Mixed Waste Policy

Title: Mixed Waste Policy and Procedure

POLICY: The Radiation Safety Office (RSO) at the Medical Center and the Office of Environmental Health & Radiation Safety (EH&S) at the Morningside Campus manage radioactive waste, such as dry solid waste, aqueous waste and mixed waste, under their respective Radioactive Materials Licenses obtained from the New York City Department of Health (NYCDOH), New York State Department of Health (NYSDOH) and the U.S. Nuclear Regulatory Commission (NRC). However, since mixed radioactive waste contains both radioactive isotopes and hazardous chemicals, it therefore, additionally comes under the guidelines of the United States Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). The Office of EH&S collaborates with the Radiation Safety Officer (RSO) in the disposal of mixed wastes at the campuses of the Medical Center, Morningside, Lamont Doherty Earth Observatory and Nevis Laboratories.

PURPOSE: This Policy & Procedure sets forth the guidelines for mixed radioactive waste management in laboratories at Columbia University. All Responsible Investigators (RI) and laboratory workers generating mixed waste must comply with the applicable regulatory requirements as outlined by federal, state and local regulations.

RESPONSIBILITY: The RSO is responsible for the enforcement of this policy and to provide training to researchers and staff related to the management of mixed waste. All principal investigators, administrators, and laboratory personnel are required to comply with this policy for mixed waste management.

APPLICABILITY: This policy and procedure applies to all generators of mixed waste at the campuses of Lamont Doherty Earth Observatory, Medical Center, Morningside, and Nevis Laboratories.

DEFINITIONS:

1. **Aqueous Waste** - Aqueous waste refers to liquid radioactive waste that mainly consists of radioactive materials dissolved in non-hazardous water solution. It must not contain any hazardous chemicals.

2. **Hazardous Waste** – Hazardous Waste is a waste with properties that make it dangerous or potentially harmful to human health or the environment. The definition of waste materials includes spent reaction products, expired virgin materials, and materials that have no intended immediate use. In regulatory terms, a Hazardous Waste is a waste that appears on one of the four hazardous wastes lists, or exhibits at least one of four characteristics—ignitability, corrosivity, reactivity, or toxicity as outlined in the Code of Federal Regulations (40 CFR Part 261). Please refer to the EH&RS Hazardous Waste policy for additional details.

3. **Liquid waste** - Liquid radioactive waste (referred to hereafter as “liquid waste”) can be classified into two categories according to its constituents: aqueous radioactive waste (referred to hereafter as “aqueous waste”) and mixed liquid radioactive waste (referred to hereafter as “mixed waste”).

Liquid waste may consist of a variety of chemical constituents but it must be “homogeneous” and ”pourable”. Although, the presence of small amounts of non-soluble materials may be unavoidable, it should not generally contain any solid materials such as pipette tips, micro centrifuge tubes, sharps, debris or gloves etc.

4. **Mixed Waste** - The term “mixed liquid waste” or “mixed waste” refers to liquid wastes that contain both, radioisotopes and hazardous chemicals. It also includes solid, radioactive oxidizers such as thorium nitrate and uranium nitrate. Examples of mixed waste include: tritiated benzopyrene in ethyl acetate (a Flammable Characteristic Waste/Listed Waste), P-32 labeled GTP in chloroform (a Toxicity Characteristic Waste), and C-14 labeled acetic acid, pH<2 (a Corrosive Characteristic Waste). Commonly found Uranyl Acetate is not a mixed waste, but rather only a radioactive solid. The Responsible Investigator (RI) must determine if the waste generated by an experiment would be classified as an aqueous waste or a mixed waste. Please consult with the RSO and EH&S if the laboratory has questions to whether or not the waste is a “mixed waste.”

**PROCEDURE:**

1. **Liquid Waste Segregation**

Liquid radioactive waste must be segregated on the basis of chemical composition (aqueous vs. mixed) as well as by radioisotope. The mixed waste, however, must be segregated on the basis of hazard class of the chemical present in the waste (flammable, corrosive, toxic, etc.). Long lived isotopes such as 3H and 14C must be segregated from isotopes with a half-life <90 days. Scintillation vials should be segregated by half-life categories.

2. **Storage of Mixed Waste**

The liquid waste must be stored in the laboratory in a satellite accumulation area at the point of generation until picked up by the RSO. The containers should not be filled more than 75 % and then submit for a waste pickup request. Important points to remember include:

- Segregate and store radioactive waste in the laboratory at the point of generation according to isotope, chemical hazard class, and compatibility. Additional guidelines on Hazardous Waste management are available through EH&S at Morningside or CUMC and chemical segregation charts are available at [http://www.ehs.columbia.edu/chemSegChart.pdf](http://www.ehs.columbia.edu/chemSegChart.pdf).
• Mixed waste containers must remain in an upright position at all times.
• The waste container must be kept closed at all times except when adding liquid waste into the container.
• Whenever the liquid container is moved, the cap must be tightly sealed.
• Each collection container must be maintained in a secondary containment capable of holding the total volume of liquid in case of any leak or spill.
• Scintillation vials and in-vitro vials of mixed waste must be collected and stored in containers provided by RSO. Before putting vials into a waste container, the laboratory personnel must ensure that vial caps are tightened.
• Do not put other materials into mixed waste containers such as gloves, pipettes, cartons, sharps, paper towels, Styrofoam, etc.
• The RSO can provide 1 or 5 gallon plastic containers for liquid waste storage, but will allow laboratories to use other containers for the storage of mixed waste as long as it is compatible with the chemical present in the mixed waste and it is approved by the RSO and EH&S.

3. Mixed Waste Management

There should be no generation of mixed wastes without the prior written approval of the RSO. If the laboratory is planning an experiment that could potentially generate mixed wastes, a written standard operating procedure (SOP) containing information regarding collection, storage, labeling and disposal of mixed waste must be developed. The RI should forward a copy of SOP to RSO and EH&S for approval.

RI’s must store mixed waste in their laboratory at the point of generation and ensure that each container is properly closed and labeled with appropriate radiation and chemical/hazardous waste labels. Containers should be inspected on a frequent basis for leaks.

Liquid waste with hazardous constituents (flammable, corrosive, toxic, etc.) should be substituted for nonhazardous chemicals whenever the process permits to minimize the potential of mixed waste generation. Laboratories are encouraged to use non-hazardous substituted materials to minimize the generation of mixed waste, when feasible.

Laboratories should use the smallest volume of hazardous materials to minimize production of mixed waste. Do not add aqueous waste into the mixed waste as it will increase the volume and disposal cost of mixed waste.

4. Packaging Instructions

Aqueous Waste

All aqueous waste should be collected and stored per RSO guidelines found in the Radiation Safety manual available at the Morningside campus at http://www.ehs.columbia.edu/rsp.pdf and at the CUMC campus at
Mixed Waste

Laboratory personnel should observe the following rules for packaging containers of mixed waste:

- Use separate containers for short half-life and long half-life radioactive wastes.
- Use 1 or 5 gallon containers provided by RSO suitable for storage of mixed waste. If plastic carboys are not suitable for waste contents, approved glass bottles may be used instead.
- Ensure a "Caution Radioactive Materials" label is fixed to the outside of the carboy.
- Record the isotope and activity of the contents of the carboy and secure or attach it to the outside of the container.
- Secure a “Chemical/Hazardous Waste” label listing hazardous chemical(s) and percentage of each chemical on the label. The full name of the chemical must be used. Abbreviations, short hand and abbreviations may not be used. Chemical/Hazardous Waste labels may be obtained from EH&S by submitting a pickup request available at http://www.ehs.columbia.edu/cwpform.html.
- Do not overfill containers.

5. Mixed waste pick ups

Mixed waste pickups will be made directly from the laboratories upon written request of the RI, as follows:

- For the Morningside campus, pickups occur within 48 hours of submittal. For the Lamont Doherty Earth Observatory (LDEO) and Nevis campuses, pickups are addressed on a case by case basis through the EH&S Morningside campus. For Morningside, LDEO and Nevis a pickup request may be submitted at http://www.ehs.columbia.edu/rwpForm.html.
- For the CUMC mixed waste for Black, Physicians & Surgeons and Vanderbilt Clinic locations containers <5 gallons (19 liters) may be dropped off by laboratory personnel with a completed Radioactive Waste Storage Record available at http://rso.cumc.columbia.edu/forms/RSO%20Waste%20Storage%20Record.pdf in the Black Building basement room B447 between 11:00 a.m. and 12:00 p.m. Other CUMC locations are required to deliver the completed Radioactive Waste Storage Record to the RSO located in the Mailman School of Public Health on the 4th Floor.
- At the Medical Center campus, mixed waste containing isotopes with short half-life (half-life less than 60 days) will be stored in the laboratory for decay. Upon filling the container it must be sealed and dated by the RSO. At the end of decay period the RSO will assay the waste for radioactivity. If the activity is below the regulatory limits, liquid waste carboys will be handled by the EH&S.
for proper disposal.

At the Medical Center campus, mixed waste containing isotopes with a long half-life (half-life greater than 60 days), will be scheduled for pickup by the RSO from the laboratory immediately prior to shipment by a licensed vendor.

- Short-lived isotopes should be selected over long-lived isotopes as the process permits.

6. Spill Control
A copy of the RSO Radioactive Spill Procedure is posted in each laboratory where radionuclides are used. In case an aqueous waste is spilled, laboratory personnel should observe procedures outlined in the RSO guidelines and inform the RSO immediately. In case where a mixed waste is spilled, the laboratory should immediately inform both the RSO and EH&S.

7. Training
The RSO provides a radiation safety training lecture that includes waste management topics. Mixed waste training lectures will be given to individual laboratories upon request and when necessary. All investigators and laboratory workers using radionuclides must attend the initial training class prior to working with radioactive material, and must attend refresher lectures once a year, thereafter.

A schedule of radiation safety training lectures is obtainable from the RSO or via the website available at the Morningside campus at http://www.ehs.columbia.edu/TrainingSchedule.html or at the CUMC campus at http://rso.cumc.columbia.edu/training.htm.

Contacts:
Morningside Campus:

Radiation Safety: (212) 854-4442
EH&S: (212) 854-8749

Medical Center:

Radiation Safety Office: (212) 305-0303
EH&S: (212) 305-6780

Lamont Doherty Earth Observatory:

Radiation Safety: (212) 854-4442
Safety, Security & Telecommunications Office: (845) 365-8822
Nevis Laboratories:
Radiation Safety: (212) 854-4442
EH&S: (212) 854-8749

LINKS:
EPA
http://www.epa.gov/epaoswer/osw/hazwaste.htm

NYSDEC
http://www.dec.ny.gov/regs/2491.html

NYCDOH

Columbia University
Environmental Health & Safety
http://www.ehs.columbia.edu/index.html

Columbia University Medical Center
Radiation Safety Office
http://rso.cumc.columbia.edu/index.htm