Chemical Laboratory Safety and Security

A QUICK GUIDE FOR LABORATORY SUPERVISORS AND MANAGERS

NATIONAL RESEARCH COUNCIL
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The laboratory manager should instruct personnel to follow these basic principles for working safely and securely in the laboratory with chemicals. However, many chemicals have the potential to cause harm if they are misused intentionally or unintentionally. It is the responsibility of laboratory leaders to promote a culture of safety and security in the laboratory, so that the environment is a safe place in which to teach, learn, and work.

KNOW YOUR RESPONSIBILITIES

As a laboratory supervisor or manager, you are the key connection between the laboratory and the chemical safety and security officer in your institution. Your responsibilities include

- setting expectations for safety and security and including safety and security in performance appraisals;
- planning to handle emergencies, such as fires, power outages, flooding, and community-wide disasters;
- setting up the appropriate level of laboratory security, including reviewing and approving work with chemicals of concern (COCs);
- setting up procedures for safely and securely storing, handling, and working with chemicals in the laboratory based on risks and hazards;
- making sure that laboratory personnel receive training in general chemical safety and security, especially how to work safely with COCs;
- providing specific training as needed, including developing and reviewing standard operating procedures; and
- providing laboratory personnel with the engineering controls and personal protective equipment (PPE) needed to work safely and securely;
- developing a program to ensure the safe and environmentally responsible disposal of chemicals;
- following all institutional, local, national, and international regulations for transporting chemicals; and
- considering ways to recognize and reward those who follow the best practices in handling and working with chemicals, and providing tools for enforcement of the practices when laboratory personnel bypass the system.

PLAN FOR EMERGENCIES

Every laboratory supervisor or manager should make plans for handling emergencies, such as fires, floods, and community-wide disasters. This should involve developing an **Emergency Preparedness Plan** for the facility. A thorough emergency preparedness plan includes details on

- a laboratory survival kit,
- communications,
- evacuations,
- sheltering in place,
- loss of power,
- an institutional or building closure,
- community emergencies, and
- fire or loss of the laboratory.

Emergency plans should involve local emergency-responders, such as fire departments, to make sure they have the equipment to assist in the event of an emergency.

EVALUATE LABORATORY SECURITY AND SAFETY

Setting up a safe and secure laboratory begins with a thorough evaluation of the chemical management practices and physical facilities in which chemicals are stored and used. Carrying out this evaluation will provide essential information for managing your laboratory and prioritizing efforts to improve safety and security. The following aspects of operating a laboratory should be inspected regularly:

- laboratory cleanliness and order;
- emergency equipment and planning;
- signs, labels, plans, and postings;
- storage of chemicals and waste;
- compressed gases and cryogenics;
- pressure and vacuum systems;
- chemical hoods and ventilation;
- security plans in place; and
- training and awareness of laboratory personnel.

CONDUCT A SECURITY VULNERABILITY ASSESSMENT

The specific evaluation of the security of the physical facilities is called a Security Vulnerability Assessment (SVA). The purpose of an SVA is to identify the potential security risks to the laboratory and to assess the adequacy of the security systems already in place.

The following is a partial list of issues to review as part of an SVA:

- existing threats, based on the history of the institution (e.g., theft of laboratory materials, data security breaches, protests);
- inventory of biologics, chemicals, materials, or laboratory equipment with dual-use potential (see "Set Up and Maintain an Inventory");
- infrastructure vulnerabilities (e.g., accessible power lines, poor lighting);
- security systems in place (e.g., access control, cameras, intrusion detection);
- laboratory personnel identification (e.g., badges, escorted access); and
- institutional culture (e.g., open laboratories, no questioning of visitors).

Conduct an SVA with a committee of two or three motivated staff members who have the required knowledge and awareness about chemical safety and security. Where resources are available, consider hiring a laboratory security consultant to conduct the SVA with the security, safety, and laboratory staff.

SET UP A SECURITY SYSTEM

A laboratory security program will employ a combination of physical, electronic, and operational components for an integrated system. The choice and implementation of the system depends on the level of security needed and the resources available. Laboratory supervisors and managers have many options from which to choose, including the following:

- **Security guards and procedures:** Security guards are often the most common laboratory security measure available to control access to buildings and laboratories. However, never ask or allow security guards to check on the status of unattended experiments.

- **Door locks:** Every door lock system requires management and maintenance. For keys, make sure that there is a program in place to collect keys when a person no longer works at or needs access to the facility.
- **Closed circuit television (CCTV):** CCTV is another tool used for laboratory security. CCTV can be used to recognize unusual activity and validate staff and student identities and entry authorization. Locate CCTV cameras at entryways or exits, not necessarily in the work area itself.
- **Other measures:** Other security measures include
  - intrusion and glass-break alarms for windows and doors;
  - lighting for areas where people may enter a secure area;
  - boundary walls, fences, and shrubbery;
  - blinds on windows; and
  - badges or other forms of identification.

SET UP AND MAINTAIN AN INVENTORY

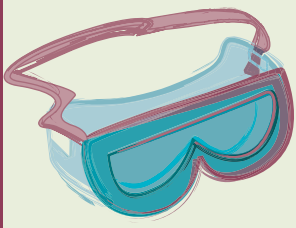
All laboratories should keep an accurate inventory of the chemicals on hand. An inventory is a record, usually a database, of the chemicals in the laboratory and essential information on their proper management. A well-managed inventory includes chemicals obtained from commercial sources and those synthesized in the laboratory, as well as the storage location for each container of each chemical.

The inventory process should track the purchase, creation, storage, and use of every chemical until it is completely consumed or disposed of. To begin an inventory, laboratory supervisors and managers should establish a list of all chemicals that are in the laboratory, especially the COCs.

Chemicals of Concern

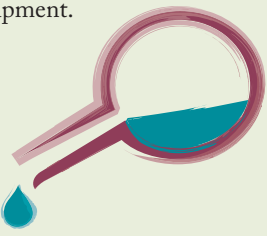
COCs typically include chemicals listed by the Chemical Weapons Convention, chemicals that have potential for mass destruction, explosives and precursors of improvised explosive devices, and chemicals of high acute toxicity (rated as Category 1 in the Globally Harmonized System of Classification and Labeling of Chemicals).

TRAIN LABORATORY PERSONNEL TO BE SAFE AND SECURE



The laboratory manager should instruct personnel to follow these basic principles for working safely and securely in the laboratory with chemicals:

- **Plan ahead.** Determine the potential hazards associated with an experiment before beginning. Have a plan in place for handling waste generated in the laboratory before any work is begun.
- **Limit exposure to chemicals.** Do not allow laboratory chemicals to come in contact with the body. Allow an experiment to proceed only if adequate engineering controls (such as proper ventilation) and personal protective equipment (such as chemical splash goggles) are available.
- **Do not underestimate risks.** Assume that any mixture of chemicals will be more toxic than its most toxic component. Treat all new compounds and substances of unknown toxicity as toxic substances.
- **Be prepared for accidents.** Before beginning an experiment, know what specific action to take in the event of accidental release of any hazardous substance. Know the location of all safety equipment. Be prepared to provide basic emergency treatment. Keep your coworkers informed of your activities so they can respond appropriately.

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This information is meant to be used with *Chemical Laboratory Safety and Security: A Guide to Prudent Chemical Management*, which is available for free on the Internet at www.nas.edu/bcst.

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