

# *Waste Disposal in EHE*

Prepared by EHE Safety Steering Committee  
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## ***Introduction***

This supplement describes the procedures that should be taken in disposing of wastes generated in our laboratories. Proper disposal of wastes is a very serious matter. As a group of researchers studying environmental contamination, we should be particularly sensitive as to whether our wastes are being disposed of in an environmentally sound manner. Moreover, improper disposal of waste and materials contaminated with wastes represents a safety hazard to other people working in the lab, as well as to Housekeeping staff. Finally, failure to comply with these disposal procedures will incur significant charges levied against research grants or the Department, and worse yet could even result in enormous fines levied against Johns Hopkins University for regulatory non-compliance. Any time you have any questions as to the appropriate method to dispose of a particular waste material, please call the Health, Safety, and Environment office at 410-516-8798 or 410-955-5918.

Because the University and the EPA view the proper disposal of laboratory wastes so seriously, it is vitally important that **EVERY** sample you work with (regardless of whether it's a field sample, an ongoing experiment, a stock solution, or a waste container) be labeled fully and accurately with your name, the contents, and a date. Failure to comply with this requirement has resulted in fines in the thousands of dollars per offense at other universities during EPA inspections. If you use any abbreviations (including chemical symbols), they *must* be defined on a "list of abbreviations" that is prominently posted inside the door of each laboratory. All chemicals received must be dated and entered into an inventory, which must be prominently displayed within each laboratory.

## ***Waste Chemicals***

Waste solutions containing innocuous salts may be disposed of down the drain. We are not allowed to do any on-site treatment of wastes; therefore, neutralize dilute acid or alkaline solutions or oxidize hydrogen sulfide solutions with bleach *as a part of your experimental protocol*, rather than accumulating such materials as wastes. Aqueous solutions containing small quantities (*i.e.*, below the drinking water limit) of biodegradable organic contaminants (not radioactively labeled) may be disposed of down the sink. Be especially careful with fluids containing a biocide such as  $\text{NaN}_3$ ,  $\text{HgCl}_2$ , and pesticides;  $\text{HgCl}_2$ -containing solutions can only be disposed if the mercury concentration is less than 10 ppm.

Note that EPA is considering requiring a "cradle to grave" approach in laboratories, in which researchers must keep track of the eventual fate of the entire mass of any hazardous chemical purchased.

Excess hazardous materials in any of the following categories must be disposed of as hazardous waste:

**Ignitable:** any substance with a flash point below 60°C (140°F).

Please note that the following flammable chemicals should be stored in approved metal or plastic safety containers:

**Class 1A** (flash point below 22.8°C and boiling point below 37.8°C)  
examples: diethyl ether; *n*-pentane

**Quantities in excess of 1 pint (0.48 L)**

**Class 1B** (flash point below 22.8°C and boiling point above 37.8°C)  
examples: methanol, ethanol, acetone, toluene, xylene, gasoline

**Quantities in excess of 1 quart (0.95 L)**

**Class 1C** (flash point above 22.8°C and below 37.8°C)  
examples: ethyl mercaptan, turpentine, methanol (30% in water)

**Quantities in excess of 1 gallon (3.785 L)**

Please also note that any containers that contain 1 gallon or more of flammable or combustible liquids should be stored in an approved flammable or combustible liquid storage cabinet or in an approved storage room.

**Corrosive:** any substance with a pH of less than 2.0 or greater than 12.5. These wastes must be collected in containers that will not ultimately corrode and leak, such as plastic containers.

**Reactive:** any substance that is unstable, reacts violently with water, forms potentially explosive mixtures with water, generates toxic gases, vapors or fumes when mixed with water or exposed to a pH between 2.0 and 12.5, or is capable of detonation or explosive decomposition or reaction. Compounds such as cyanides or sulfides are included in this class if they can readily evolve toxic gases such as hydrogen cyanide. Their collection for disposal must be carried out with particular care. It may be advisable to deactivate certain sulfur containing compounds through oxidation. Specific procedures should be carefully developed through consultation with your advisor and HSE.

**Toxic:** any substance which contains any of the compounds listed by the EPA under the Resource Conservation and Recovery Act at or greater than the listed concentration.

**Specific chemicals:** any substance containing an EPA listed compound.

Unwanted, used or spent chemicals must be disposed of through the Health, Safety, & Environment (HSE) guidelines of JHU:

1. **All waste chemicals must be identified by specific name or CAS number, the laboratory disposing of the waste, the principal investigator, and a contact person's name and phone number.** All too often, students list only the chemical(s) they're studying— and forget to include the solvent. This is especially important in non-aqueous solutions or in solvent-water mixtures (e.g., HPLC eluent) – the toxic risk posed by the solvent may outweigh that of the (minor) constituents of interest to the researcher. Label all bags, boxes or bottles with an indelible ink marker using a label provided by HSE. Make certain that the labels are securely fastened to the container. Mixtures should be identified as to chemical composition and concentration, using a designation such as “Nonhalogenated solvent waste: mixed organic liquids in primarily *n*-hexane – see clipboard”. Nonspecific designations such as "Waste Solvent" or "Waste Acids" are not acceptable, nor are chemical formulas, abbreviations, or reaction chains.
2. All waste chemicals are to be stored in containers of similar construction to the container in which the manufacturer originally shipped the material. Be careful not to fill bottles too full; glass bottles containing waste solvent have been known to explode as the contents warmed and expanded! The

containers will be disposed along with the waste chemical. The only exception is solvent safety cans, unless prior arrangements are made with the waste chemical technician.

3. *Before* bringing your unwanted waste chemicals to the Hazardous Material Accumulation Room (see below), you will need to enter your waste into an online form, available at:

<https://orchid.hosts.jhmi.edu/hse/webtools/wasteform/>

After all materials are entered, the form is submitted to HSE. When you bring your materials to the Accumulation Room, it will be checked against the list that was submitted, and the route of disposal will be documented. You can also opt to have the waste collected from your lab. If you pursue this option, be sure to include your cell phone number on the form, so that personnel can contact you when they are ready to collect your wastes.

Please take the time to acquaint yourself with the system. There are examples of how to enter various types of waste on the part of the HSE website where you find the form.

The basic procedure will be as follows:

1. Access the online form
2. Enter each container, providing the required information
3. Submit the information to HSE
4. Unless you opt for in-lab pickup (see above), all chemicals should be transported on carts to the Hazardous Material Accumulation Room (HMAR), located in the basement of Macaulay Hall. Make certain you take your JHU Identification Card/J-Card with you, as access to the HMAR is restricted. Entry to the HMAR is via the Macaulay basement. (Please do *not* enter via the Macaulay ramp; this ramp, and its associated entrance, have been designated an emergency exit only). Enter Macaulay from the Quad. Take the elevator to the basement. Off the elevator, turn left and proceed to the end of the corridor to the HMAR J-card access entrance door.

This area is staffed on THURSDAYS from 10:30-11:30 AM and 1-2 PM. Note that there is no waste chemical collection on Federal holidays, nor on holidays observed by Johns Hopkins. Carts used to transport chemical waste should have sides of sufficient height to restrain containers. In transporting wastes, make sure *all* containers (even if non-breakable) are placed within a secondary container that is large enough to hold the entire contents in the event of a spill or leak.

Take the route that would cause the least exposure to the public in case of an accident. Only empty elevators should be boarded; passengers attempting to use the elevator should be requested to wait until the elevator is free. Make sure you wear appropriate clothing when transporting wastes (closed shoes, long pants). Bring gloves with you in case you need to handle materials that may be contaminated with chemical waste.

5. No infectious or "RED BAG" waste will be accepted at the HMAR; these materials should be disposed of as described below.
6. No chemicals are to be left at the HMAR unless a waste chemical technician or other HSE staff member is present.
7. Separate all chemical bottles or glassware from contaminated lab waste or spill cleanup material; chemical bottles should be disposed as described below.

8. Be careful to segregate incompatible wastes. People have been injured by adding alcohol to acid waste. For example, never add acid to solutions containing  $\text{N}_3^-$ ,  $\text{HS}^-$ , or  $\text{CN}^-$ ; toxic gases could be generated. Toxic, highly reactive, and corrosive chemicals should be collected in compatible (*e.g.*, glass or chemical resistant plastic) containers with all contents clearly labeled. Individual chemicals or reagents containing especially hazardous chemicals should be collected separately for disposal.
9. Chlorinated and non-chlorinated solvents should not be mixed for disposal. Due to differences in allowable disposal methods, it is costlier to dispose of chlorinated solvents. Even if a non-chlorinated solvent only contains modest levels of chlorinated compounds (as is often the case when disposing of spent standards or sample extracts), they should be considered as "chlorinated solvents" for purposes of disposal since if they are to be incinerated, a scrubber is required to minimize emission of polychlorinated dibenzo-*p*-dioxins and furans. (There is no reason to maintain separate waste containers for non-chlorinated solvents containing traces of chlorinated compounds and neat chlorinated solvents; these may be combined as "chlorinated solvents").
10. PCBs, PCDFs, pyridine, and mercaptan compounds must be segregated from other chlorinated and non-chlorinated chemicals and appropriately labeled.
11. **NO MORE THAN ONE CONTAINER OF ANY SINGLE TYPE OF WASTE MAY BE KEPT IN EACH LABORATORY.** At present, there is no restriction on the maximum *size* of any container. There is, however, a restriction on the total *volume* of all waste of 5 gallons (20 L) per lab.
12. Fume hoods are not an acceptable means for disposing of hazardous waste. In particular, residual ether should never be disposed of by open vaporization; this could cause peroxide contaminants to become concentrated to explosive levels.
13. Arrangements for the pickup of large quantities of chemicals and questions about specific waste chemical handling should be directed to the Health, Safety, and Environment office at 955-5918 or  $\times$  8798.
14. Unknown hazardous materials cannot be disposed until they have been properly characterized with appropriate documentation. If you encounter an unknown material, bring it (in a sealed container) to the HMAR along with a completed M&S or Requisition Form in the amount of \$450. HSE will have the material analyzed by an independent lab. Upon receipt of the results, HSE will inform the Department Administrator of the results and will dispose of the material appropriately.

***Other Lab Waste: "Special Medical Waste", Biohazard Waste, "Sharps", and Broken Glass***

These categories of waste require special consideration. The Maryland Department of the Environment classifies *any* waste that is perceived as having originated in a laboratory as medical waste and could hold JHU accountable for improper disposal (accompanied by a substantial fine). Generators of pollution are legally liable for their waste, and laboratory waste in a leaking sanitary landfill could make JHU liable for some expensive cleanup costs, even if *you* don't think your waste is likely to contribute to contamination of the environment. Be considerate of people in Housekeeping, and don't throw any waste which could cut people (or provoke fears of AIDS from a needle stick) into the trash. Use the proper disposal procedures, described below. And please note the following definitions:

"Special Medical Waste": Anatomical material, blood in any form, blood-soiled articles, contaminated material, **microbiological research laboratory waste**, and "**sharps**". **Furthermore, any and all waste which might be potentially identifiable as laboratory waste (such as paper towels, plastic**

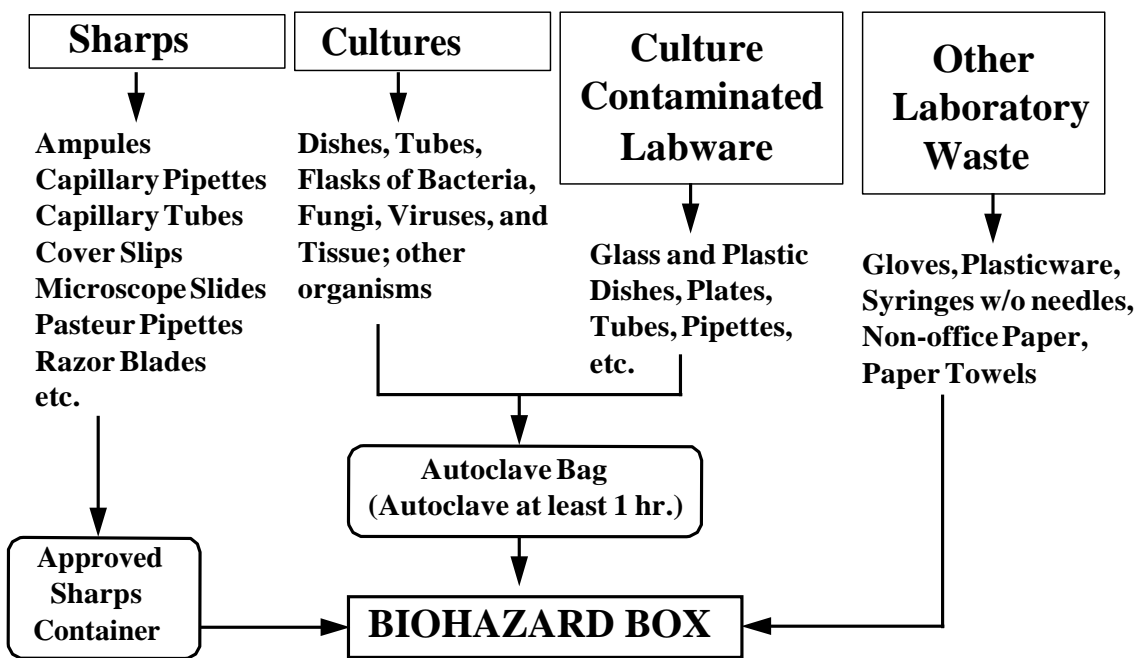
weighing dishes and weighing paper, etc.) should be treated as "special medical waste" so that it will be incinerated, and not later found in a landfill and associated with JHU.

"Sharps" are further defined as any material capable of piercing the skin. This includes, but is not limited to: **syringes with needles, needles alone, capped needles**, scalpels, razor blades, **pasteur pipettes, disposable pipet tips, small glass tubes, capillary tubes**, butterfly needles, and **glass pipettes**.

A summary of waste disposal procedures for these categories of laboratory waste is presented in Figure 1. *Note that according to these definitions, all laboratory waste, except chemicals and radionuclides, must be discarded into JHU approved red bag-lined biohazard boxes.*

Because virtually all waste that might originate from an EHE lab could be considered as "special medical waste", *it is EHE policy to recommend against the use of wastepaper baskets inside laboratories* – it is simply too easy for laboratory waste that a researcher may view as relatively innocuous to make its way into the trash instead of a biohazard box. Blue recycling containers should only be used in computer-intensive areas.

## The Johns Hopkins Institutions Laboratory Waste Disposal



**Figure 1: Waste disposal procedures for "special medical waste", "sharps", and general laboratory waste. Note that all of this material is ultimately incinerated.**

### *Biohazard Waste*

"Special medical waste" must never be discarded directly into the general trash. It must be discarded into a red bag or container labeled with the "biohazard" symbol. The cardboard biohazard box with the red plastic bag liner is for disposal of sharps containers, disposable **plastic** pipettes (pasteur pipettes and Eppendorf pipette tips are classified as "sharps" -- see next section), autoclaved waste material, blood tubes, or other materials soiled with potentially infectious agents, blood, tissue, or body fluids, and any materials which may be perceived to be "special medical waste" or laboratory waste such as

calibrated plastic centrifuge tubes, conical tubes and pipettes (*i.e.*, **anything** that would make JHU look bad if found on a beach, whether or not it actually represents a biohazard). Every biohazard box must contain a red bag liner at least 3 mil thick. Red bag liners **must** be placed in the cardboard biohazard box for disposal. Approved biohazard boxes and red bag liners can be requested from Housekeeping staff. The *only* biohazard box that Housekeeping is currently authorized to accept is the BFI biohazard box with red bag liner.

All solid, autoclave-decontaminated materials must be discarded into the biohazard box. The biohazard box must not be reused. When the biohazard box is approximately two-thirds full, † the red bag liner must be carefully closed and sealed with tape. Then the box must be closed and sealed with tape prior to pick up by Housekeeping. The red bag liner should never be removed. Please label each sealed box with your name, department address, and phone number. **Place one of the bar-coded JHU stickers (see Figure 2) on the outside of the box.** (*Special note: as of 9/10/2014, these forms have been unavailable for several years. Until a final resolution is reached as to whether Johns Hopkins Institutions are still using them, do not worry if you cannot locate one*). Filled biohazard boxes are removed by Housekeeping. Do not, under any circumstances, put laboratory waste outside the building.

### ***Waste Syringes, Needles, and Other "Sharps"***

"Sharps" must never be discarded directly into plastic trash bags. Furthermore, to minimize the risk of injury, needles must never be clipped, bent, or recapped by hand. All sharps must be discarded in an approved JHU polypropylene sharps container (JHU catalog number 504491). Cans, bottles and glass, metal or plastic jars are not acceptable substitutes for the approved sharps container.

When disposing of Pasteur pipettes to which small amounts of solvent may be clinging, do not throw them into a "sharps" container until the solvent has had a chance to evaporate. Such Pasteur pipettes are best left to dry in a beaker in a hood for a *few hours* (not days or weeks -- remember to minimize clutter!) prior to disposal.

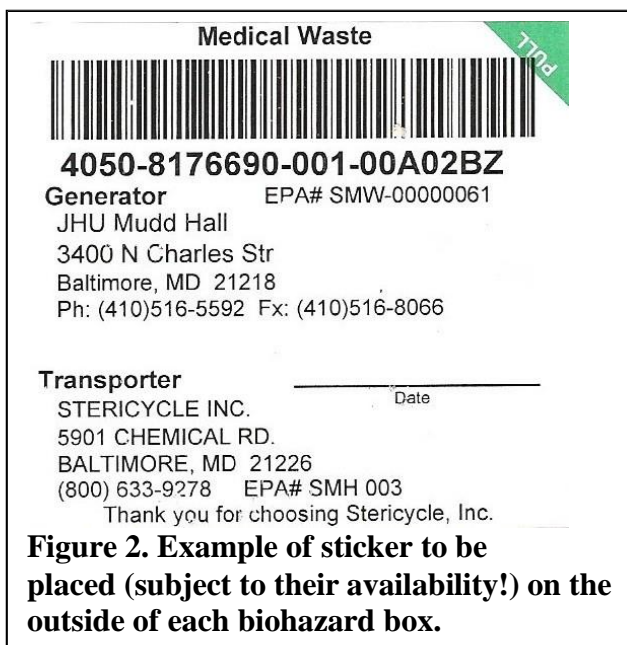
The lid on "sharps" containers is to be left open until the container is ready for disposal. When discarded "sharps" reach the fill level designated on the container, screw the lid into place.

**The container must be discarded in a red bag-lined biohazard box for pickup by Housekeeping.** Please label each filled sharp container with your name, department address, and phone number.

Note that sharps disposal containers are puncture *resistant*, not puncture *proof*. Filled containers are to be handled with caution; sharps may penetrate under certain conditions.

### ***Reagent Bottles, Solvent Bottles, and Broken Glass***

Never dispose of ANY glass in an ordinary trash receptacle; be considerate of Housekeeping staff. Glass not contaminated with biohazardous materials (*i.e.*, reagent bottles, broken glass beakers, flasks, funnels, test tubes, and similar materials), must be **rinse**d and discarded into a red bag-lined



† In no cases should a biohazard box be filled to the point that its weight exceeds 40 lb.

“biohazard box”. The Health, Safety and Environment office at JHU no longer recycles broken glass from laboratories, and so it is no longer necessary to maintain separate “broken glass” boxes; furthermore, a box full of broken glass would exceed the 40-lb weight limit for Housekeeping staff. The biohazard box must be sealed with tape when ready for pickup by Housekeeping. If the glass fragments are small and sharp, they should be disposed of in a “sharps” container. If there is a possibility that a broken flask might puncture a biohazard bag, consider fire-polishing the broken area after first rinsing the flask free of chemical residues, or else transfer the broken glass to a secondary container (e.g., a small cardboard box).

If the remnants in a reagent bottle do not readily evaporate, are insoluble in water, or are recalcitrant to biodegradation, use Alconox in the rinse water, and save the rinse water for disposal as chemical waste. Similarly, if the contents are toxic, save the rinse water and dispose of it as hazardous waste.

Empty solvent or acid bottles are particularly useful for disposal of waste solutions and should not be thrown out. Any residual contents should be allowed to evaporate (acid bottles should be carefully rinsed), and the labels should be clearly and fully eradicated (experiments have been ruined by researchers using waste instead of clean solvent from improperly labeled containers). Please store empty solvent bottles in your lab; if you don't need them, please store them (clearly labeled) in Room 004.

### *Other Waste*

#### *Non-refillable, non-returnable compressed gas cylinders*

**It is a policy at Johns Hopkins to prohibit the use of commercially supplied gas in non-refillable, non-returnable cylinders.** This eliminates unnecessary handling and disposal of compressed gas cylinders and their contents and assures that these materials are disposed of properly. In the event that a vendor does not exist who is willing to supply a needed gas in a refillable, returnable cylinder, then an application must be made in writing for a waiver to this policy. Applications must be submitted to the office of Health, Safety, and the Environment. If approved, you will be required to purchase the smallest quantity you need. In the event that non-refillable cylinders are used, they must be completely emptied before being transported for disposal to the hazardous waste collection area. Cylinders must be delivered with the valve completely opened.

All compressed gas cylinders must be returned to the manufacturer for refilling or for proper disposal; this should be verified by the purchaser prior to purchase. Note that refillable gas cylinders that are transported by truck (e.g., by BOC Gases), unlike the nonrefillable ones, should never be completely emptied, but should be returned with a small residual pressure (impurities tend to collect in the last fraction of gas cylinders).

#### *Broken Thermometers*

Broken thermometers may contain mercury in the fragments; these belong in their own "broken thermometer" container.