Biological Waste Disposal

Introduction

Ecological studies have repeatedly demonstrated the intertwined nature of all elements of the ecosystem. A basic ecological principle simply states—"You can't do just one thing." So when we dispose of materials we are likely to do more than just dispose of the materials. When considering the disposal of any material (school or elsewhere) our goal must be to minimize the environmental impact of the disposal, i.e., come as close to doing "one thing" as possible. Common sense, a knowledge of the material, and a familiarity with local disposal regulations, procedures and policies must prevail. The general guidelines provided here are only intended to stimulate clear thinking about how to minimize the effects on the environment as we recycle earth's materials.

A Biological Waste Disposal Policy

One important first step is to formulate a biological waste disposal policy. General guidelines and parameters should be written prior to conducting actual disposal procedures. Some suggestions that might help in formulating a general biology disposal policy:

- Contact the state department of education. Many states have a science supervisor who might be able to make suggestions on disposal of biohazards or give advise about existing programs already in operation.
- If located near a large university, biological research facility, hospital, or other biological institution, check with officials for possible cooperative activities. Piggybacking your biohazard materials with their disposal procedures might be a possibility.
- Form a cooperative with other schools in the area and have a unified disposal plan. There are often savings in bulk disposal.
- The state equivalent of the Environmental Protection Agency (EPA) may have useful resources.
- State or national biology teacher associations have resources and guidelines that are very helpful.

We have arbitrarily divided waste materials into six categories for the sake of discussion and clarity. Some situations might involve a combination of several of the categories. Specific federal, state, and local regulations may apply to the disposal of biohazards from your lab. You must review your obligations and options with regulatory and school officials before developing a disposal procedure at your school.

When conducting any disposal procedures, be sure to provide personal protection for yourself and others around you. Always wear proper personal protection equipment (goggles, aprons, gloves, etc.). Conduct disposal procedures in proper areas for the materials (hoods, ventilated areas, appropriate sinks, etc.). Where appropriate, follow sterile procedures and cautions relative to potential pathogens.

Type I—Potentially Harmful Wastes Due to Microorganism-type Contamination

Examples: Bacterial cultures, culture tubes, disposable loops, Petri dishes, blood typing materials, any body fluids, any unknown "growing" items, contaminated media products, disposable gloves used in dissections or when handling living materials, electrophoresis materials, or any items which might harbor microorganisms.

★ **Hazards:** All laboratory wastes that may harbor microorganisms must be assumed to be pathogenic and need to be treated before they are thrown in the trash. Biological culture media are specifically designed to foster the growth of microorganisms, which will continue to grow even after disposal unless they are destroyed. Contaminating microorganisms may be growing along with known organisms. These organisms must be assumed to be harmful. Recent concerns about blood-borne pathogens and body fluid transmissions have heightened awareness for utilizing sterile techniques when doing any human physiology experiments or blood typing. For these reasons, all of these laboratory materials must be sterilized after use and before disposal.

Disposal Procedures: Materials that are potentially contaminated with microorganisms must first be sterilized before disposal. After sterilization, they can usually be disposed of by normal trash removal methods. Check with local authorities for rules and regulations that apply to your community. There are two methods for sterilizing wastes: Method IA—autoclaving and Method IB—chemical sterilization.

Method IA: Autoclaving: Materials can be autoclaved in an autoclave. If an autoclave is not available, a pressure cooker

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may be used. Biohazard bags should be used wherever possible and will make the sterilization of some biohazard materials easier, while also providing a convenient disposal container. Biohazard bags are made of a very durable plastic that can withstand the high temperature and pressure of autoclaving. An indicator patch on the bag turns dark when it has been autoclaved/steam processed. The dark patch provides quick external proof that the bag and its contents have been sterilized and that it should not be opened.

Objects to be autoclaved should be carefully placed into a biohazard bag without opening the containers (Petri dishes, test tubes, etc.). Highly dangerous materials should be handled only when wearing gloves, masks, and safety eyewear, and practicing other sterile precautions. Do not put any sharp objects (blood lancets, broken glass, dissecting instruments, etc.) into biohazard bags. The bag should then be tightly sealed by doubling over its end and sealing it shut with a twist tie. Do not overload or "stuff" the bag.

The bagged biohazard materials should be autoclaved at 15 lbs. per square inch of pressure for 30 minutes at 121 °C. Follow directions for specific autoclaves or pressure cookers very carefully. Use insulated gloves when removing the bags from the autoclaving device. Bags containing glass or other breakable materials should be separated from other bags prior to disposal in the trash depending on your local practices.

Method IB: Chemical Sterilization: To sterilize, place culture or material in a 10% bleach solution for 24 hours. To prepare 10% bleach solution, dilute one part household bleach with nine parts water. Rinse the sterilized materials with water, and then dispose of them following appropriate procedures.

Type II—Potentially Harmful Wastes Due to Dangerous Chemical Hazards

Examples: Solutions from electrophoresis or staining procedures, formaldehyde solutions, or other chemical solutions or solids.

★ **Hazards:** Chemical wastes may be corrosive, toxic, or flammable and should be handled accordingly. If the waste material is of unknown composition, assume the material is toxic, corrosive, and flammable and take all precautions when handling the material. Contact Flinn Scientific technical staff for advice on how to identify and dispose of unknown chemical wastes.

Disposal Procedures: If the identity of the chemical waste is known, then consult the Chemical Disposal Procedures section of the *Flinn Scientific Catalog/Reference Manual*. To find the proper disposal procedure, look up the chemical in the chemicals section of the *Flinn Scientific Catalog/Reference Manual*, and find the Flinn Suggested Disposal Procedure (e.g., Disposal: #26a) in the chemical listing. Then find the Flinn Suggested Disposal Procedure in the Chemical Disposal Procedures section of the reference manual. The disposal of chemical wastes is regulated by federal, state, and local ordinances; do not perform any disposal procedure without first consulting with your local government regulatory officials.

Type III—Preserved Materials

Examples: Preserved materials such as fetal pigs, frogs, rats, etc. used in dissection activities, museum mount display materials.

★ **Hazards:** Preserved materials are often fixed using formalin or formaldehyde. After the fixing process, the excess formaldehyde is usually removed and replaced with a nonformaldehyde preservative. The preservative solution and the preserved material both contain low levels of formaldehyde, an alleged carcinogen, and other chemicals. Many of these chemicals are also toxic by ingestion and inhalation.

Disposal Procedures: Do not perform this procedure if your school uses a septic system for wastewater treatment. No chemicals should be placed down the drain unless your school is hooked up to a municipal water treatment facility. Prior to starting this procedure, check with your local water treatment facility for any rules or regulations concerning the disposal of formaldehyde solutions.

The first step in this disposal procedure is to rinse and wash away the preservative from the specimens. The room in which this process is undertaken should be well ventilated. Transfer the preserved specimens to a large plastic bucket or pail and place it in a large sink. Attach a length of tubing to the cold water outlet and, wearing gloves, force the exit end of the tubing into the very bottom of the bucket. If possible, use a water faucet equipped with a siphon breaker to eliminate the possibility of backflow.

Turn the water on slowly. Start the water flowing before forcing the tubing into the bucket to better gauge and control the water flow. A very slow but steady flow rate is desirable.

Allow the water to flow into the bottom of the bucket, forcing the preservative to overflow into the sink. Continue washing the specimens for a period of 6–8 hours to completely wash all preservative from the specimens.

After the wash cycle is complete, turn off the water, remove the tubing, and drain all the remaining water from the container. Let the specimens drain for an hour, and then double bag them in non-transparent plastic bags (black is preferred). Seal each bag completely and follow your local procedures for normal garbage disposal. Do not leave the specimens where students may find them, such as the trash can in the science laboratory.

Type IV—Living Materials

Examples: Carcasses of dead animals such as snakes, guinea pigs, fish, etc.

★ **Hazards:** Deceased living materials may contain diseases or pathogenic microorganisms that may spread to humans. Deceased animals should only be handled with gloves and disposed of as quickly as possible.

Disposal Procedures: Living animals, especially reptiles, amphibians, and insects should never be released into the environment unless first checking with local authorities. Introducing new species to a local environment may result in irreparable damage to local ecosystems.

Most areas prohibit the burial of dead animals and the local county's sanitation regulations should be reviewed for information on disposal of dead animals. For advice, consult your local Humane Society office, the local animal shelter, highway department, or state natural resources department. A general disposal procedure is to wrap the deceased animal in newspaper, place it in a non-transparent plastic bag, and then throw it in the school's main trash container if this is allowed. Do not leave the animal where it may be discovered by students.

Microorganism cultures, such as protozoans, should be sterilized by Method IA or IB as outlined earlier and then flushed down the drain.

Very small dead fish can be simply flushed down the drain if the school is hooked up to a municipal water treatment facility.

Type V—Sharps and Broken Glass

Examples: Sharps and broken glass items; needles, dissecting blades, glass tubing, and glass pipets.

★ **Hazards:** Any sharp metal or glass object has the potential to puncture or cut the skin and deliver pathogenic organisms directly into the bloodstream in addition to creating a wound. These materials must be placed inside a hard plastic or metal container to prevent any possible physical injury.

Disposal Procedures: Check with a local hospital, health clinic, or college for assistance in disposing of sharps. Hospitals and health clinics have rigorous programs to handle their sharps and may be willing to help a local school in safely disposing of sharps.

If outside help is not available, either purchase a sharps disposal container or obtain a hard plastic or metal container and add a large "sharps" label on the outside. If using a plastic container, make sure it is a hard plastic that is not flexible and cannot be easily squeezed. PET and PVC are usually better than LDPE or HDPE plastic containers. Ideally, the bottle should have a narrow neck to prevent any possibility of a student sticking his hand into the sharps container. Another option is to cut a small hole in the top of the lid to allow the sharps to be added but not easily removed.

When the sharps container is full, the container and sharps must be sterilized before disposal. Use either Method IA or IB for sterilizing biohazards. After sterilization, place a cap on the bottle, wrap the container in a heavy thickness of newspaper, place it in a nontransparent plastic bag, and dispose of it following local disposal procedures. Never place a sharps container in a recycling bin.

Type VI—Common Garbage Wastes

Examples: Paper products, plastic laboratory wastes that are not contaminated with chemicals or biological material.

★ **Hazards:** No hazards with these materials beyond that of normal garbage.

Disposal Procedures: If a material has been used to dispense a chemical solution, rinse thoroughly before placing it in the trash. Dispose of all other materials that do not have chemical or biological wastes in the normal trash following your school's

normal trash procedures. A good practice is to place disposable laboratory items in a black plastic garbage bag and then thoroughly close the plastic bag before throwing it in the trash. This may prevent laboratory items from being discovered in the trash by students and used for personal experiments or practical jokes.

Products to help dispose of biological waste are available from Flinn Scientific, Inc.

Catalog No.	Description
FB0060	Biohazard Disposal Bags
FB0061	Biohazard Spill Kit
AP8829	Glass Disposal Container
SE1041	Gloves for Sharp Materials
S0079	Bleach, Sodium Hypochlorite Solution

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.