

Environmental Health and Safety Update

Disposal of Electrophoresis Gels and Solutions

Overview

Electrophoresis gels are commonly used in molecular biology laboratories for the identification of DNA. These gels will typically be agarose-based or polyacrylamide-based. This identification process utilizes an organic fluorescence dye (e.g., ethidium bromide, propidium iodide, acridine orange, SYBR® Green) to stain the nucleic acids. Ethidium bromide is the most commonly utilized dye throughout the College and is a highly toxic and potentially mutagenic chemical which may be fatal if swallowed, inhaled, or absorbed through the skin.

The waste by-products of the DNA identification process must be managed and disposed in a manner to protect public health and the environment. This Update provides generators with the proper procedures for managing and disposing electrophoresis gel wastes.

Applicability

This procedure applies to all laboratories and their personnel (“generators”) utilizing electrophoresis gels for the identification of DNA. This procedure does not apply to wastes containing radiological or infectious agents, human blood or other potentially infectious materials.

Responsibilities

Generators ensure that electrophoresis gel wastes are properly managed and disposed in accordance with this Update.

Environmental Health and Safety (EHS) ensures that the information provided to the generators is concurrent with the laws and regulations governing the disposal of these wastes and provides assistance and training as needed.

Procedure

Utilize the following procedures for each specific type of electrophoresis gel waste:

ELECTROPHORESIS GELS AND CONTAMINATED “NON-SHARP” LAB DEBRIS:

1. **COLLECT:** Collect electrophoresis gels and contaminated “non-sharp” lab debris (e.g., gloves, pads, towels, tubes, etc.) into a 5-gallon pail, lined with a clear plastic bag. The 5-gallon pail utilizes a screw-top lid which must remain closed at all times except when immediately adding or removing wastes from the container. *Contact EHS to obtain a 5-gallon pail.*
2. **LABEL:** Mark on the container’s label which waste constituents are present in the pail by checking the appropriate box.
3. **NO SHARPS:** No sharp items (e.g., large plastic pipettes, razor blades, etc) are to be placed into the 5-gallon pails. See below for the proper means for disposing of contaminated sharps lab debris.
4. **DISPOSE:** Once the 5-gallon pail is 75% full, complete and submit an on-line Chemical Collection Request Form available on EHS’ website. An empty replacement pail will be provided at the time of the collection.

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CONTAMINATED SHARPS LAB DEBRIS:

Various types of sharp lab debris (e.g., razor blades, rigid plastic pipettes, etc.) may become contaminated with chemicals throughout the identification process. The contaminated sharps debris must be collected and disposed in a proper manner.

1. **DECANT:** Decant any excess solutions into an applicable waste buffer or stock solution bottle.
2. **COLLECT:** Collect the contaminated sharps lab debris into a container with rigid walls to prevent puncture. The container must remain sealed/closed at all times except when immediately adding or removing wastes.
3. **LABEL “SHARPS”:** Label (i.e., yellow self-adhesive hazardous waste label available from EHS), store, and otherwise manage the waste container in accordance with the College’s Chemical Waste Disposal Procedures. Be sure to indicate “SHARPS CONTAINING” on the label.
4. **DISPOSE:** Once full, complete and submit an on-line Chemical Collection Request Form available on EHS’ website.

STOCK SOLUTIONS:

Stock solutions typically contain higher concentrations of toxic chemicals. As such, stock solutions are unsuitable for treatment and must be submitted to EHS for disposal in accordance with the College’s Chemical Waste Disposal Procedures.

1. **COLLECT:** Collect stock solutions into a sealable bottle/container. The bottle must remain sealed/closed at all times except when immediately adding or removing wastes from the bottle.
2. **LABEL:** Label (i.e., yellow self-adhesive hazardous waste label available from EHS), store, and otherwise manage the waste container in accordance with the College’s Chemical Waste Disposal Procedures.
3. **DISPOSE:** Once full, complete and submit an on-line Chemical Collection Request Form available on EHS’ website.

SPENT BUFFER SOLUTIONS:

Spent buffer solutions typically contain low concentrations (less than 0.01% by wt) of an organic fluorescence dye used in the identification process. **These solutions are not suitable for drain disposal without prior treatment.** The following are approved methods for treating the spent buffer solutions. Please note that laboratories may also choose to submit the spent buffer solutions to EHS for disposal in accordance with the College’s Chemical Waste Disposal Procedures.

Treatment via Adsorption for Organic Fluorescence Dyes:

Filtering the spent buffer solutions, which are free of other non-organic contaminants (e.g., heavy metals) through a bed of activated charcoal or ion exchange resin is a relatively simple and effective method for removing the toxic contaminant.

1. **DETERMINE:** Utilize the College’s Drain and Trash Disposal of Chemicals procedure to determine if any of the spent buffer constituents, other than the organic fluorescence dyes, are not acceptable for drain disposal (e.g., heavy metals.) **If a spent buffer contains any constituents, other than the organic fluorescence dyes, which are not acceptable for drain disposal, then do not treat the waste.** Manage the spent buffer solution as a hazardous waste in accordance with the College’s Chemical Waste Disposal Procedures.

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2. **ACCEPTABLE/FILTER:** If the spent buffer solution contains only constituents, other than the organic fluorescence dyes, which are acceptable for drain disposal, then filter the solution through a bed or column of activated charcoal or ion exchange resin. Follow the manufacturer's directions for the filter's proper use. The following filter kits are examples of products available:

| Company Name | Product Name | Product Code | Phone Number | Website |
|-------------------------|----------------------------------|--------------|--------------|---------------------|
| Amresco, Inc. | Destaining Bags | E732 | 800-829-2805 | www.amresco-inc.com |
| BD Biosciences-Clontech | BondEX Detoxification Cartridges | K3080-1 | 877-232-8995 | www.clontech.com |
| VWR International | Extractor Waste Reduction System | 28165-500 | 800-932-5000 | www.vwrsp.com |

3. **DETECT:** If ethidium bromide (EtBr) was utilized as the organic fluorescence dye, utilize an ultraviolet (UV) light to observe its presence in the filter effluent.
- RE-FILTER:** If EtBr is still present in the effluent, then re-filter the solution. Please note that this may be an indication that the filter may be spent and need to be replaced.
 - FLUSH:** If EtBr is not observed in the effluent, then discharge to a sink drain with copious amounts of water.
4. **DISPOSE:** Dispose of the spent filter cartridges / resins in the Electrophoresis Gel 5-gallon pails.

Treatment via Chemical Detoxification for Ethidium Bromide Only:

Spent buffer solutions containing ethidium bromide (EtBr) in very dilute aqueous solutions and are free of other contaminants (e.g., heavy metals), can be chemically treated and disposed via a sink drain. This process converts the ethidium bromide to the physiologically inactive product, 2-carboxybenzophenone, with chlorine bleach.

- DETERMINE:** Utilize the College's Drain and Trash Disposal of Chemicals procedure to determine if any of the spent buffer constituents, other than the EtBr, are not acceptable for drain disposal (e.g., heavy metals.) **If a spent buffer contains any constituents, other than the ethidium bromide, which are not acceptable for drain disposal, then do not treat the waste.** Manage the spent buffer solution as a hazardous waste and submit it to EHS for disposal in accordance with the College's Chemical Waste Disposal Procedures.
- ACCEPTABLE:** If the spent buffer solution contains only constituents, excluding the EtBr, which are acceptable for drain disposal, then collect the buffer solutions into a sealable bottle/container. The bottle must remain sealed/closed at all times except when immediately adding or removing wastes from the bottle.
- LABEL:** Label the collection bottle "Spent Buffer Solution with Ethidium Bromide & Bleach."
- BLEACH:** For each 10 mg EtBr per 100 ml of solution, add 100 ml household bleach. (*Bleach deteriorates over time upon exposure to air. If in doubt about the quality of the bleach, use an excess amount and stir overnight.*)
- STIR:** Stir at room temperature for 4 hours.
- DETECT:** Utilize a UV light to observe its presence of EtBr.
 - If EtBr is still present in the effluent, re-treat the solution.
 - If EtBr is not observed, then continue.
- pH ADJUST:** Check and adjust the pH of the waste solution utilizing either sodium hydroxide or potassium hydroxide so as the resultant solution has a pH greater than 5.0 and less than 11.0.
- FLUSH:** Flush waste solution to a sink drain with copious amounts of water.

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SPILLS:

All spill response activities are to be conducted in accordance with the EHS Update – Chemical Spill Planning and Response.

References

Armour, Margaret-Ann. *Hazardous Laboratory Chemicals Disposal Guide, 3rd Edition*.