Laboratory Safety Programs

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Laboratory Safety Programs

Introduction

The goal of any laboratory safety program is to minimize the risk of injury or illness to employees by ensuring that they have the training, information, support, and equipment needed to work safely in the laboratory. The guidelines and standards set forth by the existing regulatory agencies assist laboratories in ensuring that this goal is met.

There are a number of regulatory agencies and some private organizations that establish safety guidelines, all of which have differing sets of procedures and/or standards. Some agencies may incorporate a less stringent program, while others establish more rigorous standards. In addition, state agencies may create programs that can be more stringent than the federal counterpart. It is the laboratory safety officer's responsibility to coordinate with the appropriate state and local authorities to ensure that the laboratory's safety program is in compliance with the relevant regulations. Visit the Occupational Safety and Health Administration (OSHA) website for a list of states that have their own programs.

Upon successful completion of this unit of instruction, the student shall:

- Be aware of the principal regulatory agencies and their roles and requirements
- Understand the laboratory requirements for an effective safety program
- Be aware of the essential components of a comprehensive laboratory safety program
- Understand the significance and nature of an effective chemical hygiene plan

Safety Requirements

The laboratory safety program will be influenced by requirements of regulatory agencies and accrediting bodies. The main agencies and their requirements are described in the following pages.

Occupational Safety & Health Administration (OSHA)

OSHA

The Occupational Safety and Health Administration (OSHA) was established by the Occupational Safety and Health Act of 1970. Under the auspices of the United States Department of Labor, OSHA is responsible for the development and enforcement of workplace safety and health regulations. OSHA regulations are concerned with all workplaces and employees in the United States, from agriculture to robotics, from laboratories to construction.

The Occupational Safety and Health Administration:

- Creates and enforces regulations
- Provides compliance assistance
- Produces safety and health related publications
- Collects data and publishes statistics
- Approves and monitors state plans

Even with the existence of a federal safety and health administration, many states have their own safety programs. Each state plan must set job safety and health standards that are at least as effective as the complementary federal standards. The states must also conduct inspections to enforce their own standards and operate safety and health training and educational programs. At present, twenty-one states and Puerto Rico have OSHA approved state plans. New Jersey, New York, Connecticut, and the U.S. Virgin Islands have plans that cover only state and local government employees. Visit the OSHA website for a complete list of states that have OSHA approved plans. It is the responsibility of the laboratory's safety officer to ensure compliance with either federal or state OSHA regulations.01

National Institute of Safety and Health (NIOSH)

Like OSHA, the National Institute of Occupational Safety and Health (NIOSH) was established by the Occupational Safety and Health Act of 1970. Although created by the same Act and sharing a common goal, they are two distinct agencies with separate responsibilities. OSHA is an agency of the United States Department of Labor, and NIOSH affiliated with the Center for Disease Control and the United States Department of Health and Human Services. NIOSH was established to assist in assuring safe and healthful working conditions by providing research, information, education, and training in occupational safety and health. NIOSH does not set standards or regulations; it gathers information and conducts research, which is translated into products and services.

NIOSH also provides:02

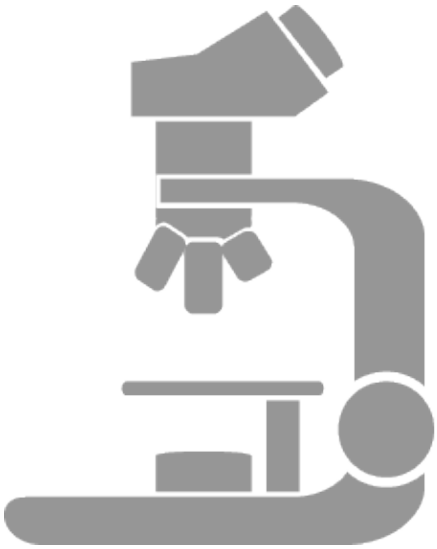
- Training
- Databases
    - *Pocket Guide to Chemical Hazards*
    - Chemical safety cards
- Health hazard evaluation programs
- Information on workplace injury, disability, and disease prevention

Visit the NIOSH website.

Laboratory Accreditation

Most crime laboratories in the U.S. are accredited under the long-established program provided by the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB®). Some are accredited under programs that meet the requirements of ISO/IEC 17025:2005, offered either by Forensic Quality Services (FQS) or by ASCLD/LAB® International. The ASCLD/LAB® legacy program includes specific criteria covering safety, whereas ISO/IEC 17025:2005 does not. However, both FQS and ASCLD/LAB® International programs, as well as the ASCLD/LAB® legacy program, incorporate the QAS (Quality Assurance Standards). The safety requirements of the QAS are therefore an essential part of any forensic laboratory accreditation.

Scientific Working Group on DNA Analysis Methods (SWGDAM)



The Scientific Working Group on DNA Analysis methods (SWGDAM) is a group of forensic scientists that meets under the guidance of the Federal Bureau of Investigation (FBI). It is the body that proposes and recommends revisions to the National Quality Assurance Standards (QAS) and has a more general liaison role with the forensic DNA community.

In 2002, SWGDAM issued a guidance document based on OSHA standard *29 CFR 1910.1450 Occupational Exposure to Hazardous Chemicals in the Laboratory [Chemical Hygiene]. The document* was developed to assist laboratories in the establishment of a comprehensive health and safety program by giving specific direction rather than simply stating that a safety program is needed. It is imperative to note additional federal, state, and local regulations not mentioned in the guidance document or the federal OSHA standard must be

adhered to in order to ensure compliance.06

National Fire Protection Association (NFPA)

Established in 1896, the National Fire Protection Association (NFPA) is the authority on fire, electrical, and building safety. The NFPA has created and published more than 300 standards relating to fire and building safety. The NFPA standard affecting forensic laboratories is *NFPA 45 Standard on Fire Protection for Laboratories Using Chemicals 2000 Edition.* This standard applies to laboratories in which chemicals are handled and/or stored.07

NFPA also provides professional development including certification programs, online learning, and training seminars, as well as issuing a number of publications.

Visit the NFPA website.

American National Standards Institute (ANSI)

The American National Standards Institute (ANSI) is a private, non-profit organization that administers and coordinates the U.S. voluntary standardization and conformity assessment system. ANSI facilitates the development of the American National Standards by accrediting the procedures of standard-developing organizations.

ANSI is the official U.S. representative to the International Organization for Standardization (ISO) and, via the U.S. National Committee, the International Electrotechnical Commission (IEC). ANSI is also a member of the International Accreditation Forum (IAF).08

Visit the ANSI website.

Quality Assurance Standards for Forensic DNA Testing Laboratories (QAS)

Safety is included as a criterion within the Quality Assurance Standards for Forensic DNA Testing Laboratories (QAS). Standard 16.1 reads, "…does the laboratory have and follow a documented environmental health and safety program?" The standard is very general in nature and therefore may have varying discussions and interpretations associated with it. As mentioned above, SWGDAM published a guidance document in 2002. Ultimately it is the responsibility of the DNA Technical Leader, Quality Assurance Manager, and Safety Officer (or similarly titled personnel) to ensure compliance with this standard.09

Read the QAS document by the FBI.

International Labour Organization (ILO)

The International Labour Organization (ILO), created in 1919, is a United Nations agency that seeks the "promotion of social justice and internationally recognized human and labour rights." The ILO formulates international labor standards and provides technical assistance in such areas as vocational training, employment policy, working conditions, labor relations, and management development.10

Visit the ILO website.

Components of a Safety Program

A comprehensive health and safety program should be taken as seriously as the quality of the laboratory's work product. The onus is on the safety officer to ensure that the program meets the needs of the laboratory, fits into the overall scheme of the laboratory, and meets all necessary Federal, State and local requirements. The components of the safety program covered in this section are intended as an outline for the minimum standards necessary when developing a program. Further development may be necessary.

Chemical Hygiene Plan

The Chemical Hygiene Plan will address general and specific hazards that exist within the laboratory and the controls to manage and/or avoid them. OSHA has promulgated non-mandatory standards that will assist with the creation of an appropriate Chemical Hygiene Plan. Be aware that some states have an OSHA-approved state plan that may differ from the federal OSHA regulations. The OSHA references for creating or updating a Chemical Hygiene Plan are:

- *29 CFR 1910.1450 National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (non-mandatory)* and its Appendix A and Appendix B.

The laboratory's Chemical Hygiene Plan should encompass a number of topics including, but not limited to:11-13

- Standard operating procedures for laboratory chemicals
    - ♦Procedures for chemical procurement, receipt, and handling

- ♦ Identification of personnel responsible for laboratory chemicals
- ♦ Chemical inventory
- ♦ Chemical storage
- ♦ Chemical handling
- ♦ Definitions of chemical hazards
  - ◊ Toxins, corrosives, allergens, asphyxiants, carcinogens, reproductive/embryo toxins
- Compressed gases
- Radiation protection program
  - ♦ Monitoring, exposure, training
- Personal protective equipment
- Methods/routes of contamination
  - ♦ Inhalation, absorption, ingestion, injection
- General laboratory work practices
  - ♦ Grooming, appropriate attire, working alone, handling of chemicals
- Criteria for the implementation of control measures
- Engineering controls employed in the laboratory
- Employee information and training
- Medical information
  - ♦ Specific information covering the "Who, what, when, why, and how"
- Chemical Hygiene Plan responsibilities
  - ♦ Safety officer
  - ♦ Safety committee
  - ♦ Lab director
  - ♦ Supervisors
  - ♦ Employees
  - ♦ Employer
- Record keeping
- Annual audit
- References and recommended reading

The plan should address safety needs in specific testing areas, as required. For example, if the laboratory has a firearms section, it will have protocols for lead testing and general (physical) safety.

Hazard Communication

A written Hazard Communication Program (HazCom) is a necessity for any laboratory that deals with chemicals. The purpose of the Hazard Communication Program is to document the receipt, storage, use, and

disposal of chemicals within the laboratory. Often, the HazCom Program is part of the laboratory's Chemical Hygiene Plan, but may exist as a stand-alone program. See OSHA standard *29 CFR 1910.1200 Hazard Communication*.

Read more about the HazCom standard on the OSHA website.

The Hazard Communication Program should include the following components:14

- Procurement of hazardous chemicals
    - ♦ Purchasing may have to be reviewed and approved by the Safety Officer and/or the laboratory's governing agency's safety group.
    - ♦ Material Safety Data Sheets (MSDS) should be reviewed before procuring chemicals new to the laboratory

View the Material Safety Data Sheet.

- Material Safety Data Sheets
    - ♦ The written Hazard Communication Program should include instructions on how to review and evaluate the MSDS for chemicals used in the laboratory in order to appropriately evaluate the chemicals' hazard.
- Personal Protective Equipment
    - ♦ The Hazard Communication Program may be the area where the Safety Officer chooses to address personal protective equipment (PPE) and the evaluations of tasks that require PPE.
- Chemical Inventory
    - ♦ The laboratory should have a complete and accurate chemical inventory. Local fire departments and municipal environmental programs offices will deem it necessary to create and maintain an accurate chemical inventory. A yearly audit of the chemicals and storage conditions should also be a part of the inventory.
- Chemical Labeling and Storage
    - ♦ The program should also include labeling requirements that ensure that all chemical-containing products are labeled in compliance with OSHA Hazard Communication standards. The standard requires:
        - ◊ Name of the product matching the MSDS
        - ◊ Manufacturer's name, address, and phone number
        - ◊ Appropriate hazard warnings including target organ effects
        - ◊ If the chemical is transferred to a smaller container, each container must be appropriately labeled
- Training
    - ♦ The intent of the OSHA HazCom standard is to ensure that employees are aware of safety issues regarding chemicals that are being used in the workplace BEFORE work commences. It is therefore the responsibility of the employer to provide HazCom training to new laboratory employees before they are assigned to work with hazardous chemicals.
    - ♦ Training should include:

◊ Methods and observations that may be used to detect the presence of a hazardous chemical.
◊ The hazards involved with the chemicals present in the workplace.
◊ The measures employees can take to protect themselves against the chemical hazards present in the workplace.
◊ Explanations on how employees can obtain and use chemical hazard information (labeling system, MSDS).

Hazardous Material Management/Biological Waste Disposal

Hazardous and biohazard waste disposal is not new to laboratories or to their state or municipal agencies. It is probable that the laboratory will have an existing waste disposal program and/or contracted vendor through their governing city, county, or state agency. Private laboratories may employ a vendor to handle waste disposal.

Strict federal standards exist for dealing with hazardous material and/or biological waste storage and disposal. Non-compliance with these standards may result in severe penalties for the laboratory and/or agency. See *40 CFR 262* put forth by the Environmental Protection Agency (EPA) as *Standards Applicable to Generators of Hazardous Waste*.15

A number of federal acts address waste management, management of non-hazardous waste, right-to-know issues, and span-of-control of waste (cradle-to-grave).

Visit the Environmental Protection Agency's website for information regarding:

- Resource Conservation and Recovery Act (RCRA)
- Comprehensive Environmental Response Compensation and Liability Act (CERCLA)
- Superfund Amendments and Reauthorization Act (SARA)

Note:

Before storing or disposing of any type of waste, contact the appropriate personnel with the laboratory and/or agency to ensure compliance with their program.

Hazardous materials storage and disposal both require documentation. A chemical storage inventory provides tracking of both the receipt and the use of chemicals, as well as a double check for disposal of chemical waste.

The chemical storage inventory is a part of the laboratory's Hazard Communication Program/Chemical Hygiene Plan. Waste documentation logs or a similar form of documentation are necessary to track waste storage in the laboratory. When waste is disposed of, it is documented on either a manifest or bill of lading. All waste disposal and storage paperwork is kept by the laboratory and its parent agency. It is the responsibility of the Safety Officer and laboratory employees to ensure that proper documentation of chemical use and waste generation is recorded and archived.16

Bloodborne Pathogens

All personnel with the potential for exposure to blood or other bodily fluids should be trained in the area of bloodborne pathogens and the laboratory biological materials exposure control plan.

See an example of a Biology Safety Manual

In general, the laboratory's bloodborne pathogen section of the safety manual will follow the OSHA standard *29 CFR 1910.1030 Bloodborne Pathogens*.

The standard discusses:17

- The scope of the bloodborne pathogen standard
- Who is affected by the standard
- Definitions
- 

The creation of an exposure control plan

- ♦Universal Precautions
- ♦Engineering/work control practices
- ♦Hepatitis B vaccination
- ♦Employee exposure
- ♦Communication of hazards to employees
- ♦Training
- ♦Labeling

Read the Bloodborne Pathogens standard on the OSHA website.

Personal Protective Equipment (PPE)

OSHA standard *29 CFR 1910.132* provides a general discussion of the requirements for personal protective equipment and its use.18

The standard discusses:

- Hazard assessment and equipment selection (selecting the appropriate personal protective equipment, or PPE, for the task) - *29 CFR 1910.132(d)*
- Training - *29 CFR 1910.132(f)*

  - The employer is required to train the employees
  - The employer must verify that the employee understands the training principles, documented by a dated certificate.
  - The training shall encompass:
    - When PPE is necessary
    - What PPE is necessary
    - Limitations of PPE
    - Proper care, maintenance, and disposal of PPE

OSHA standard *29 CFR 1910.120 Appendix B (non-mandatory)* is a general description and discussion of the levels of protections and protective gear.19

This standard defines the levels and when they should be used:

Read the PPE standards on the OSHA website.

Laser Safety

Even though lasers may not be a common analytical instrument in the laboratory , the indirect use of lasers in laboratory instrumentation (in the form of embedded lasers-such as the AB 310 Genetic Analyzer) deems it necessary to include laser safety as part of a safety program. The use of an alternate light source (ALS) within the laboratory also makes a laser/ALS safety program a necessity.

In general, this portion of the safety program will focus on:

- **Who is affected**
- **Personnel responsibilities**
  - **Laser Safety Officer**
  - **Responsibilities of the employer, supervisors, and employees**
- **Laser hazard classification**
  - **Class I, Class II, Class IIA, Class IIIA, Class IIIB, Class IV, Embedded**
- **Laser control measures**
- **Training**
  - **Employees assigned to service, maintain, adjust, and/or operate laser/ALS equipment**
  - **Training can be general (reading the associated equipment manuals) or specific (dealing with a particular instrument)**
  - **Work in conjunction with the appropriate personnel to design the proper training for the equipment in use**

Due to the specialized nature of lasers, the laboratory safety officer may not be able to fulfill the requirements of a laboratory laser safety officer. Therefore, it may be necessary to subcontract or work in conjunction with the municipal safety department and/or industrial hygienist. OSHA Directive *PUB 8-1.7 Guidelines for Laser Safety and Hazard Assessment* provides guidelines for the assessment of laser safety.22

Laboratory Safety Programs

Read the Laser Safety Guidelines on the OSHA website.

Respiratory Protection Plan

Major state and local agencies will have a Respiratory Protection Plan (or similarly named program) as a part of their safety program. The plan will follow the regulations set forth in OSHA standard *29 CFR 1910.134 Respiratory Protection*.23,24

The Respiratory Protection Plan should include sections on:

- **Purpose of the program**
- **Scope of the program**
- **Program administration**
- **Definitions**
- **Hazard Assessment**
  - **Review of MSDSs**
  - **Identification of potential hazards**
  - **Evaluation of respiratory hazards**
  - **Reasonable estimate of employee exposure to hazards**
- **Hazard control**
- **Selection of respirators**
  - **Selection will depend upon the hazard and duration of hazard exposure**
    - **Immediately Dangerous to Life and Health (IDLH)**
    - **Not IDLH**
- **Medical surveillance**
  - **Medical history**
  - **Physical exam**
  - **Respiratory exam**
  - **Documentation**
- **Fit testing**
- **Use and care of respirator**
- **Training**
- **Record keeping**

Laboratory Safety Programs

- **Laboratory requirements**
- **Municipal requirements**
- **Medical record requirements**
- **Medical questionnaire (used prior to medical exam and fit testing)**
- **Program evaluation**
  - **Evaluation of how the program is implemented and followed**

Read the Respiratory Protection standard on the OSHA website.

Emergency Action Plan

It may be necessary to include plans for both man-made disasters (e.g., chemical spills, fires, terrorist acts) and natural/weather emergencies. It is imperative to work in conjunction with local law enforcement, emergency services, and/or homeland security bureau to coordinate and implement emergency plans properly.

The emergency action plan should include not only situation and evacuation procedures, but also training on how to act on the procedures. The amount and extent of training depends upon the nature of the emergency. The laboratory should conduct periodic emergency drills in order to practice evacuation procedures, such as an annual fire drill. These may be coordinated with the emergency services and law enforcement in the area. As always, the training should be documented and retained. More extensive training will be required to prepare for situations such as a terrorist attack or major hurricane.

The evacuation procedure should, at a minimum, include:25

- **Description of the emergency signal/notification and action to be taken**
- **Responses to the emergency notification**
  - **Secure evidence?**
  - **Turn off sources of ignition?**
  - **Leave immediately?**
- **Designated evacuation meeting locations**

Laboratory Safety Programs

- Primary and secondary
- **Procedures to follow at the evacuation meeting location**
  - Employee roll call
  - All clear signal
- **Responsible personnel and their duties**

Documentation

A basic rule of effective quality systems is "If it's not written down, it didn't happen." Thus, documentation is essential to the laboratory safety program. Documentation must include the program and records of:

- **Program audits**
- **Incidents**
- **Training**
- **updates**
- **Medical issues**

The actual length of time that a document must be kept may vary depending upon the nature of the documentation. Medical records are usually kept for thirty years, while training records may only be kept for five years. The responsible party or parties in the laboratory must verify that the document retention policy complies with all requirements.

Training

Laboratory safety program training should cover continuing education as well as initial requirements.

Initial safety training of new employees should include:

- **Chemical hygiene plan**
- **Hazard communication**
- **Bloodborne pathogens**
- **Laser/ALS safety**
- **Radiation safety (if necessary)**
- **Emergency action plan**
- **Fire extinguisher training**
- **Unit-specific training (e.g., firearms, special handling procedures based on the laboratory's physical plant)**

Continuing education should encompass:

- **New procedures that evolve during the employee's tenure with the laboratory**
- **Refresher training as needed**

- New unit-specific procedures as they are developed

Yearly retraining in all of the above topics may not be necessary. All training, either initial or continuing, shall be documented and the records maintained according to the appropriate procedures.

Works Cited & Online Links

1. Electronic information at http://www.osha.gov/
2. Electronic information at http://www.cdc.gov/niosh
3. American Society of Crime Laboratory Directors/Laboratory Accreditation Board. (1999) The Accreditation Decision. What is ASCLD/LAB Accreditation? Forensic Science Communications. 1(1). United States Department of Justice, Federal Bureau of Investigation.
4. American Society of Crime Laboratory Directors/Laboratory Accreditation Board. (2003). Accreditation Manual.
5. Electronic information at http://www.iso.org
6. Scientific Working Group on DNA Analysis Methods. (2003). Guidance Document for Implementing Health and Safety Programs in DNA Laboratories. Forensic Science Communications. 5(2). United States Department of Justice, Federal Bureau of Investigation.
7. Electronic information at http://www.nfpa.org
8. Electronic information at http://www.ansi.org
9. DNA Advisory Board. (1998). Quality Assurance Standards for DNA Testing Laboratories. Forensic Science Communications. 2(3). United States Department of Justice, Federal Bureau of Investigation.
10. Electronic information at http://www.ilo.org
11. 29 CFR 1910.1450 National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory)
12. 29 CFR 1910.1450 National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory) Appendix A
13. 29 CFR 1910.1450 National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory) Appendix B
14. 29 CFR 1910.1200 Hazard Communication
15. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
16. City of Phoenix Personnel Department, Safety Section. Hazardous Waste Management.
17. 29 CFR 1910.1030 Bloodborne Pathogens
18. 29 CFR 1910.132 General Requirements
19. 29 CFR 1910 Subpart I Appendix B Non-Mandatory Compliance Guidelines for Hazard Assessment and Personal Protective Equipment Selection
20. 29 CFR 1910.133 Eye and Face Protection
21. 29 CFR 1910.120 Appendix B [Non-Mandatory]
22. Pub 8-1.7 Guidelines for Laser Safety and Hazard Assessment http://www.laserinstitute.org/publications/safety_bulletin/ laser_safety_info/
23. 29 CFR 1910.134 Respiratory Protection
24. City of Phoenix Personnel Department, Safety Section. (2002). Respiratory Protection Plan.
25. Kobojek, Kimberly. (2001) Phoenix Police Department Laboratory Services Bureau Safety Manual

Online Links

- American National Standards Institute (ANSI)
  http://www.ansi.org/

Laboratory Safety Programs

- **American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB®)**
  http://www.ascld.org
- **Bloodborne Pathogens standard**
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=STANDARDS&p_id=10051
- **Environmental Protection Agency**
  http://www.epa.gov/
- **Forensic Quality Services (FQS)**
  http://www.forquality.org
- **HazCom standard**
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=STANDARDS&p_id=10106
- **International Labour Organization (ILO)**
  http://www.ilo.org/
- **Laser Safety Guidelines**
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=DIRECTIVES&p_id=1705
- **National Fire Protection Association (NFPA)**
  http://www.nfpa.org/
- **National Institute for Occupational Safety and Health (NIOSH)**
  http://www.cdc.gov/niosh/homepage.html
- **Occupational Safety and Health Administration (OSHA)**
  http://www.osha.gov/
- **Personal Protective Equipment (PPE) Standards**
  http://www.osha.gov/SLTC/personalprotectiveequipment/index.html
- **Quality Assurance Document**
  http://www.fbi.gov/hq/lab/codis/forensic.htm
- **Respiratory Protection standard**
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=STANDARDS&p_id=12716

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Feedback for the Course

Thank you for your interest in the *Laboratory Safety Programs* training course. We are very interested to receive feedback from our users, whether it's ways to improve the course, things you liked/disliked, or any problems you encountered along the way. Please take a moment to fill out the following Feedback Form.

Personal Information (optional)

First Name:

Last Name:

Email address:

Comments
(required)

Laboratory Safety Programs

Thank you!

We appreciate you taking the time to contact us. If a response is necessary, we will attempt to do so within 48 hours.

Contact Us

Website and Course Questions

If you have a technical question about the Web site or this course, please contact DNA.gov Training Site Assistance.

General DNA Questions

If you have a question about DNA or need additional material, please contact Ask DNA.gov.

User Guide

This page provides an overview of interface controls that allow navigation between modules, topics, and individual pages. Descriptions of courseware icons and links are also included in this user guide.

- Navigating the Course
  - Section Tabs
  - Page Navigation
  - Modules and Topic Menu Navigation
- What Icons Mean
  - Content Icons
  - Sound and Captioning Icons
- Closing Pop-Up Windows
- System Requirements

Navigating the Course

Section Tabs

There are 5 section tabs for navigating to different areas of the content:

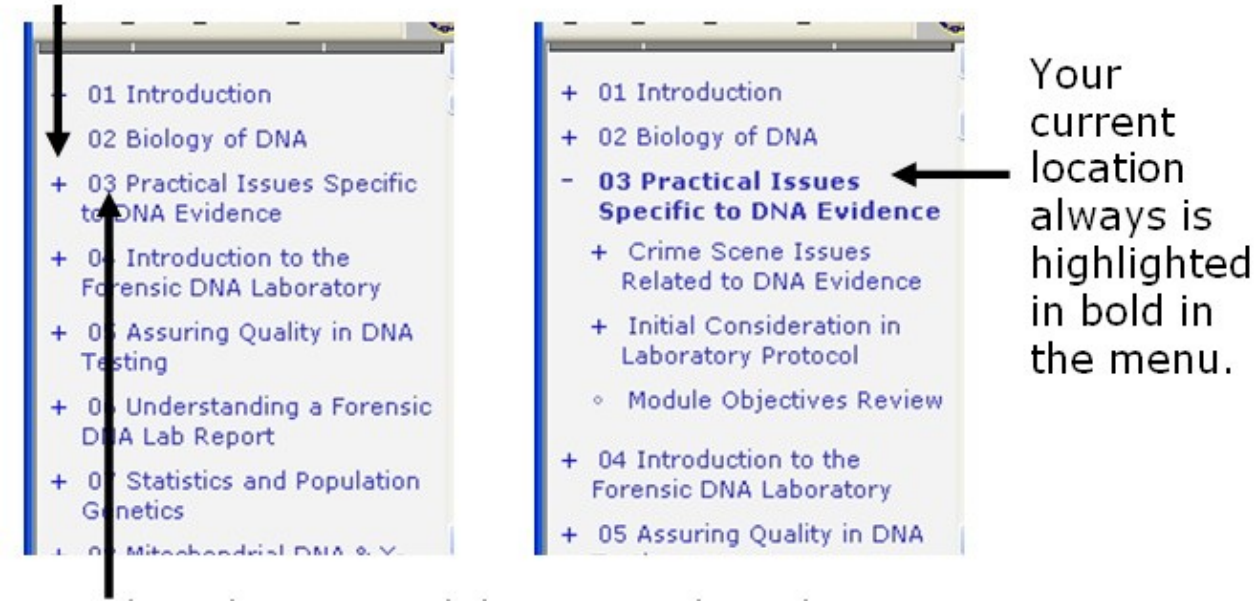
- Home—Return to the first page of the course. From this page you can easily skip to a new or return to a previous module/lesson. Your progress through the course is tracked so selecting module/lesson that you have already begun will return to to the last page viewed in that lesson/module.
- Glossary—A complete list of terms defined within this course and throughout DNA.gov
- Resources—A complete list of references from within this course.
- Help—Return to this page.
- Contact Us—Submit a question or comment about this course.

Page Navigation

Back and Forward arrows are available at the bottom of the content area to navigate from page to page.

Modules and Topic Menu Navigation

Select the '+' sign to expand the menu from any page to view all topics and subtopics within a module while staying on the same page.



Go directly to a module or topic by selecting the title text. When a module is accessed, each topic will appear below it within the menu.

What Icons Mean

Content Icons

4 icons signify what type of document they link to:

Gavel - case references

Bouncing ball - animations

Eyeglasses - flash paper documents and online links

Camera - plays a short video clip.

Sound and Captioning Icons

Sound Icon

Closed Captioning Icon

Most animations have sound (where appropriate) and contain text. These items can be turned off in most cases by clicking the sound icon or the closed caption (CC) icon as noted above.

Closing Pop-Up Windows

When certain links are selected (e.g., glossary terms, other Web sites), they open a new browser window. To close the new window and return to the previous page, just click the X in the upper right-hand corner.

System Requirements

To view all content in this course you will need at least Adobe Flash Player 8. You can check your version or download the latest from Adobe. We also recommend a recent version of your Web browser.

Resources by Module

LaboratorySafety Programs

Works Cited

1. Electronic information at http://www.osha.gov/
2. Electronic information at http://www.cdc.gov/niosh
3. American Society of Crime Laboratory Directors/Laboratory Accreditation Board. (1999) The Accreditation Decision. What is ASCLD/LAB Accreditation? Forensic Science Communications. 1(1). United States Department of Justice, Federal Bureau of Investigation.
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7. Electronic information at http://www.nfpa.org
8. Electronic information at http://www.ansi.org

9. DNA Advisory Board. (1998). Quality Assurance Standards for DNA Testing Laboratories. Forensic Science Communications. 2(3). United States Department of Justice, Federal Bureau of Investigation.
10. Electronic information at http://www.ilo.org
11. 29 CFR 1910.1450 National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory)
12. 29 CFR 1910.1450 National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory) Appendix A
13. 29 CFR 1910.1450 National Research Council Recommendations Concerning Chemical Hygiene in Laboratories (Non-Mandatory) Appendix B
14. 29 CFR 1910.1200 Hazard Communication
15. 40 CFR 262 Standards Applicable to Generators of Hazardous Waste
16. City of Phoenix Personnel Department, Safety Section. Hazardous Waste Management.
17. 29 CFR 1910.1030 Bloodborne Pathogens
18. 29 CFR 1910.132 General Requirements
19. 29 CFR 1910 Subpart I Appendix B Non-Mandatory Compliance Guidelines for Hazard Assessment and Personal Protective Equipment Selection
20. 29 CFR 1910.133 Eye and Face Protection
21. 29 CFR 1910.120 Appendix B [Non-Mandatory]
22. Pub 8-1.7 Guidelines for Laser Safety and Hazard Assessment http://www.laserinstitute.org/publications/safety_bulletin/ laser_safety_info/
23. 29 CFR 1910.134 Respiratory Protection
24. City of Phoenix Personnel Department, Safety Section. (2002). Respiratory Protection Plan.
25. Kobojek, Kimberly. (2001) Phoenix Police Department Laboratory Services Bureau Safety Manual

Online Links

- American National Standards Institute (ANSI)
  http://www.ansi.org/
- American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB®)
  http://www.ascld.org
- Bloodborne Pathogens standard
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=STANDARDS&p_id=10051
- Environmental Protection Agency
  http://www.epa.gov/
- Forensic Quality Services (FQS)
  http://www.forquality.org
- HazCom standard
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=STANDARDS&p_id=10106
- International Labour Organization (ILO)
  http://www.ilo.org/
- Laser Safety Guidelines
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=DIRECTIVES&p_id=1705
- National Fire Protection Association (NFPA)
  http://www.nfpa.org/
- National Institute for Occupational Safety and Health (NIOSH)
  http://www.cdc.gov/niosh/homepage.html
- Occupational Safety and Health Administration (OSHA)
  http://www.osha.gov/

- **Personal Protective Equipment (PPE) Standards**
  http://www.osha.gov/SLTC/personalprotectiveequipment/index.html
- **Quality Assurance Document**
  http://www.fbi.gov/hq/lab/codis/forensic.htm
- **Respiratory Protection standard**
  http://www.osha.gov/pls/oshaweb/owadisp.show_document? p_table=STANDARDS&p_id=12716