Joe Kanabrocki</td>
<td>Bob Hawley</td>
<td>Steve Beaudoin, Joe Kanabrocki, John Bivona</td>
</tr>
<tr>
<td>10:00 - 10:30</td>
<td>BREAK</td>
<td>BREAK</td>
<td>BREAK</td>
</tr>
<tr>
<td>10:30 - 11:00</td>
<td>Laboratory Safety Operations</td>
<td>Lab animal Allergies</td>
<td>Lab Acquired Infections</td>
</tr>
<tr>
<td></td>
<td>Bob Hawley</td>
<td>Joe Kanabrocki</td>
<td>Joe Kanabrocki</td>
</tr>
<tr>
<td>11:00 - 11:30</td>
<td>LAST8 Operations</td>
<td>Zoonoses</td>
<td>Ricketts BSL3 Facility Design &amp; Operations</td>
</tr>
<tr>
<td></td>
<td>Lois Zitzow</td>
<td>Lois Zitzow</td>
<td>Judd Johnson</td>
</tr>
<tr>
<td>11:30 - 12:00</td>
<td>ABSL3 Operations</td>
<td>Respiratory Protection &amp; Fit-Testing</td>
<td>Lab Animal Risk Assessment</td>
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<tr>
<td></td>
<td>Lois Zitzow</td>
<td>John Bivona</td>
<td>Lois Zitzow</td>
</tr>
<tr>
<td>12:00 - 1:00</td>
<td>LUNCH</td>
<td>LUNCH</td>
<td>LUNCH</td>
</tr>
<tr>
<td>1:00 - 1:30</td>
<td>CONCURRENT SESSIONS</td>
<td>CONCURRENT SESSIONS</td>
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<tr>
<td>1:30 - 2:00</td>
<td>BS13 Lab Exercises</td>
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<td>BS13 Lab Exercises</td>
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<tr>
<td></td>
<td>Dave Bressler and Lauriane Quenee</td>
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<td>Dave Bressler and Lauriane Quenee</td>
</tr>
<tr>
<td>2:00 - 2:30</td>
<td>BS33 Exercises</td>
<td>ABLS3 Exercises</td>
<td>ABLS3 Exercises</td>
</tr>
<tr>
<td></td>
<td>Dave Bressler, Lois Zitzow and Nancy Ciletti</td>
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</tr>
<tr>
<td>2:30 - 3:30</td>
<td>rDNA Risk Assessment Case Studies</td>
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</tr>
<tr>
<td>3:30 - 4:00</td>
<td>Risk Assessment Case Scenarios (Open Discussion)</td>
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<td>Risk Assessment Case Scenarios (Open Discussion)</td>
</tr>
<tr>
<td>4:00 - 5:00</td>
<td></td>
<td></td>
<td>Quiz</td>
</tr>
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Cognitive and Practical Biosafety Education for Host-Pathogen Investigators

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GLRCE Biosafety Scholarship Program

- GLRCE supports one Scholars per year
- “In-residence” one year program,
- NIH Stipend, plus benefits
  - Extramural support for additional biosafety staff
- Scholars support Biosafety/IBC activities, with primary focus on laboratory (esp. BSL3) and research safety.
GLRCE Biosafety Scholarship Program

- Scholars attend/present at national/regional meetings:
  - ABSA
  - MABioN
  - ASM
  - National Science Advisory Board for Biosecurity (NSABB)
- Scholars attend GLRCE-sponsored activities
- Scholars prepare and sit for the ASM NRCM-SM(BS) certification examination
  - Subsidized by the GLRCE Biosafety Core
GLRCE Biosafety Scholarship Program

Scholars conduct basic science research projects with applied biosafety implications.

Scholars participate in all BSO administrative activities:
- IBC protocol review/risk assessment
- Select Agent Program management
- Laboratory inspections
- Training (RCE Cognitive and Practical Biosafety Education…)
- HTRL BSL3 Facility Operations and Maintenance
- Emergency spill response
- All external inspections (USDA, CDC, FAA)
- Export Controls/Dual Use Program and MTAs
Engineering Internship

- Partnership with schools of engineering
- Internship rotations for school of engineering students.
- Engineering mentorship provided by UC Facilities and UW-Madison Environmental Health Program
  - BSC Certification Program
- Rotations at HTRL
Howard T. Ricketts
Regional Biocontainment Laboratory
Animal Holding Rooms

- 5 large sized animal holding rooms
  - 4 ventilated racks
  - 2 Class IIA2 BSCs
- 2 small sized animal holding rooms
  - 2 ventilated racks
  - 1 Class IIA2 BSC
Aerosol Exposure Room

- Class III BSC
- Aerosol delivery of pathogen to animals
- Mimics natural exposure
- Uses a HEPA-filtered cart to safely transport animals too and from animal housing rooms
Equipment Decontamination

- 2 walk-in autoclaves
- Vaporous hydrogen peroxide decon room
Biosafety Challenges at RCEs?

Two Principles of Laboratory Safety

1. Scientific risk assessment is the foundation upon which safety protocols must be based.
2. Research safety must be integrated into the culture and fabric of the research enterprise.
Joe Kanabrocki
Contact Information

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