

Labratory Chemical Management Program

People working in laboratories are exposed to many hazards. One of these hazards is the handling of chemicals with diverse hazardous properties. Various chemicals may be explosive, flammable, corrosive or highly toxic. Because of these exposures, an effective laboratory safety program must include a comprehensive chemical management system.

Program organization

The laboratory supervisor/manager is ultimately responsible for a chemical management program. This individual should develop a comprehensive program covering the acquisition, storage, handling and disposal of laboratory chemicals.

Because laboratory personnel must operate under the procedures developed, it is recommended that they participate in developing them. All procedures and allocations of responsibilities should be clearly spelled out in writing.

Program implementation

Chemical purchasing

Written procedures should be developed detailing chemical ordering and receipt. All chemical purchase requests should be approved by the laboratory manager. The manager should ensure that adequate storage facilities and trained personnel are available to handle the new chemical and that a safe disposal plan exists for any waste generated by acquisition of the new chemical. The manager should also:

- Review the chemical Material Safety Data Sheet or other similar document to determine the potential hazards.
- Assure that all employees who handle the chemicals receive proper education and training, including all receiving personnel.
- Assure that excessive amounts of chemicals are not ordered. (Only the amount to be used before the chemical shelf life expires should be purchased.)

Chemical inventory

An inventory control log should be maintained for each chemical stored. The form should contain the following information:

- Generic chemical description
- Quantity on hand
- Date of purchase
- Chemical shelf life
- Storage characteristics and disposal instructions

A routine inventory of all chemical storage rooms should be made on a regular basis. Information on the chemical inventory control log should be updated based on these inventories.

Chemical labeling

Where feasible, all chemicals should be kept in their original containers to ensure proper labeling. If dispensing into smaller containers is necessary, labels should be affixed to these containers also.

Laboratory mixtures should be labeled with the chemical name, mixture concentration, the name of the individual who synthesized the mixture, and the date of the synthesis.

Chemical storage practices

All hazardous chemicals should be stored in storerooms or safety cabinets. Access to these chemical storage facilities should be limited to authorized personnel only. These facilities should be locked when unattended, and warning signs posted to limit access.

Chemicals should be stored according to their properties, such as reactivity, compatibility, flammability and stability. They should not be randomly stored by an alphabetized system. The following are control rules for storage:

- Separate inorganic chemicals from organic chemicals.
- Within the inorganic/organic groups, store on shelves families that are compatible.
- Store flammables in approved cabinets, and always isolate from oxidizers.
- Acids should be kept on bottom shelves.
- Large containers should be stored near floor level.
- No chemicals should be stored above eye level.

The chemicals in the storage facilities should be examined periodically. This inspection should identify chemicals that have been kept beyond their shelf life, have deteriorated, or have deteriorated caps or leaking containers. Problem chemicals/containers should be properly disposed of or repackaged. The inspection can be done at the time of the chemical inventory.

Chemical handling and transporting

When chemicals are transported in the laboratory, precautions should be taken to prevent spills. When hand carrying large bottles of reagents or numerous small bottles, they should be placed in outside containers or acid carrying buckets to protect against breakage or spills.

For large quantities, a wheeled cart should be used. The cart should be stable and should have a non-reactive basin to protect against spills.

When chemical work is done, proper controls should be utilized. These should include laboratory hoods, aprons, goggles, gloves, etc. Safety equipment such as eyewash stations, safety showers, and fire blankets should be available.

Chemical spill control

Spills are a common occurrence in laboratories and require preplanning procedures to minimize exposures to employees and property. Preplanning should include the following factors:

- Potential location of release
- Quantity of material that might be released and whether the chemical is a liquid material or a compressed gas

- Chemical and physical properties of the material
- Hazardous properties of the material (toxic, corrosive, flammable)
- Types of personal protective equipment and cleanup equipment that will be needed

Supplies and equipment should be available for cleaning up spills (commercial spill kits are available). The following is a general procedure example in the event of a spill:

- Attend to any person who may have been contaminated.
- Notify persons in the immediate area of the spill.
- Evacuate all nonessential persons from the spill area.
- If the spill is flammable, turn off all heat and ignition sources.
- Turn on exhaust ventilation, if it is safe to do so.
- Notify the safety coordinator if a hazardous substance is involved.
- Secure supplies for cleanup.
- During cleanup, wear appropriate apparel.
- Use proper disposal procedures for cleaned up material.

Waste disposal

Waste should be disposed of according to a waste management plan. This plan should be developed by the lab supervisor. The plan should conform to EPA/RCRA rules, and state and local regulations.

This plan should attempt to minimize disposal costs by reducing the volume and weight of waste which must be disposed of. General rules for reducing the amount of waste for disposal are:

- Design experiments to minimize the volume of waste.
- Use recoverable solvents or the least hazardous solvents in experiments.
- Plan experiments so that laboratory destruction of chemical by-products is feasible.
- Return or exchange unneeded reagents in unopened containers to suppliers or other laboratories through regional chemical exchanges.

Disposal via outside sources (i.e., incineration, landfill, etc.) is the last option available. This must be done in accordance with EPA/RCRA rules, and state and local regulations. Chemicals must be prepared in lab packs. Transporters of hazardous waste and the waste sites must be licensed by the EPA and the EPA/RCRA manifest system must be used.

Program assessment

A viable program requires periodic evaluation and updating, supplemented by training and refresher sessions. Procedures should be reviewed annually and modified as necessary to conform to changes in regulations and in laboratory operations.