A Guide to Training and Information Resources on the Culture of Biosafety, Biosecurity, and Responsible Conduct in the Life Sciences

2019

International Working Group [formerly known as the Federal Experts Security Advisory Panel (FESAP) Working Group]

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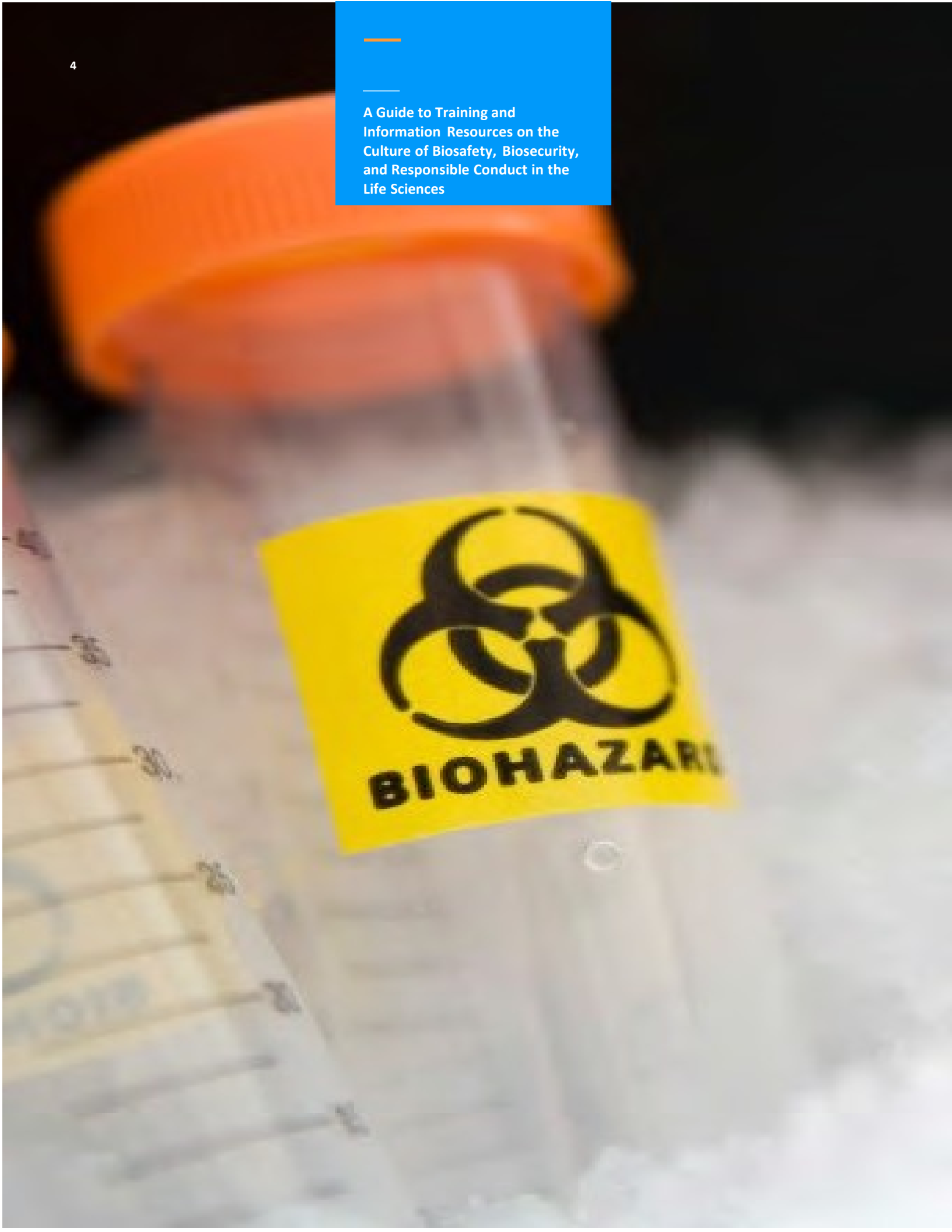


What is the culture of biosafety, biosecurity, and responsible conduct in the life sciences?

An assembly of beliefs, attitudes, and patterns of behavior of individuals and organizations that can support, complement or enhance operating procedures, rules, and practices as well as professional standards and ethics designed to prevent the loss, theft, misuse, and diversion of biological agents, related materials, technology or equipment, and the unintentional or intentional exposure to (or release of) biological agents [1].

Section A

Elements of culture adapted from a model developed by IAEA [2, 3]

1

Management Systems

An organizational culture of biosafety, biosecurity, and responsible conduct in the life sciences includes policies, processes, procedures, and programs in the organization that make biosafety and biosecurity a top priority and have an important impact on biorisk management functions. Examples include but are not limited to:

- **Clear roles and responsibilities**
- **Visible safety and security policy**
- **Performance measurement**
- **Feedback process**
- **Competency-based training**

2

Behavior of Leadership and Personnel

Leadership behavior **(i.e., specific patterns of behavior and actions which are designed to foster more effective biorisk management) should emphasize inter alia:**

- **Expectations**
- **Decision-making**
- **Oversight**
- **Effective communication**
- **Motivation**

Personnel behavior **(the desired outcomes of the leadership efforts and the operation of the management systems) should underscore inter alia:**

- **Professional conduct**
- **Adherence to approved/validated procedures and research protocols**
- **Team work and cooperation**
- **Vigilance**

3

Principles for Guiding Decisions and Behaviors

Emphasis should be placed on principles for guiding decisions and behaviors as they relate to biorisk management. Examples include but are not limited to:

- **Leadership**
- **Commitment and responsibility**
- **Professionalism and competence**
- **Learning and improvement**
- **Maintaining public trust**
- **Codes of conduct (including codes of ethics)**

4

Beliefs and Attitudes

Beliefs and attitudes on biosafety and biosecurity (including on dual use research of concern and cyberbiosecurity) should be assessed periodically and reinforced through training and education aiming to:

- **Raise awareness on consequences and mitigation strategies of risks associated with working in a laboratory with biological materials (e.g., accidental exposure, infection or release; intentional theft and/or misuse; others such as cybersecurity, radiological/chemical/physical safety and security)**
- **Increase understanding of the ethical, legal, and societal issues and consequences concerning life sciences research, development, and associated technologies**
- **Emphasize laboratory quality management**
- **Ensure compliance with regulations, policies, guidance, and procedures[4]**

A strong safety culture involves "*seeing safety as a culture (the way to work) rather than as an imposed obligation*"[5] and "*requires that laboratory safety become an integral and apparent priority to the organization, embraced first and foremost by top management and with the concomitant infrastructure support required to foster safe behaviors among its employees*"[6]

"a good biosecurity culture will be more easily introduced and maintained at those institutions with a strong biosafety program" [7]

"framing the issue as Responsible Science makes concepts such as biosecurity and dual use relevant and more readily accepted when presented as part of the larger social responsibility of science . . . and provide[s] a basis for discussing additional measures or changes in practices" [8]

Participants at the NATO Advanced Study Institute on CBRN Security Culture, Yerevan, Armenia, 2014

***"Safety and security share many common elements... with the ultimate aim of protecting people, society, and the environment... The acceptable risk is presumptively the same whether the initiating cause is a safety or a security event. Moreover, the philosophy that is applied to achieve this fundamental objective is similar. Both safety and security typically follow the strategy of defence in depth — that is, the employment of layers of protection. The fundamental nature of the layers is similar. Priority is given to prevention. Second, abnormal situations need to be detected early and acted on promptly to avoid consequent damage. Mitigation is the third part of an effective* strategy. Finally, extensive emergency planning should be in place in the event of the failure of prevention, protection and mitigation systems" [9]**

Learning about the Culture of Biosafety, Biosecurity, and Responsible Conduct

If you are interested in finding out more about the culture of biosafety, biosecurity, and responsible conduct, this guide is for you. A U.S. interagency Working Group was established in 2015 to implement the recommendation of the Federal Experts Security Advisory Panel to "*create and strengthen a culture that emphasizes biosafety, laboratory biosecurity, and responsible conduct in the life sciences... characterized by individual and institutional compliance with biosafety and laboratory biosecurity regulations, guidelines, standards, policies and procedures, and enhanced by effective training in biorisk management*"[10]. This group morphed into an International Working Group, a Community of Practice comprised of representatives of governments, academia, industry, professional and international organizations from across the globe. We are using crowdsourcing to develop educational materials and promote learning.

From the U.S. perspective, we are guided by the 2018 National Biodefense Strategy which tasked us to "*support and promote a culture of global biosafety, biosecurity, ethical, and responsible conduct in the life sciences*"[11]. Per our 2019-2022 National Health Security Strategy, "*we must ensure the benefits of scientific research are effectively realized, while the potential for misuse is minimized by…supporting responsible conduct in the life sciences through promoting a culture of responsibility, effective oversight of dual-use research, and engagement with nontraditional and amateur research communities…*"[12]

While not intended as a comprehensive resource, this guide provides information about training and educational resources related to the culture of biosafety, biosecurity, and responsible conduct in the life sciences. The guide highlights courses and repositories of training/educational resources, including professional certification and competencies on biosafety/biosecurity; select conferences or events where the culture of biosafety and biosecurity was addressed; resources on dual use research of concern, ethics, and codes of conduct; and relevant publications. Certain educational or informational resources from IAEA and OPCW are also mentioned. Each section draws from information provided or noted by the members of our Community of Practice.

Until human beings are replaced with robots – we will have to mitigate human risk factors.

— Sean G. Kaufman, CEO and Founding Partner, SAFER BEHAVIORS (USA)

Courses and repositories of training/ educational resources

Section B

Culture Matters

Professional Organizations Lead the Way

ABSA International

Online Education Center: **https://absa.org/online-education**

Training Tools and Resources:
https://absa.org/tools-resources/

European Biosafety Association
EBSA21 Conference – Copenhagen 2018 – Session 2 Biosafety Culture

Awareness of Biosafety and Biosecurity (including resources on the culture of biosafety, biosecurity, and responsible conduct):
https://ebsaweb.eu/awareness-biosafety-and-biosecurity

International Federation of Biosafety Associations (IFBA)

Training Geared Toward IFBA Certifications:
https://www.internationalbiosafety.org/index.php/professional-certification/ifba-professional-certifications/training

"The gap between daily practices and those required by law or standards can never be eliminated. It has to be governed.

— Ruthanne Huising, Professor of Management and Organizations, EMLYON Business School

ABSA International Credentialing Program

Registered Biosafety Professional (RBP)

RBPs are individuals with documented university education or specialized training in relevant biological safety disciplines. A RBP has an understanding of infectious diseases, their transmission, and the application of methods to safely control infectious materials in research, clinical production, testing, educational development, and other work environments.

https://absa.org/credentials

Certified Biological Safety Professional (CBSP)

ABSA and the American Society for Microbiology (ASM) agreed to jointly develop the biological safety microbiology certification under the auspices of the National Registry of Certified Microbiologists (NRCM). The first examination was offered in 1997 and, in 2018 exam development was assumed by ABSA. A CBSP requires submission of transcripts, references, work history and successful completion of the CBSP exam.

ABSA Advanced Biosafety Training Series:

An intermediate to advanced online offering designed for those studying for the CBSP exam and for those interested in advanced training:

https://absa.org/abts

ABSA International Laboratory Accreditation Program

ABSA International (ABSA) offers a voluntary ABSA Laboratory Accreditation Program for BSL–2, ABSL–2, BSL-3, and ABSL-3 laboratories that are not under the jurisdiction of the U.S. Select Agent and Toxins Regulations. ABSA accreditation will provide entities recognition of excellence and compliance with high standards, while providing facilities guidance in generating processes and policies to create a safer environment for their organization, employees, research animals, and the community.

http://absa.org/aiahclap.html

Applied Biosafety: ***Journal of ABSA International (APB)****:* is a peer-reviewed, scientific journal committed to promoting global biosafety awareness and best practices to prevent occupational exposures and adverse environmental impacts related to biohazardous releases. A goal of *Applied Biosafety* is to provide a forum for exchange of sound biosafety and biosecurity initiatives through publication of original articles, review articles, letters to the Editors, commentaries, and brief reviews. **https://absa.org/publications/#_tab-8d469589620e8f68d1c**

IFBA Professional Certification (PC) in Biosecurity*
-- Topic Areas --

- ✓ Biosecurity Conventions, Guidelines, and Standards
- ✓ Biosecurity Risk Assessment & Program Management
- ✓ Physical Biosecurity Measures
- ✓ Pathogen Accountability
- ✓ Personnel Reliability
- ✓ Dual-Use & Bioethics

International Federation of Biosafety Associations

*Candidates applying for this certification must first successfully complete the PC in Biorisk Management before they are eligible for examination. The certification exams are available at any time online, or, in conjunction with key biosafety association conferences. Exam fee is US$200.00. Candidates can apply for a scholarship; a reduced fee of US$100 is available to certain countries. See: http://www.internationalbiosafety.org/index.php/professional-certification/ifba-professional-certifications/applying

UNITED STATES

National Veterinary Accreditation Program

Free online courses for accreditation or continuing education at:
https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/nvap/ct_aast

National Animal Health Emergency Response Corps Training Site

Online Courses | http://naherc.cfsph.iastate.edu/

This site offers free training for any individuals wanting to learn. First time visitors may create an account to access the courses using the "Create an account" link in the Log In box on the website. Once you have logged in you simply select the course that you want to take. You will be asked if you want to enroll in the course. Simply respond "yes" and begin your animal health emergency training.

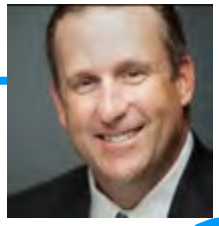
The site was created and is maintained by the Center for Food Security and Public Health located at Iowa State University in the College of Veterinary Medicine. This material was made possible, in part, by a Cooperative Agreement from the United States Department of Agriculture's Animal and Plant Health Inspection Service (APHIS).**A**

BEHAVIORAL-BASED IMPROVEMENT SOLUTIONS
Changing behavior. One step at a time.

Training, consulting, and coaching services aimed to reduce overall health and safety risk by providing effective professional and personal development opportunities. For more details, visit:

http://www.saferbehaviors.com/services

Free, remote Lunch-Break Series designed to provide personal and professional growth opportunities. Using the *GoToTraining* Platform, these short discussions (~45 minutes) provide participants with a reference tool, an active discussion, and opportunity to engage with the presenter. A list of past Lunch Break Series videos is at:
http://www.saferbehaviors.com/portfolio/workforce-training/monthly-lunch-break-series-remote



We believe the leadership and workforce must work together to minimize the risks in the workplace. Our programs prepare and protect the workforce by focusing on what is needed to behave safely. Knowing and doing are very different - and the greatest risk is not the risk itself - it is how the workforce interacts with the risk on a day-to-day basis.

— **Sean G. Kaufman, CEO and Founding Partner, SAFER BEHAVIORS (USA)**

Highlights

American Society for Microbiology

Pakistan and Egypt | 52 Weeks of Biosafety

A year-long training program that improves biosafety/security and biorisk management best practices for laboratorians, and human and animal health professionals. Monthly modules cover a host of topics including workforce culture, dual use concerns and bioethics, leadership, and positive behavioral change in support of fostering healthy organizational/institutional culture. Participants view monthly webinars and are given monthly assignments related to the webinar topic, to reinforce lessons learned, which can include such things as interviewing leadership, acknowledging co-workers for following safety best practices, completing questionnaires on how they would respond to an unethical request in the workplace, to name a few. The program does include 1-3 in-person workshops throughout the year, depending on the country and level of funding.

Multiple Countries| Culture of Responsibility Workshop

The Culture of Responsibility Workshop provides an overview of the principles of laboratory biological safety, biosecurity, and the responsible conduct of research. The workshop includes video-based lectures, group discussion and exercises. Workshop participants gain tools to identify, assess, and mitigate risks for the betterment of science and those in our community.

MENA Region| Teaching Research Integrity and Professional Development

This workshop prepares educators in the life sciences to provide instruction to students that incorporates integrity, bioethics, and responsible conduct of research. This includes approaches to teaching research ethics, developing research plans that take into account research integrity, writing papers and journal submission processes.

Pakistan| Life Science Journal Ethics Course

This course provides training and best practices to journal Editors-in-Chief, Journal Editors, and others involved in the publication of life science journals. Topics covered in the course include responsible research and publication practices, the role of journals in promoting a culture of responsibility, responding to cases of misconduct, responding to proven misconduct, and developing and maintaining effective journal policies, to name a few.

For further information, contact:
Peter Geoghan
pgeoghan@asmusa.org
+1 202-942-9412

http://t.co/SkwdVg0v0O

Highlights

American Association for Laboratory Animal Science

Online Courses | AALAS Learning Library https://aalaslearninglibrary.org

- **Animal Biosafety Training Program.** Orients researchers, animal care technicians, and other personnel to the biosafety principles, guidelines, safety equipment, and facility safeguards that enable the safe conduct of infectious disease research using laboratory animals at Animal Biosafety Level (ABSL) -2 and -3.
- **Orientation to Biosafety in Microbiological and Biomedical Laboratories**
- **NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules**
- **Bloodborne Pathogens Training for Animal Research**

Webinars | https://www.aalas.org/store

Training Manuals | https://www.aalas.org/store

- **Assistant Laboratory Animal Technician Training Manual**
- **Laboratory Animal Technician Training Manual**
- **Laboratory Animal Technologist Training Manual**

https://www.aalas.org/certification

See website for program, professional development courses, and past symposia presentations | https://arssymposium.absa.org/

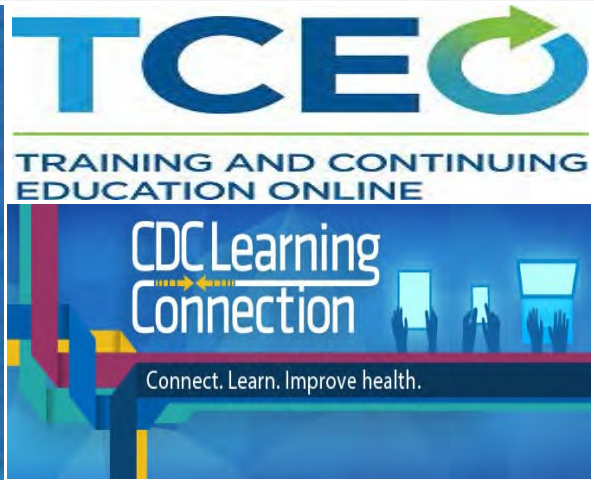
Biorisk Assessment and Management Poster Session highlights:

- **Implementation of a biorisk management system.**
- **Risk assessment for laboratory, vivarium, and field work.**
- **Facility design and maintenance for improved biorisk management: challenges and solutions.**
- **Operational and training issues.**
- **Security and reliability issues surrounding the life sciences.**
- **Developing and measuring biosafety culture**

Culture change and leadership insights:

https://arssymposium.absa.org/wp-content/uploads/2017/02/2017ARS_S1_1100Kappes.pdf

ABSA International Animal Biosafety Videos:
https://absa.org/absl/



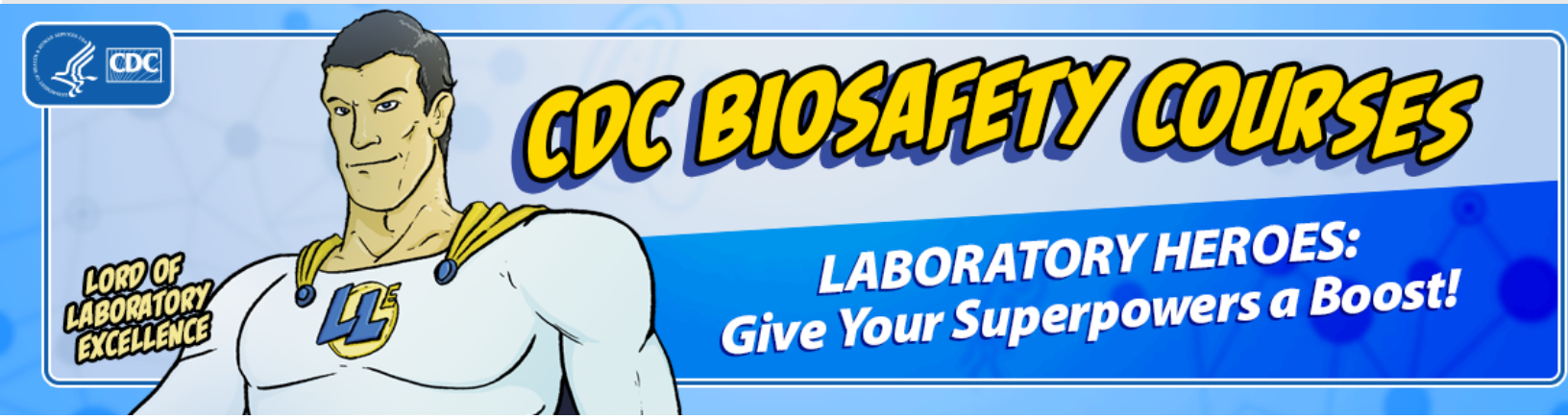
Training and Continuing Education Online (TCEO) is a system that provides access to the Centers for Disease Control and Prevention (CDC) educational activities for continuing education (CE). Use TCEO to search for CE opportunities, complete course evaluations and posttests, receive your CE certificates, and manage your CE transcript.

https://tceols.cdc.gov

The CDC Learning Connection features quality public health learning opportunities from CDC, other US federal agencies, and federally funded partners. Through monthly website features, social media, and an e-newsletter, the CDC Learning Connection keeps you informed about public health trainings, including many that offer free CE. https://www.cdc.gov/learning/index.html

CDC Laboratory Training:

https://www.cdc.gov/labtraining/index.html



CDC Laboratory Safety Portal:

https://www.cdc.gov/labsafety/

Free Educational Materials for Public Health and Clinical Laboratories

https://www.cdc.gov/csels/dls/educational-materials.html

CDC's Division of Laboratory Systems (DLS) has collaborated with public health and clinical laboratory partners to develop online educational materials on a variety of laboratory topics. These materials - training courses, tools, and other resources - are designed to help laboratory professionals and healthcare providers learn and use recommended practices for quality laboratory services. All training courses and other materials are free, and continuing education (CE) credits are available for many courses.

Browse DLS training courses at: **https://www.cdc.gov/labtraining/**

Biosafety Resources and Tools:

https://www.cdc.gov/safelabs/resources-tools.html

Additional CDC resources:

https://www.cdc.gov/labs

https://www.train.org/cdctrain/welcome

https://www.cdc.gov/ophss/csels/dls/index.html

APHL

Biosafety Checklist: Developing a Culture of Biosafety

https://www.aphl.org/aboutaphl/publications/documents/id_biosafetychecklist_42015.pdf

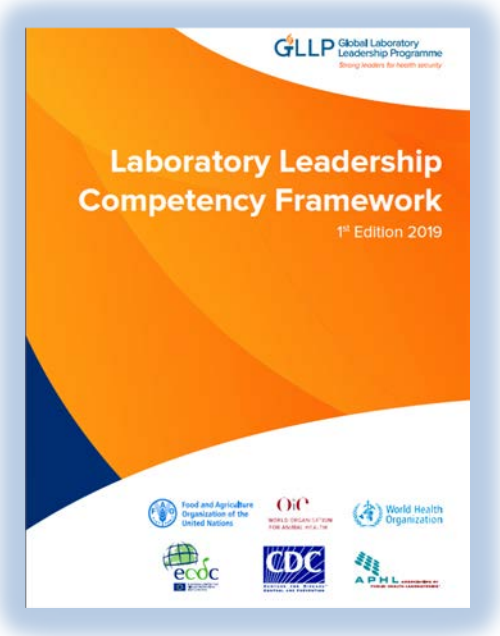
Provides US-based laboratories (including clinical laboratories) performing testing on infectious agents with broad recommendations for components across six areas that should be considered for inclusion in their biosafety policy:

1. Risk Assessment
2. Selection of Safety Practices
    a. Biosafety Level
    b. Engineering Controls
    c. Personal Protective Equipment (PPE)
    d. Laboratory Practices
3. Biosafety Competencies
4. Safety Orientation and Training
5. Audits, Monitoring and Safety Committee
6. Administrative Controls

LABORATORY BIORISK MANAGEMENT
CEN WORKSHOP AGREEMENT CWA 15793: 2011
HTTPS://WWW.UAB.CAT/DOC/CWA15793_2011

LABORATORY BIORISK MANAGEMENT
GUIDELINES FOR THE IMPLEMENTATION OF CWA 15793: 2008
CEN WORKSHOP AGREEMENT CWA 16393: 2012
HTTPS://WWW.CDC.GOV.TW/DOWNLOADFILE.ASPX?FID=49B44973866FEC44

Global Laboratory Leadership Program



Goal: Foster and mentor current and emerging laboratory leaders to build, strengthen and sustain national laboratory systems.

To help ensure that laboratories can continue to effectively play their critical role in the detection, prevention and control of diseases, laboratory directors and senior laboratory managers worldwide need specialized training in leadership and management.

Towards this end, leading organizations are partnering to develop a **Global Laboratory Leadership Program (GLLP)** targeting human and animal health laboratories, as well as laboratories with public health impact (e.g. environmental, agricultural, food or chemical laboratories). The partners include:

- The World Health Organization (WHO)
- The Food and Agriculture Organization of the United Nations (FAO)
- The World Organization for Animal Health (OIE)
- The European Centre for Disease Prevention and Control (ECDC)
- The U.S. Centers for Disease Control and Prevention (CDC)
- The Association of Public Health Laboratories (APHL)

The GLLP Competency Framework

International experts agree that laboratory leaders need certain core competencies to meet national, regional, and global disease prevention and control objectives. The GLLP encapsulates these in nine core competencies:

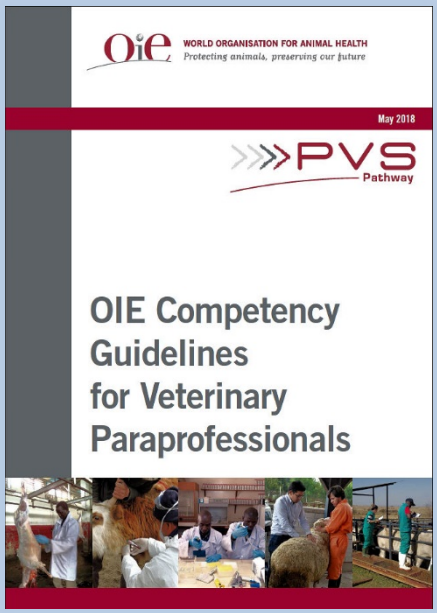
- Laboratory System
- Disease Surveillance and Outbreak Investigation
- Emergency Preparedness, Response and Recovery
- Biosafety and Biosecurity
- Leadership
- Management
- Communication
- Quality Management System
- Research

GLLP Learning Package

These core competencies will guide the development of the forthcoming GLLP Learning Package, which will provide the materials necessary to implement programs in any country or educational institution in the world, including:

- Competency framework
- Core course materials
- Guidance for program development, planning, implementation and evaluation

A flexible program, GLLP may be adapted to meet country-specific workforce needs.
See additional information at: **http://www.rr-africa.oie.int/docspdf/en/2018/NFPLABS/23%20GLLP_Tunis.pdf**



Includes competencies in Biosafety, Biosecurity, Occupational Health and Safety

http://www.oie.int/fileadmin/Home/eng/Support_to_OIE_Members/pdf/A_Competence.pdf

GUIDELINES FOR BIOSAFETY LABORATORY COMPETENCE

Morbidity and Mortality Weekly Report (MMWR)
CDC and the Association of Public Health Laboratories
Supplements
April 15, 2001 / 60(02); 1-6

https://www.cdc.gov/mmwr/preview/mmwrhtml/su6002a1.htm

APHL

Biosafety and Biosecurity Training:

https://www.aphl.org/programs/preparedness/Biosafety-and-Biosecurity/Pages/Biosafety-Biosecurity-Training.aspx

Laboratory Biosafety and Biosecurity Resources:

https://www.aphl.org/programs/preparedness/Biosafety-and-Biosecurity/Pages/BB-Resources.aspx

Biosafety Community of Practice:

https://www.aphl.org/programs/preparedness/Biosafety-and-Biosecurity/Pages/Biosafety-Community-of-Practice.aspx

Biorisk Management for Clinical and Public Health Laboratories:

https://www.aphl.org/programs/preparedness/Biosafety-and-Biosecurity/Documents/APHL_Biorisk_management_program_guidance_document.pdf

Association of Public and Land-Grant Universities

A guide to implementing a SAFETY CULTURE in our Universities

http://www.aplu.org/projects-and-initiatives/research-science-and-technology/task-force-laboratory-safety/index.html

Culture of reliability

High Reliability Organizations generate and maintain high levels of safety and security

A culture of security and safety only takes hold where security and safety are demanded and practiced at all levels of management, from the top down.

- Tim Trevan, Co-Founder, CHROME Biosafety and Biosecurity Consulting


WELLCOME DIAGNOSTICS
October 2006

Worldwide Training Opportunities in the Spotlight

Section C

Culture Matters

Denmark

The Centre for Biosecurity and Biopreparedness is the national biosecurity authority in Denmark.

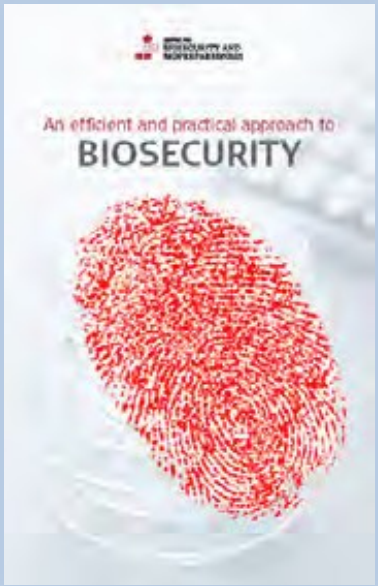
https://www.biosecurity.dk/home/

International biosecurity course - how to establish a biosecurity system

The purpose of this course is to share experiences and assist countries that intend to establish a national biosecurity system. The full program lasts a week, but the duration can be tailored to meet individual needs. Participants receive a biosecurity certificate on completion. Areas covered are listed below. For additional details, see:

https://www.biosecurity.dk/647/

- **Framing the issue**
- **Setting up a biosecurity system**
- **Biosecurity administration**
- **Inspection visits**
- **Responsible science, ethics, and awareness raising**
- **Biopreparedness**



https://www.biosecurity.dk/biosecuritybook

Belgium

Belgian Biosafety Server:

https://www.biosafety.be

Thematic Areas:

- Assessment of biological risks
- Biosecurity
- Laboratory-acquired infections
- Genome editing
- Polio eradication and laboratory containment
- Synthetic biology
- Safety measures for the transport of GMOs and/or pathogens

Canada

Public Health Agency of Canada:

https://www.canada.ca/en/public-health.html

Laboratory Biosafety and Biosecurity Training offered by the Centre for Biosecurity of the Public Health Agency of Canada and the Office of Biohazard Containment and Safety of the Canadian Food Inspection Agency.

Instructional videos on biosafety which can be viewed for free online:

- **Biosafety 101**
- **Containment Level 2 Laboratory: Operational Practices**
- **Containment Level 3 Laboratories: Operational Practices**

https://training-formation.phac-aspc.gc.ca/course/index.php

The Netherlands

The Biosecurity Office is the national information center for the Dutch Government and for organizations that work with high-risk biological material.

Biosecurity Self-Scan Toolkit:

A questionnaire covering the eight pillars of biosecurity listed below, that is designed to give you an indication of the current level of biosecurity in your organization.

http://www.biosecurityselfscan.nl/mainMenu.html

- **Biosecurity Awareness**
- **Personnel Reliability**
- **Transport Security**
- **Information Security**
- **Control of Materials**
- **Response Plans**
- **Management**
- **Physical Security**

User Manual for Biosecurity Vulnerability Scan:
A complement and follow-up step for the self-scan toolkit, it delves deeper into vulnerabilities through in-depth questions, scenarios, and analyses.

https://www.bureaubiosecurity.nl/en/toolkit/user-manual-for-biosecurity-vulnerability-scan

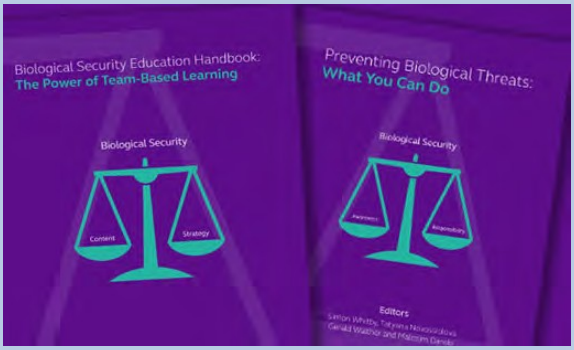
United Kingdom

University of Bradford developed resources for promoting biological security education globally. The project was jointly funded by the Governments of Canada and the UK under the Global Partnership Against the Spread of Weapons and Materials of Mass Destruction (GP).

The two authoritative books on **biological security education** produced under this grant are available online at:
https://www.bradford.ac.uk/social-sciences/peace-studies/research/publications-and-projects/guide-to-biological-security-issues/

Both books are available in various languages on the Biological Weapons Convention website, under National Implementation / Resource Repository:

https://www.unog.ch/80256EE600585943/%20(httpPages)/0A20E57D9F8424B8C12581D8007EC32E?OpenDocument



Additional resource:

Team-Based Learning Exercise - Social, ethical and legal responsibilities of life sciences

https://education.humanbrainproject.eu/web/1st-hbp-curriculum-ethics/workshop-media

https://www.youtube.com/watch?v=EFvraNKU1UE&feature=youtu.be

UNITED KINGDOM

Biosecure Ltd and the University of Bath launched on January 2019 the inaugural open run of a new 6-week open online course entitled ***"Biosecurity for the Next Generation: Responding to Biological Risks in the 21st Century".***

The course can be accessed via the FutureLearn platform at:
https://www.futurelearn.com/courses/biosecurity

The course is specifically designed to provide students and young professionals in the biosciences, bioengineering and security sectors with a comprehensive understanding of:

- The biosecurity challenges inherent in the life sciences,
- Local, national and international responses to these biological risks, and
- The role and contribution of biological scientists and engineers in making sure that science and technology is used safely and securely.

All course materials, including videos, quizzes and case studies, are free to download and share, and can be incorporated into university courses as either standard teaching tools or the course can be used as part of a flipped learning approach.

A promotional video with more course details is available here:
https://www.youtube.com/watch?v=Q8Kidqqva6I&t=7s

Twitter: @NextGenBiosec #NextGenBiosecurity
LinkedIn: **https://www.linkedin.com/company/nextgenbiosecurity/**
YouTube channel: Biosecurity for the Next Generation

NATO

Mr. Karen Gasparyan (NPCA, Armenia) and Dr. Igor Khripunov (UGA/CITS, USA), Co-Directors, NATO Advanced Study Institute on CBRN Security Culture, Yerevan, Armenia, 2014

CBRN Security Culture in Practice

***Series: NATO Science for Peace and Security Series - E: Human and Societal Dynamics, Volume 121*, Published: 2015**
Editors: Julia Thompson, Seema Gahlaut
ISBN 978-1-61499-533-3 (print) | 978-1-61499-534-0 (online)

United States

Global Biorisk Management Curriculum: training resources based on international best practices such as CWA 15793 and WHO biosafety and biosecurity guidance.

https://ibctr.sandia.gov/human_capacity_development/hcd-gbrmc.html

The GBRMC library is designed to:

- Include peer-reviewed and quality-controlled training materials that can be adapted to meet local needs.
- Provide specific training designed for a variety of personnel including: policy makers, top management, biorisk management advisers (also called biosafety officers), scientific and/or laboratory management, and laboratory workers.
- Provide courses based on instructional design that include:
  - Instructor's guide
  - Student guide
  - Presentation materials
  - Course evaluations materials
  - References and resources
- Provide courses that can be used together or separately in a variety of implementation strategies based on both the organization and student needs and the preferred training method and environment.

Training tools and resources developed by the FESAP Working Group on strengthening the culture of biosafety. biosecurity, and responsible conduct in the life sciences are available online on the EBSA website at:

https://ebsaweb.eu/awareness-biosafety-and-biosecurity

and on the ABSA website (under Training Tools and Resources - Misc Handouts/Posters at:

https://absa.org/tools-resources/

United States

BBTC-Global is an on-line interactive course instructed by 18 topic experts. The BBTC-Global session modules are presented on-line through an interactive Learning Management System: General Session, Animal Session, and Plant Session. Take all sessions, an individual session, or a combination of sessions. The course module presentations will be recorded and will allow you to access the recordings for later review.

Topics: General Biosafety; Biosafety and Biosecurity in animal research and veterinary clinics; ABSL-3 Research: Multiple Agents and Multiple Animal Species; Biosafety in animal field investigations Plant research and diagnostics (includes a plant research facility tour) Select Agent regulation updates (Tier 1); Laboratory and Select Agent inspection preparations; Risk Communication, Risk Assessment, and Risk Management; Building design and operations; Ethics and Culture of Biosafety; Clinical and Public Health Lab Biosafety.

Please direct questions to: Robert Ellis, BBTC-Global Course Chairman and Founder, or call at: 970–567-6607. Sean Kaufman is the Program Facilitator for the remote-based course.

For more information, registration, scheduling, and associated costs, visit:
https://www.bbtcfortcollins.com/

ABSA International

Basic Biosafety On-demand:

Basic Biosafety is an on-demand module designed to provide guidance on the basic principles and practices of biological safety for biosafety professionals, biosafety officers, and other professionals involved in workplace safety in laboratories and facilities throughout the world. The module contains 5 sections: Defining the Biosafety Professional; Basic Risk Assessment; Hazard Controls; Introduction to Chemical Decontamination; and Biosafety Resources. This module will include available resources, additional training opportunities and contact relevant to the field of biosafety to aid in knowledge acquisition for those located in laboratories and facilities around the globe.

https://absa.org/basic-biosafety-module

Principles & Practices of Biosafety (PPB):

A comprehensive, interactive 5-day course PPB introduces the essential elements of biosafety and provide extensive resource lists for use after the course. Interactive exercises will be used throughout to provide hands-on experience and to encourage networking and problem-solving among participants and instructors.
This course is designed for persons who are entering the profession and those with up to 3-years' experience in biosafety. It is also suitable for persons who supervise biosafety professionals and for those who will benefit from additional knowledge of biosafety as a complement to their primary responsibilities.

https://absa.org/events/category/absa-sponsored/ppb/

United States

Virtual Reality Disaster Health Preparedness Training

The **National Library of Medicine's (NLM)** Virtual Reality Disaster Health Preparedness Training program leverages simulation, computer gaming and instructional design technologies to develop training tools to support disaster preparedness training needs of the health workforce. The NLM Disaster Information Management Research Center (DIMRC) investigates and develops applications that enable a variety of learning experiences on either mobile devices, personal computers or the latest immersive virtual reality platforms, for individual or collaborative (team or multi-player) learning.

https://disasterinfo.nlm.nih.gov/virtual-reality#Virtual_Highly-Infectious_Disease_Emergency_Management_Training

Screenshot of Virtual Highly-Infectious Disease Emergency Management (HIDEM) Personal Protective Equipment (PPE) Training Tool

Regulations or guidelines alone cannot ensure safe, secure, and responsible practices in the laboratory. A strong culture of biosafety, biosecurity, and responsible conduct includes willingness to report concerns, preparedness to respond to incidents, and effective communication of risks, based on a desire to protect the health and safety of people and the environment while maintaining the public trust in the biomedical research enterprise.

- **Dana Perkins, Senior Science Advisor, Office of the Assistant Secretary for Preparedness and Response, US Department of Health and Human Services**

A Guide to Training and Information Resources on the Culture of Biosafety, Biosecurity, and Responsible Conduct in the Life Sciences

International Working Group

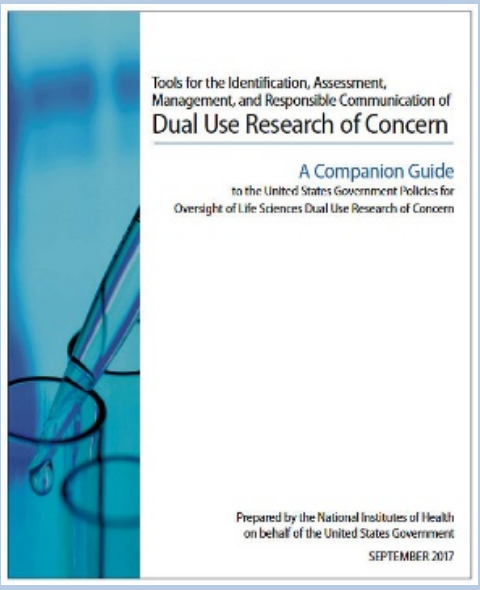
Dual Use Research of Concern

Section D

Culture Matters

United States

Tools for the Identification, Assessment, Management, and Responsible Communication of Dual Use Research of Concern



This Guide has been developed to assist institutions, investigators, and Institutional Review Entities in the development of policies and practices for the effective oversight of Dual Use Research of Concern (DURC) and in the execution of some of the required steps for institutional review and oversight. Different sections are intended for different audiences, depending on who is involved at different stages in the process for institutional review and oversight of DURC.

United States Government Policy for Oversight of Life Sciences Dual Use Research of Concern

United States Government Policy for Institutional Oversight of Life Sciences Dual Use Research of Concern

For additional information:

https://www.phe.gov/s3/dualuse/Pages/companion-guide.aspx

Enhancing Responsible Science Considerations for the Development and Dissemination of Codes of Conduct for Dual Use Research

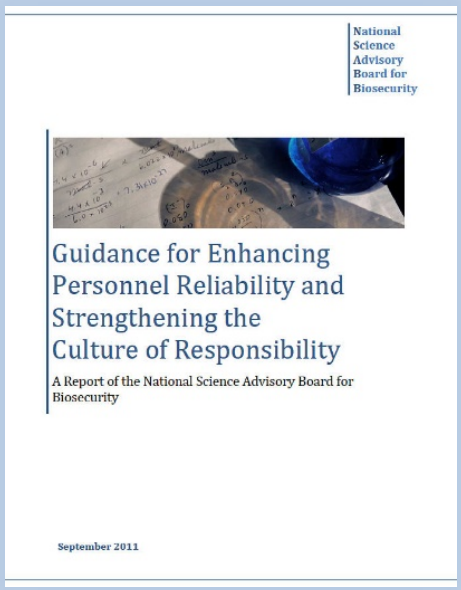
NSABB

...The scientific community, governmental authorities, and the public have raised the concern that life sciences research conducted for legitimate scientific purposes could be misused for harmful purpose. This type of research is known as dual use research (DUR). To help address concerns regarding DUR, certain scientific and professional societies have advocated the use of codes of conduct as a way to guide scientists' work...

https://osp.od.nih.gov/wp-content/uploads/2013/06/COMBINED_Codes_PDFs.pdf

UNITED STATES

NSABB



https://osp.od.nih.gov/wp-content/uploads/2013/06/CRWG_Report_final.pdf

https://osp.od.nih.gov/wp-content/uploads/2013/06/FinalNSABBReport-AmateurBiologist-NonlifeScientists_June-2011_0.pdf

UNITED STATES

Promoting Biosafety and Biosecurity through Effective Governance

A four-hour course which will discuss the importance of ensuring institutions have robust and comprehensive biosafety and biosecurity governance structures in place.

The course will include an overview of the roles and responsibilities of institutions, Institutional Biosafety Committees (IBCs), and Institutional Review Entity's (IREs) for biosafety and biosecurity oversight of research subject to the NIH Guidelines for Research Involving Recombinant or Synthetic Nucleic Acid Molecules and the U.S. Government Policy for the Institutional Oversight of Dual Use Research of Concern (DURC). Information will be provided about some of the tools and best practices institutions can employ to strengthen their biosafety and biosecurity programs.

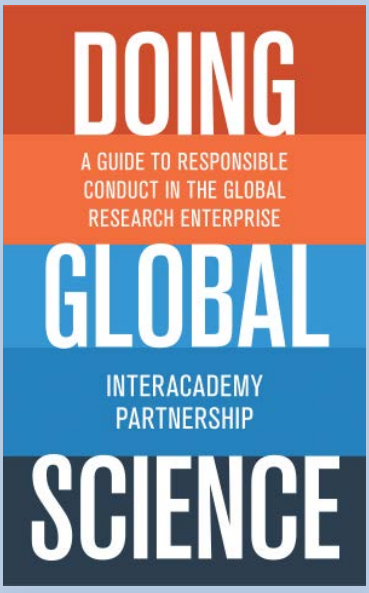
Participants will break into small groups to discuss how an incident occurring at an institution subject to the NIH Guidelines could have been prevented or better mitigated through enhancements to institutional biosafety oversight. Participants should come prepared to engage in discussion, information sharing, and interactive Q & A with course instructors and other participants.

For additional information, contact: Dr. Kathryn Harris, NIH OSP, harriskath@od.nih.gov

...Responsible conduct offers a foundation on which one can build and complements more detailed attention to security issues and legal requirements needed by those certain areas of research. It can also contribute to making scientists part of the solution to biosecurity challenges rather than part of the problem...

— Jo L. Husbands, National Academies of Science, Front. Public Health, 11 August 2014 | https://doi.org/10.3389/fpubh.2014.00107

UNITED STATES

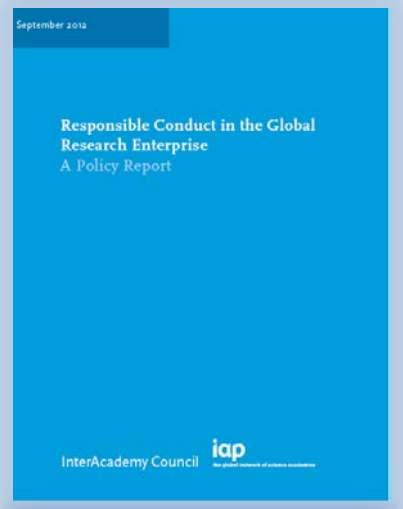


The electronic version of this guide is available for download in English and Arabic at:

http://www.interacademies.org/33345/Doing-Global-Science-A-Guide-to-Responsible-Conduct-in-the-Global-Research-Enterprise

Print copies in English are available for sale from Princeton University, at:

https://press.princeton.edu/titles/10770.html



The electronic version of this guide is available for download in English, German, Japanese, Chinese, and Arabic at:

http://www.interacademies.org/33362/Responsible-Conduct-

The electronic version of this workshop report is available for download at:

https://www.nap.edu/download/25154#

"An important component recognized during the workshop is the role of organizational culture in helping to ensure that safety and security considerations are seen as more than "check the box" compliance activities."

Dual Use Research of Concern in the Life Sciences: Current Issues and Controversies

UNITED STATES

"…. In their commissioned paper commissioned for the committee, Duane Lindner and Winalee Carter of Sandia National Laboratories described the laboratories' methodology for assessing possible risk associated with information generated by their research programs. They recognized the challenge posed by the rapid pace of change in science and biotechnology, "which can affect the risk/benefit calculus in sudden and discontinuous ways," and emphasized that "attention to establishing a culture that is aware of the risks and ready to help manage them is essential"…

National Academies of Sciences, Engineering, and Medicine. 2017. Washington, DC: The National Academies Press. doi: https://doi.org/10.17226/24761
Download at: https://www.nap.edu/download/24761#

EUROPEAN UNION

"Institutions and funding bodies aim to raise researchers' awareness of the issues relating to dual use and misuse of research and help them to handle this appropriately. Researchers indeed have a legal and ethical obligation to prevent or mitigate as much as possible the risks and potential damage which may be caused by malicious use of their research results."

https://www.uhasselt.be/documents/DOC/2017VLIR003_FolderOnderzoek_EN_DEF_20180212.pdf

UNITED STATES

Dual Use Research of Concern (DURC)

This course provides training on the U.S. Government Policy for Institutional Oversight of Life Sciences Dual Use Research of Concern (DURC).

The course describes the agents and types of experiments that require oversight, individual and organizational responsibilities, and risk mitigation strategies. Suggested Audiences: Biosafety Officers, IBC Members, Researchers. Organizational Subscription Price: Included in additional $500 annual subscription fee for Biosafety and Biosecurity. Independent Learner Price: $110 per person

https://about.citiprogram.org/en/course/dual-use-research-of-concern-durc/

Federation of American Scientists - Biosecurity Education Portal

A collection of free, online education resources including the "Case Studies in Dual-use Biological Research" which illustrate the implications of "dual-use" biology research through case studies of different researchers who have done dual-use research and provides a historical background on bioterrorism, bioweapons and the current laws, regulations and treaties that apply to biodefense research. They include interviews with researchers as well as the primary scientific research papers and discussion questions meant to raise awareness about the importance of responsible biological research.

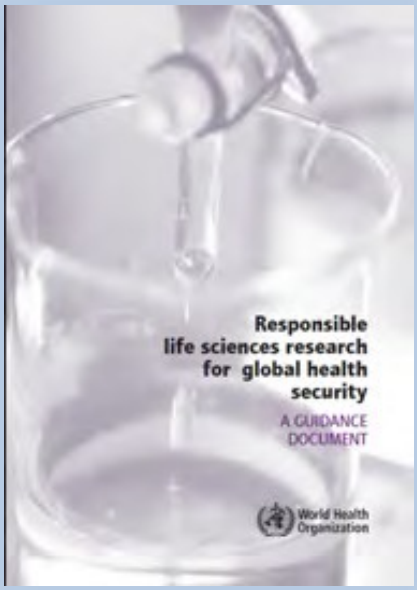
https://fas.org/biosecurity/resource/education.htm

International Initiatives on Responsible Science: A Program of the United States National Academies of Sciences, Engineering, and Medicine

The United States National Academies of Sciences, Engineering, and Medicine (The National Academies) have been working since 2011 with partners across the globe to establish international educational institutes on the responsible conduct of science. These institutes bring together life scientists, chemists, physicists, doctors, nurses, and any other collegiate- level educators who want to understand more deeply what developing a culture of responsible science means. The institutes are typically 5 days long and are an immersive learning experience where participants are taught about the pedagogical technique of active learning, which aims to engage students to take control of their own learning. Active learning has been demonstrated numerous times to result in better retention of material for longer periods of time, as well as providing for a more inclusive and supportive learning environment.

For information on the educational institutes and related workshops, as well as ongoing curriculum development activities in Egypt and Algeria, visit: http://nas-sites.org/responsiblescience/

Responsible Life Science Research for Global Health Security



Pillars of the biorisk management framework for responsible life sciences research:

- ✓ **Research excellence**
- ✓ **Ethics**
- ✓ **Biosafety and laboratory biosecurity**

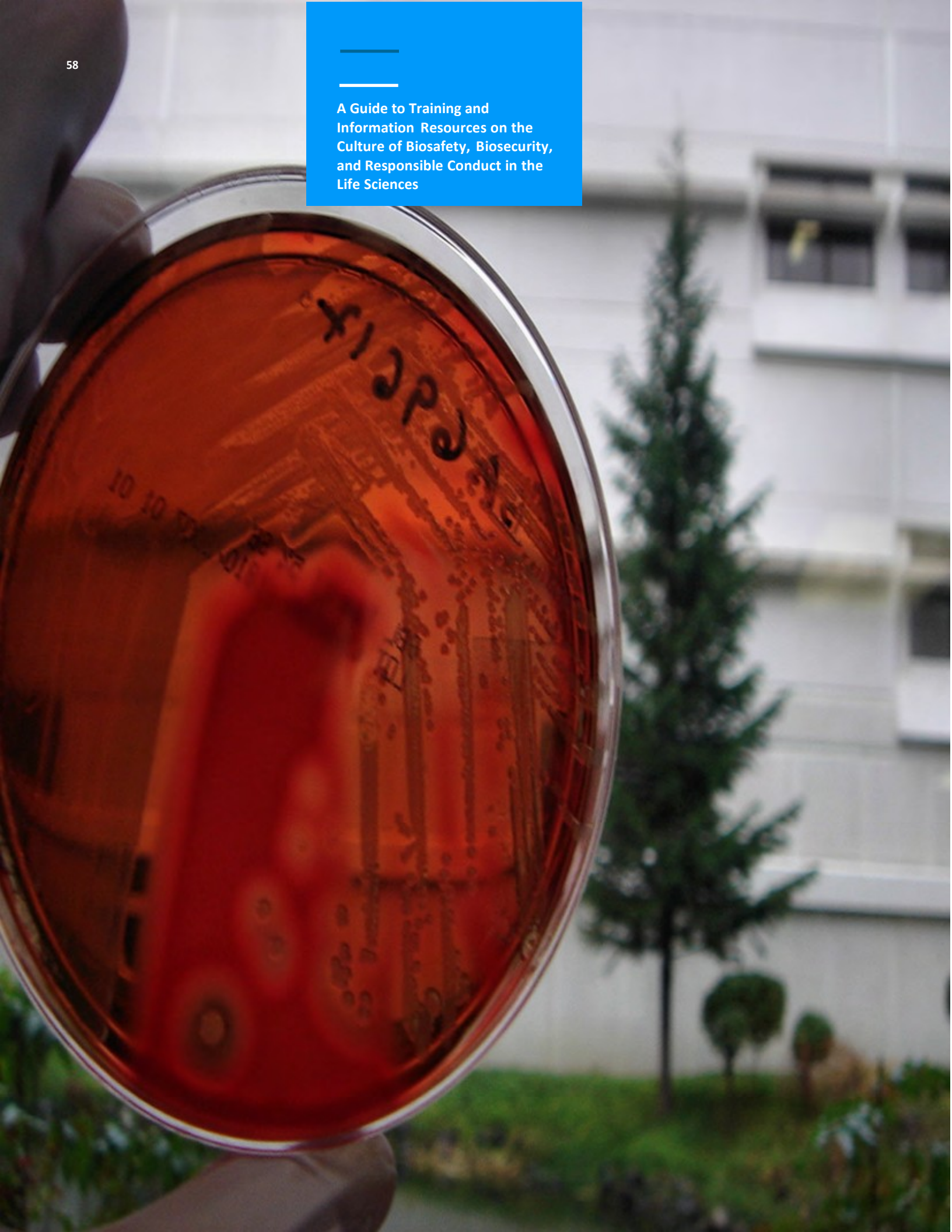
https://apps.who.int/iris/bitstream/handle/10665/70507/WHO_HSE_GAR_BDP_2010.2_eng.pdf;jsessionid=41436A82C3CB12928FE4DF4AC17B14EB?sequence=1

A train the trainer program targeted at improving biosecurity and dual-use awareness and education.

The course aims to:

- Introduce participants to the concept of 'bioethics', in so far as it relates to the broader issue of biosecurity;
- Develop awareness and understanding of a range of dual-use ethical dilemmas that arise due to the impact of science and technology on society;
- Develop knowledge of ethical approaches which provide a defense for ethical decisions or recommendations regarding dual-use technologies;
- Facilitate further bioethical research into 'dual- use' issues and develop policies and practices that will prevent the misuse of knowledge generated through biomedical research.

https://brad.ac.uk/media/SSIS/Documents/Applied-Dual-Use-Biosecurity-Education-e-brochure.pdf



A Guide to Training and Information Resources on the Culture of Biosafety, Biosecurity, and Responsible Conduct in the Life Sciences

Ethics and Codes of Conduct

Section E

Resources

Online Library of the Australasian Human Research Ethics Consultancy Services Pty Ltd (AHREC):
https://ahrecs.com/keyword/dual-use

CDC Public Health Ethics:
https://www.cdc.gov/od/science/integrity/phethics/resources.htm

Presidential Commission for the Study of Bioethical Issues:
https://bioethicsarchive.georgetown.edu/pcsbi/

WHO Global Health Ethics: http:// www.who.int/ethics/en/

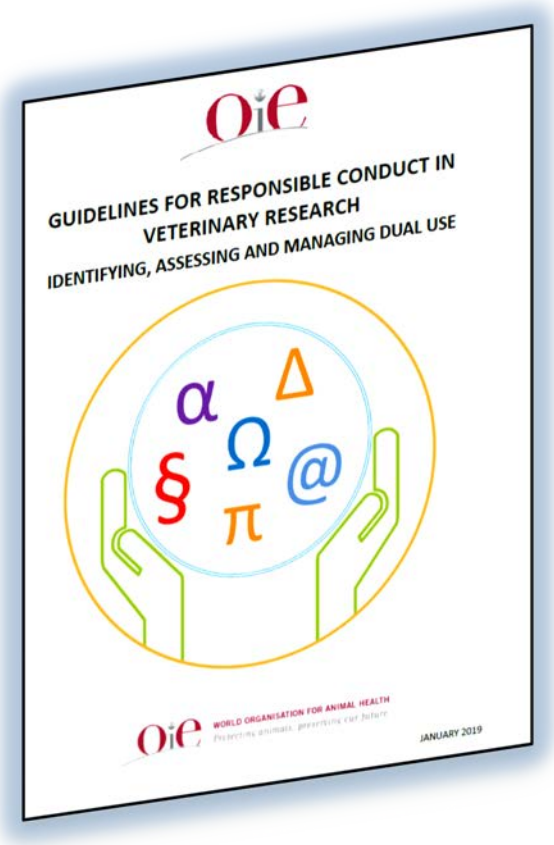
US National Academy of Engineering (NAE), Center for Engineering Ethics and Society (CEES), Online Ethics Center:

- Provide engineers, scientists, faculty, and students with resources for understanding and addressing ethically significant issues that arise in scientific and engineering practice and from the developments of science and engineering; and
- Serve those who promote learning and advance understanding of responsible research and practice in engineering and science.

  http://www.onlineethics.org/about.aspx

OIE Guidelines for Responsible Conduct in Veterinary Research – Identifying, Assessing and Managing Dual Use:

- **An aspirational code for veterinary research**
- **Risk review process**
- **Implications of dual use**
- **Relevant stakeholders**
- **Guidance on implementation**



http://www.oie.int/fileadmin/Home/eng/Our_scientific_expertise/docs/pdf/BTR/A_Guidelines_Responsible_Conduct.pdf

Codes of Ethical Conduct

American Society for Microbiology- Code of Ethics:
http://www.asm.com/Downloads/Code_of_Ethics.pdf

American Society for Clinical Laboratory Science - Code of Ethics:
https://ascls.org/about-us/code-of-ethics

Illinois Institute of Technology - Ethics Codes Collection:
http://ethicscodescollection.org/

International Union of Microbiological Societies - Code of Ethics:
https://www.iums.org/index.php/code-of-ethics

International Union of Biochemistry and Molecular Biology (IUBMB;-Code of Ethics
https://iubmb.org/about-iubmb/mission-code-of-ethics/

Individual Code of Conduct for the University of Chicago
Select Agent Program and the Howard Taylor Ricketts Laboratory:
https://researchsafety.uchicago.edu/sites/researchsafety.uchicago.edu/files/uploads/Select%20Agent%20Code%20of%20Conduct.pdf

Codes of Conduct Resource Links:
https://brianrappert.net/biological-weapons/codes-of-conduct-2001-2010/resource-links

DYI Bio Codes of Conduct:
https://diybio.org/codes/

The roles of codes of conduct in preventing the misuse of scientific research

The Royal Society, RS policy document 03/05

https://royalsociety.org/~/media/Royal_Society_Content/policy/publications/2005/9645.pdf

Humans have always relied on shared value systems that define their cultures. These stated and unstated norms touch all lives and are used every day throughout the world to keep us safe and secure. Some think that the effort to develop a culture of responsibility in the laboratory it is too hard a task with too few benefits. But history shows there is nothing more important that we can do to protect the biological research community and promote responsible science.

- **— Tricia Delarosa, Health Scientist, Office of the Assistant Secretary for Preparedness and Response, US Department of Health and Human Services**

Code of Conduct on Biosecurity for Biological Resource Centres: Procedural Implementation

Christine Rohde, David Smith, Dunja Martin,1 Dagmar Fritze1 and Joost Stalpers, *International Journal of Systematic and Evolutionary Microbiology* (2013), 63, 2374–2382 DOI 10.1099/ijs.0.051961-0
https://www.ncbi.nlm.nih.gov/pubmed/23667143

Critical Guidance: A Code of Conduct for Biodefense Scientists

Roger Roffey, John Hart, and Frida Kuhlau, Arms Control Organization, Posted: September 1, 2006
https://www.armscontrol.org/act/2006_09/BWCConduct#Sidebar1

A Code of Conduct for Biosecurity

Royal Netherlands Academy of Arts and Sciences, 2007
https://www.knaw.nl/en/news/publications/a-code-of-conduct-for-biosecurity

OECD Biosecurity Codes

http://www.virtualbiosecuritycenter.org/codes-of-ethics/

InterAcademy Partnership (IAP): Statement on Biosecurity

http://www.interacademies.org/13912/IAP-Statement-on-Biosecurity

Robert Koch Institute: Dual Use Potential of Life Sciences Research - Code of Conduct for Risk Assessment and Risk

Mitigation https://www.rki.de/EN/Content/Institute/Dual_Use/code_of_conduct.html

On the Dual Uses of Science and Ethics Principles, Practices, and Prospects

Edited by Brian Rappert and Michael J. Selgelid, 2013. Published by ANU Press, The Australian National University, Canberra ACT 0200, Australia

https://press.anu.edu.au/publications/series/practical-ethics-public-policy/dual-uses-science-and-ethics

SYNTHETIC BIOLOGY

Ethics of synthetic biology, European Group on Ethics in Science and New Technologies to the European Commission, 2009
https://www.coe.int/t/dg3/healthbioethic/cometh/ege/20091118%20finalSB%20_2_%20MP.pdf

Synthetic Biology Social and Ethical Challenges, Andrew Balmer & Paul Martin, Institute for Science and Society, University of Nottingham, 2008
http://www.synbiosafe.eu/uploads/pdf/synthetic_biology_social_ethical_challenges.pdf

Synthetic Biology iGEM ethics assessment form for research project
http://2013.igem.org/wiki/images/a/ae/Leeds_EthicsAssesmentform.pdf

iGEM Risk Assessment Tool
http://2018.igem.org/Safety/Risk_Assessment_Tool

iGEM Safety Policies
http://2018.igem.org/Safety/Policies

Principles and Approaches in Ethics Assessment - Dual-use in research

Work was part of the project Stakeholders Acting Together on the Ethical Impact Assessment of Research and Innovation -SATORI - which received funding from the European Commission's Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 612231

http://satoriproject.eu/media/1.g-Dual-use-in-research.pdf

The Biological Weapons Convention (BWC) bans the development, production, stockpiling, acquisition or retention of all naturally or artificially created or altered microbial and other biological agents and toxins, as well as their components, regardless of their origin and method of production and whether they affect humans, animals or plants, of types and in quantities that have no justification for prophylactic, protective or other peaceful purposes.

It is vital to stay informed about relevant advances in science and technology in order to identify potential breaches of the Convention.

Read more about BWC at: http://www.unog.ch/bwc

BWC Resource Repository:
https://www.unog.ch/80256EE600585943/(httpPages)/0A20E57D9F8424B8C12581D8007EC32E?OpenDocument

***Proposal for the development of a model code of conduct for biological scientists under the Biological Weapons Convention,* Submitted by China and Pakistan, 2018**

https://undocs.org/en/BWC/MSP/2018/MX.2/WP.9

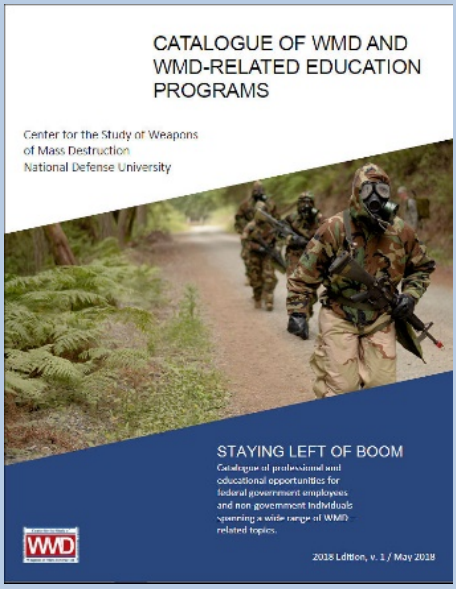
***Códigos de Conducta en el Marco de la Convención de Armas Biológicas,* Presentado por Cuba, 2018**

https://undocs.org/es/BWC/MSP/2018/MX.2/WP.10

United Nations Office for Disarmament Affairs
Disarmament Education – Resources for Learning
https://www.un.org/disarmament/education/

European Union (EU) Nonproliferation and Disarmament E-Learning Course:

https://nonproliferation-elearning.eu/



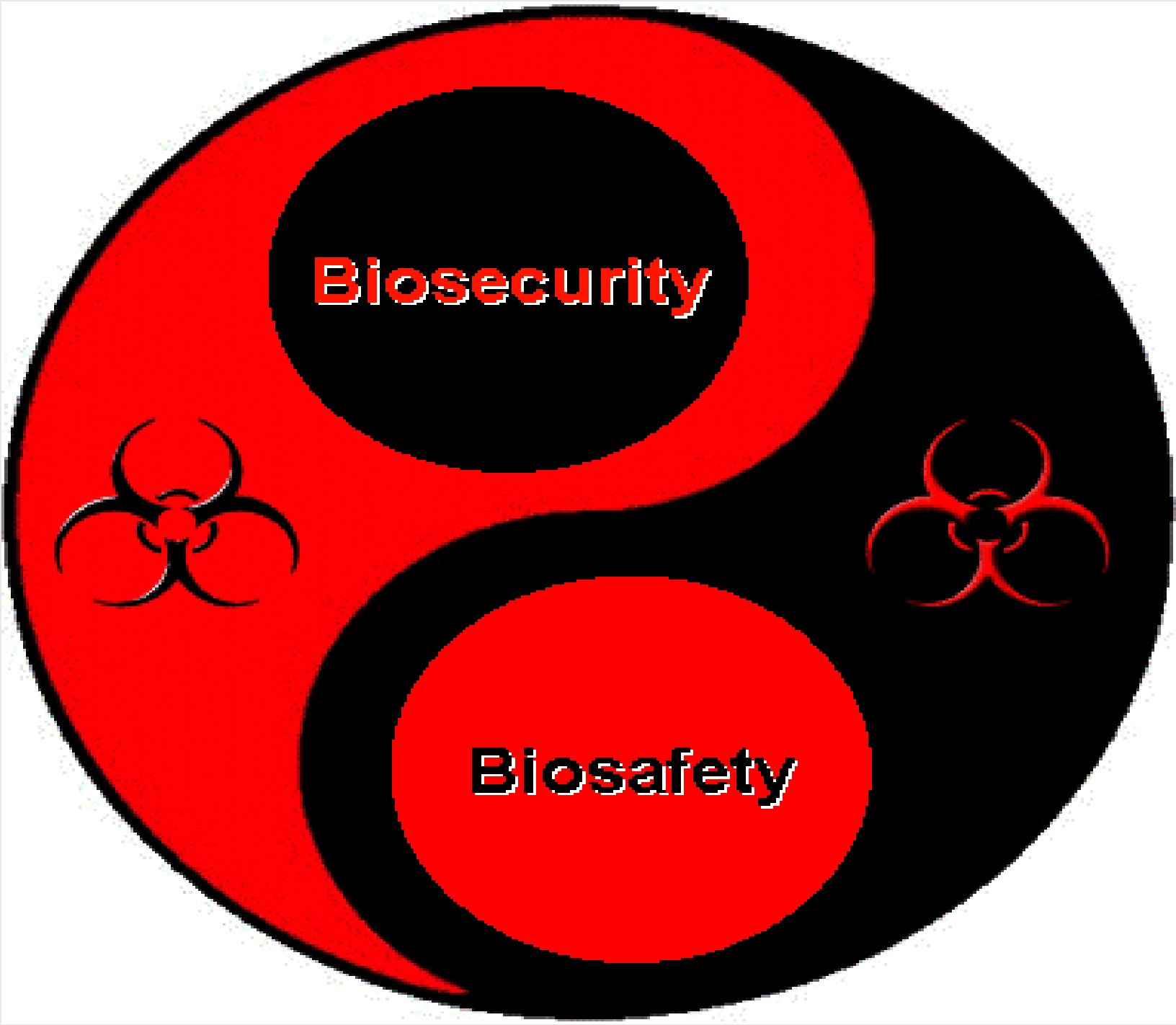
United States, National Defense University, Center for the Study of Weapons of Mass Destruction, Catalogue of professional and educational opportunities for US federal government employees and non-government individuals spanning a wide range of WMD-related topics.

https://wmdcenter.ndu.edu/Portals/97/Documents/Education%20Resources/180604-D-BD104-001.pdf?ver=2018-06-04-103054-493

A Short History of Biological Warfare: From Pre-History to the 21st Century

W. Seth Carus, Occasional Paper 12, National Defense University, Center for the Study of Weapons of Mass Destruction, August 2017

https://wmdcenter.ndu.edu/Portals/68/Documents/occasional/cswmd/CSWMD_OccasionalPaper-12.pdf?ver=2017-08-07-142315-127



Biosafety and biosecurity as essential pillars of international health security and cross-cutting elements of biological nonproliferation

Lela Bakanidze, Paata Imnadze, Dana Perkins

BMC Public Health201010 (Suppl 1) :S12 https://doi.org/10.1186/1471-2458-10-S1-S12

International Working Group

The Rise of the New Bio-Citizen
Ethics, legitimacy, and Responsible Governance in Citizen-Driven Biomedical Research and Innovation

July 8, 2018
Download Workshop report and Bio-Citizen Toolkit from:
https://www.wilsoncenter.org/article/the-rise-the-new-bio-citizen-workshop


MEDIC
MEDIC
CROSSER

Working Group Publications and Additional Resources

Section F

Culture Matters

CULTURE OF BIOSAFETY, BIOSECURITY, AND RESPONSIBLE CONDUCT IN THE LIFE SCIENCES

Fostering an International Culture of Biosafety, Biosecurity, and Responsible Conduct in the Life Sciences

Dana Perkins, Kathleen Danskin, and A. Elise Rowe,

Science & Diplomacy, 2017

http://www.sciencediplomacy.org/article/2017/biosafety

Mitigating Insider Threats through Strengthening Organizations' Culture of Biosafety, Biosecurity, and Responsible Conduct

Dana Perkins and Eilyn Fabregas, White Paper submitted to the National Academies of Sciences, Engineering, and Medicine's Board on Behavioral, Cognitive, and Sensory Sciences, 2017

https://sites.nationalacademies.org/cs/groups/dbassesite/documents/webpage/dbasse_177312.pdf

The Culture of Biosafety, Biosecurity, and Responsible Conduct in the Life Sciences: A Comprehensive Literature Review

Dana Perkins, Kathleen Danskin, and A. Elise Rowe, Alicia A. Livinski, *Applied Biosafety*, 2018

http://journals.sagepub.com/doi/10.1177/1535676018778538

IAEA AND OPCW PUBLICATIONS AND RESOURCES

The work on the culture of biosafety, biosecurity, and responsible conduct is informed by the following seminal publications from IAEA:

Nuclear Security Culture, IAEA Nuclear Security Series No. 7, Implementing Guide, 2008, **https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1347_web.pdf**

Self-assessment of Nuclear Security Culture in Facilities and Activities,
IAEA Technical Guidance, 2017

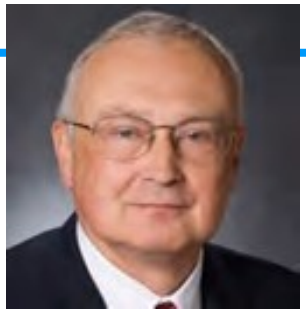
https://www-pub.iaea.org/MTCD/Publications/PDF/PUB1761_web.pdf

Key Practical Issues in Strengthening Safety Culture, A Report by the International Nuclear Safety Advisory Group, 2002

https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1137_scr.pdf

Additional IAEA publications on nuclear safety and security culture:

https://www.iaea.org/publications/search?topics=3079



What is CBRN Security Culture? In all four silos, the foundation of security culture includes human support or enforcement of common risk-based elements such as: Deterrence, Protection, Detection, and Response to theft, sabotage, unauthorized access, illegal transfer, and other malicious acts involving either materials that can be used for unconventional terrorism purposes or their associated facilities). The major assumption that drives this pattern of human behavior is that the risk of CBRN terrorism is real and security is important.

— Igor Khripunov, Distinguished fellow at the Center for International Trade and Security at the University of Georgia (USA)

A Teacher's Mission

A scientist's knowledge is a powerful tool, but what is the value of science to humanity without ethics? In a short film, teacher Chrétien Schouteten explores the subject of ethical chemistry with his students. Discussion questions provide suggestions for ways to use the film to engage different audiences.

- **Organization for the Prohibition of Chemical Weapons (OPCW) Education and Outreach:** **https://www.opcw.org/resources/education-and-outreach** or direct link: **https://youtu.be/GuraSJYEx4Y**

OPCW Education and Outreach, including The Hague Ethical Guidelines -- A set of ethical guidelines to promote a culture of responsible conduct in the chemical sciences and to guard against the misuse of chemistry: **https://www.opcw.org/resources/education-and-outreach.** **Discussion questions and an interactive exercise provide ways to use the Guidelines in various settings.**

Contributing Organizations

Section G

Culture Matters

US GOVERNMENT ORGANIZATIONS

Representatives of the following organizations participate in the Federal Experts Security Advisory Panel (FESAP) Working Group, International Working Group, and associated Community of Practice on strengthening the culture of biosafety, biosecurity, and responsible conduct in the life sciences:

US Department of Health and Human Services

- Centers for Disease Control and Prevention (CDC)
- Food and Drug Administration (FDA)
- National Institutes of Health (NIH)
- Office of the Assistant Secretary for Preparedness and Response (ASPR)

US Department of Agriculture

- Animal and Plant Health Inspection Service (APHIS)

US Department of Homeland Security

US Department of Energy

US Department of Interior

- US Geological Survey (USGS)

US Department of Justice

- Federal Bureau of Investigation (FBI)

US Environmental Protection Agency (EPA)

US Department of Defense

- Office of the Secretary of Defense (OSD)
- US Army Medical Research Institute of Infectious Diseases (USAMRIID)

NATIONAL LABORATORIES

National Biodefense Analysis and Countermeasures Center

Pacific Northwest National Laboratories (PNNL)

Sandia National Laboratories

NON-GOVERNMENTAL AND PROFESSIONAL ORGANIZATIONS, INDUSTRY AND ACADEMIC INSTITUTIONS

National Academies of Sciences, Engineering, and Medicine (US)

ABSA International
American Association for Laboratory Animal Science (AALAS)
American Society of Microbiology (ASM)
Association of Public Health Laboratories (APHL)
European Biosafety Association (EBSA)
International Federation of Biosafety Associations (IFBA)

The University of Texas Medical Branch at Galveston University (UTMB)
Colorado State University
North Carolina State University
Emory University
University of Massachusetts Dartmouth
University of Chicago
Bradford University (UK)
MedImmune
AECOM
BioSecure (UK)
Health Security Partners
iGEM Foundation
GenSpace
BUGSS
CHROME Biosafety and Biosecurity Consulting Safer Behaviors, LLC
Gryphon Scientific
Center for the Study of Democracy (Bulgaria)
B & S Europe
Emlyon Business School (France)

A culture of biosecurity includes compliance with laws, regulations, and policies which were put in place to protect against the misuse of science. This is a shared responsibility.

- Selwyn Jamison, Bioterrorism Program Manager, FBI

INTERNATIONAL ORGANIZATIONS AND ADDITIONAL GOVERNMENTAL ENTITIES

INTERPOL

World Health Organization (WHO)

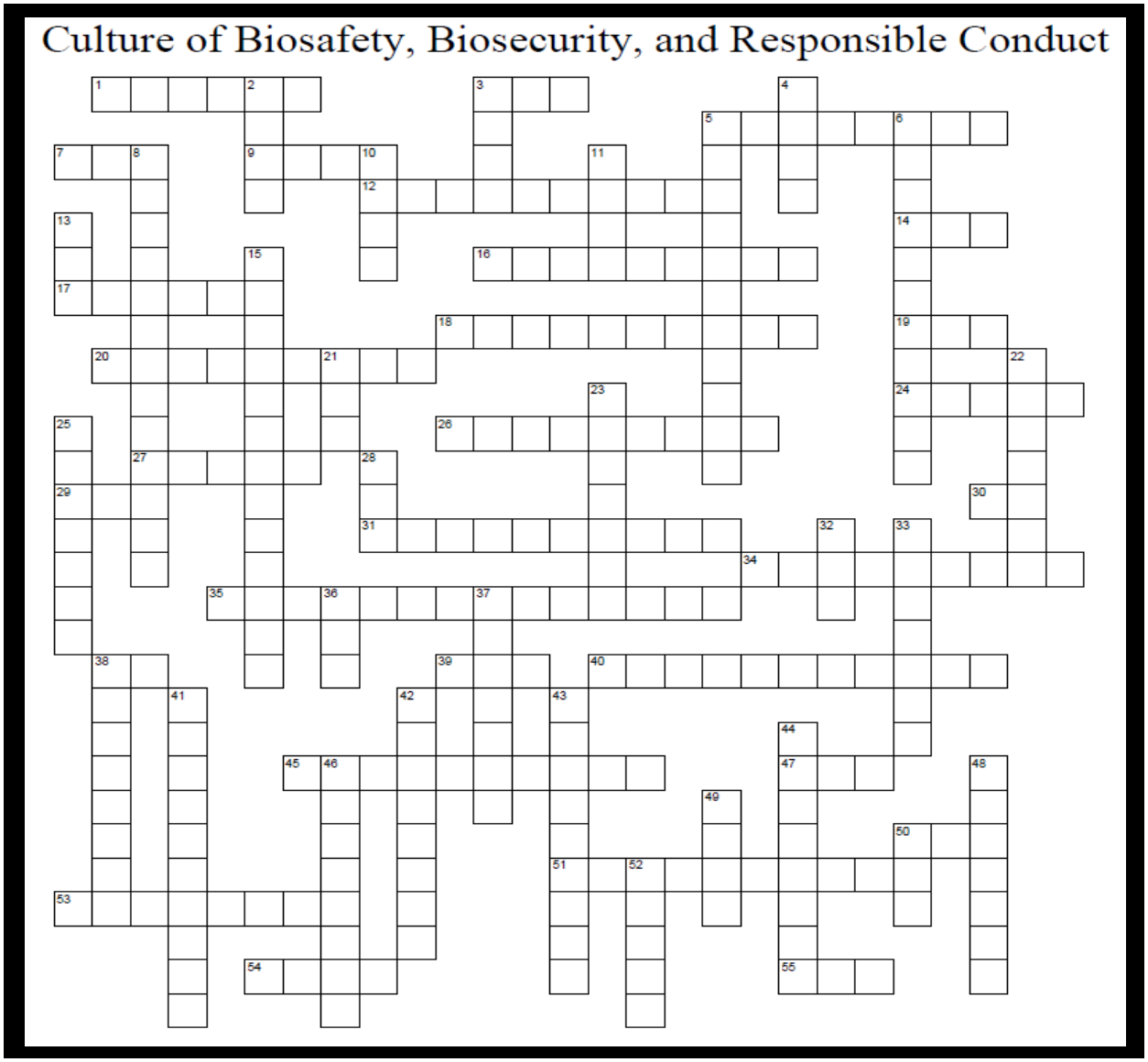
World Organization for Animal Health (OIE)

Biological Weapons Convention Implementation Support Unit (BWC ISU)

Royal Scientific Society of Jordan

National Institute for Public Health and the Environment- The Netherlands

Centre for Biosecurity and Biopreparedness - Denmark



Grid of the crossword puzzle posted at:

https://ebsaweb.eu/sites/default/files/4-bio_culture-crossword_puzzle.pdf

The online version includes the answer key.

References

1. Perkins D, Danskin K, Rowe AE, Livinski AA. 2018. The Culture of Biosafety, Biosecurity, and Responsible Conduct in the Life Sciences: A Comprehensive Literature Review, in Applied Biosafety Journal, online at: **http://journals.sagepub.com/doi/abs/10.1177/1535676018778538**

2. International Atomic Energy Agency. Nuclear Security Culture: Implementing Guide. Vienna, Austria: International Atomic Energy Agency; 2008. **https://www-pub.iaea.org/MTCD/publications/PDF/Pub1347_web.pdf**

3. International Atomic Energy Agency. Nuclear Safety and Security Programme: Safety Culture. Vienna, Austria: International Atomic Energy Agency; 2015. **https://www-ns.iaea.org/downloads/ni/safety-culture/safety-culture-leaflet.pdf**

4. Guiding Principles for Biosafety Governance: Ensuring Institutional Compliance with Biosafety, Biocontainment, and Laboratory Biosecurity Regulations and Guidelines: **https://www.phe.gov/s3/Documents/FESAP-guiding-principles.pdf**

5. Al-Hmoud N. Promoting security culture in level 3 and 4 biolaboratories. In Thompson J, Gahlaut S, eds. CBRN Security Culture in Practice. Amsterdam, Netherlands: IOS Press; 2015:18-21.

6. Miller JM, Astles R, Baszler T, et al. Guidelines for safe work practices in human and animal medical diagnostic laboratories. MMWR. 2012;61(1):1-101

7. Burnette RN, Connell ND. Biosecurity challenges for the IBC: an exploration of the roles and responsibilities of institutional biosafety committees in the age of terrorism and biosecurity, now and for the future. In: Baskin CR, Zelicoff AP, eds. Ensuring National Biosecurity: Institutional Biosafety Committees. San Diego: Elsevier; 2016:185-200

8. Husbands JL. Responsible science and active learning as tools for biosecurity education. 2014. **https://www.unog.ch/80256EDD006B8954/(httpAssets)/5E2CDD75EAD78735C1257D3100285B69/$file/BWC+MX+2014+-+Side+events+-+biosecurity+education+slides+part+3.pdf**

References (continued)

9. IAEA, The Interface Between Safety and Security at Nuclear Power Plants, INSAG-24, 2010 **https://www-pub.iaea.org/MTCD/Publications/PDF/Pub1472_web.pdf**

10. Report of the Federal Experts Security Advisory Panel. December 2014 **https://www.phe.gov/s3/Documents/fesap.pdf**

11. National Biodefense Strategy. 2018. **http://www.phe.gov/biodefense**

12. National Health Security Strategy, 2019-2022. **https://www.phe.gov/Preparedness/planning/authority/nhss/Pages/default.aspx**

For more information about the culture of biosafety, biosecurity, and responsible conduct in the life sciences, please contact the Federal Experts Security Advisory Panel (FESAP) Working Group Co-Chairs:

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