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Laboratory Chemical Disposal

- General guidelines
- Chemical disposal procedures
- Biological disposal procedures

The Basics of Laboratory Chemical Disposal

Before You Undertake Any Disposal Procedure—Please Read This Narrative!

Chemical disposal is a routine part of laboratory science programs. Most lab activities will generate some leftover chemicals, solutions, and chemical byproducts that will require proper disposal. Advance planning and preparation will help you minimize the amount of hazardous waste generated and reduce the time and resources needed to dispose of excess nonhazardous chemicals or chemical byproducts.

Every school should have a Chemical Hygiene Plan that outlines appropriate policies and procedures for disposing of laboratory chemical byproducts and correctly identifying hazardous waste requiring licensed disposal. The first step in any laboratory waste policy should attack the problem at its source—where and when waste is generated. Careful planning, tailoring lab activities to clear curriculum objectives, adopting microscale lab techniques and substituting safer chemicals will help you reduce the amount of waste generated. (See the article "16 Steps to Minimize Chemical Disposal.")

Laboratory chemical disposal requires specific knowledge and procedures. Knowing the type of sewer system your school has and understanding all federal, state and local regulations that may apply are important steps in laboratory chemical disposal. Before you choose a disposal method, it is absolutely essential that you review your plans with regulatory officials. Do not assume that because we publish a set of disposal methods, these methods are "approved" or have the "blessing" of regulatory officials—NOT SO! In publishing laboratory waste disposal methods, we assume that:

- You will consult with local regulatory officials before proceeding.
- You will act responsibly with respect to all regulations.
- The quantity of material involved is very small (i.e., laboratory quantities).
- Only trained personnel will attempt the methods.

DO NOT USE THESE METHODS if they do not meet local regulations, if the quantity of material is not small or if you are not comfortable with a disposal procedure.

Advance knowledge, preparation and planning will also allow you to dispose of laboratory waste safely and effectively. There are three main categories of laboratory waste generated:

- Biological or biomedical waste (preserved materials, "live" material remains, culture products).
- Chemical waste (unused testing solutions, reaction products, stains and indicators).
- Hazardous waste requiring licensed disposal.

Biological Waste

Biological science experiments may produce hazardous waste. Special attention should be paid to all microbiological culture products since they may contain harmful organisms. Preserved materials, deceased living materials and all "sharps" also deserve special attention prior to disposal. To assist with handling biological wastes, Flinn Scientific has developed a biological waste disposal procedure. Please see Biological Waste Disposal for a thorough discussion and detailed procedures for the safe disposal of of biological waste materials.

Chemical Waste from Laboratory Experiments

Before performing any laboratory activity, review the properties of the chemicals required and any products that may be generated. If the reactants or products present unique hazards or will require specialized disposal (e.g., flammable organic solvents), consider modifying the experiment or finding a different experiment that will teach the same concept. Flinn Scientific maintains an extensive library of tested laboratory activities. Please call (1-800-452-1261) or email us (flinn@flinnsci.com) for suggestions of safe laboratory activities.

The catalog entry for every chemical listed in the Chemicals section of the *Flinn Scientific Catalog/Reference Manual* includes a Flinn Suggested Disposal Method number in the product description. Simply look up the product in the alphabetical section of the chemical listings and determine the disposal number. Then refer to these Flinn Suggested Disposal Methods.

For best results, incorporate treatment of leftover chemicals and reaction byproducts into any laboratory activity involving chemicals. Collect all solutions or similar products in a centrally located container. For example, if students are working with acidic solutions with a pH <2, have them pour their products into one beaker placed in the hood or other central location. The acid solution may then be neutralized with base according to Flinn Suggested Disposal Method #24b at the end of the lab period. Making disposal a routine part of every lab activity teaches students that concern for the environment is everyone's responsibility and that scientists working in the lab also take this responsibility seriously.

Inventory Management and Laboratory Chemical Disposal

Chemicals, supplies and equipment tend to accumulate in the science department over time and can lead to hazardous situations. Effectively managing the chemical inventory in the school will help you reduce the amount of chemical waste and the potential impact of waste disposal on your school's budget and resources. The chemical storeroom should be cleaned out on a regular basis. Before you undertake chemical cleanout and disposal, enlist the active consent and participation of school or district administrators and facilities or risk managers to provide adequate resources. Hasty responses to chemical disposal are often expensive, unsafe or harmful to the environment.

Inspecting and Preparing the Inventory

Carry out a preliminary inspection to determine if cleanout and disposal are warranted. Look for the following:

- Bottles and containers that are broken, corroded or have crystals growing around the caps or liquid seeping out of closures.
- Inappropriate storage containers, such as beakers and flasks, buckets, plastic soda bottles or food jars.
- Poorly labeled containers used for storing solutions or transferring chemicals. Labels must have the chemical name, concentration, date and appropriate hazard information and warnings.

Prepare or update the annual chemical inventory and identify chemicals you want to keep. Laboratory chemicals and preserved materials that are no longer part of the curriculum should be removed, as should chemicals that are dangerously toxic, potentially explosive, contaminated or decomposed, mislabeled, out-of-date or present in surplus amounts. Assemble a list of chemicals requiring disposal. Include the full name of the chemical, the quantity printed on the bottle's label and the number of bottles of each size. The size of the bottle is often more important than the quantity of material if the whole bottle must be removed and shipped to a disposal facility. The cost may be identical whether there are 1 or 100 bottles in a drum.

Chemical Disposal

Research the properties of unneeded chemicals to determine any that may be neutralized, reduced, precipitated and/or disposed of in the trash or down the drain. The description for each chemical in your current *Flinn Scientific Catalog/Reference Manual* includes a disposal number. This number refers to one of the generally allowed Flinn Suggested Disposal Methods. Please verify state and local regulations that may apply, as some methods may not be permitted in particular areas. Disposal options may also be limited by the type of septic system the school has.

Review the following general guidelines and safety rules before attempting any disposal procedure.

- The quantity of material should be small—laboratory quantities only.
- Make sure you have read and understand the chemistry involved in the procedure.
- Never work alone!
- Always wear appropriate personal protective equipment.
- Perform all procedures in a laboratory environment with good ventilation.

Hazardous Waste Disposal

Some chemicals, such as heavy metal salts (e.g., Cr, Pb, Ba) and halogenated solvents, will always require licensed hazardous waste disposal assistance. The EPA has published a very thorough workbook to help you evaluate options with respect to chemical cleanout and hazardous waste disposal. "Building Successful Programs to Address Chemical Risks in Schools," available online at http://www.epa.gov/schools/workbk.pdf, encourages academic institutions to identify district and community stakeholders that are vested in safe chemical management. Local fire and police departments, area colleges and universities, industry partners and trade and professional organizations may be able to provide advice and assist with packaging chemicals for removal, removing mismanaged or unnecessary chemicals and properly disposing of chemicals. The following options will help you identify potential partners and resources to investigate, plan and carry out chemical disposal.

- Contact the facilities staff for information about ongoing chemical disposal programs.
- If applicable, get in touch with your state science supervisor or department of education. Many states have implemented chemical cleanup campaigns in recent years. The state EPA may also have an existing program.
- Work with the state and local associations. Use the experience of other teachers who have faced similar issues to help your school comply with chemical disposal requirements.
- Seek the advice of your Environmental Health and Safety Department or that of a nearby college or university. Most large universities have ongoing waste disposal programs and understand state and local requirements.
- Contract with a licensed hazardous waste disposal firm for removing chemicals. Because the institution has cradle-to-grave responsibility for its chemicals, even after they have been removed from the site, it is vital that you choose a licensed and reputable firm. Ask for and check references, and do not automatically choose the lowest bid. Request a certificate of disposal for the chemicals.

Flinn Suggested Laboratory Chemical Disposal Methods

Flinn Scientific has been publishing suggested laboratory chemical disposal methods for more than 40 years. Each chemical in the *Flinn Scientific Catalog/Reference Manual* has a disposal number under its name. The disposal number refers to one of the Flinn Suggested Disposal Procedures. As federal, state and local regulations have changed, many disposal procedures have been updated or deleted. Before attempting any disposal procedure, it is essential that you check local regulations to determine if it is allowed in your locale.

Before attempting any disposal procedure, the following safety rules must be followed:

- Never work alone!
- Always were appropriate personal safety equipment.
- Perform all procedures in a laboratory environment with proper ventilation. Note that a fume hood is required for some procedures.

If you have any questions concerning laboratory chemical disposal methods, please call (1-800-452-1261) or email (flinn@flinnsci.com) us at Flinn Scientific, Inc.