

*Section 8***Radioactive Waste Disposal**8.01 Waste Containers and Disposal - General

Radioactive waste containers must be of the type supplied or approved by the Radiation Safety Office. The minimum criteria are that waste should have at least two separate layers of unbreakable containment and be clearly marked as to its radioactive contents. Examples would be a plastic carboy and spill/drip tray for liquid waste, a heavy duty plastic bag and cardboard box for solid waste, etc.

Pickup and disposal of radioactive waste is requested by submitting to the Radiation Safety Office, through the campus mail or through our website, a "Radioactive Waste Pickup Request" form (Appendix B-10). This form must be completed and submitted prior to pickup; requests by telephone are unacceptable.

All radioactive waste must be carefully prepared in compliance with campus procedures. Waste which fails to meet these minimum requirements may be refused pickup or returned to generating laboratories for additional preparation.

All radioactive waste must be disposed of through the Radiation Safety Office. The transfer of any radioactive solids to regular refuse containers or radioactive liquids to laboratory sink drains is strictly prohibited. This includes the storage for decay of short-lived radionuclides (e.g. P-32) by lab personnel and subsequent disposal as "non-radioactive" waste within the research lab.

The following waste categories (solid, liquid, liquid scintillation vials, animal) are separate and mutually exclusive.

8.02 Solid Waste Preparation*Definition*

Solid waste consists of dry, radioactively contaminated materials (typically paper, plastics, glassware and gloves).

Prohibited Materials

Although small amounts of damp materials may be unavoidably present, solid waste must not contain any free-standing liquids. (Free-standing liquid is that amount which can readily run, and thus could easily be emptied from centrifuge tubes, pipettes, etc.; it is not droplets retained in containers by surface tension or capillary action.)

Massive, non-compactable items (motors, centrifuges and heads, etc.) shall not be placed in solid waste receptacles. (Contact Radiation Safety for specific disposal procedures.)

Solid waste must not contain hazardous chemicals and materials (EPA-RCRA) such as lead pigs, stock vials with remaining liquids/powders, or sealed radioactive sources. (Contact Radiation Safety for specific disposal procedures)

Controlled Materials

Small quantities of non-integral radioactive solids (e.g., dusts, powders, fibers) must be sealed within plastic bags or plastic containers such as centrifuge tubes before being placed into solid waste receptacles. (Contact Radiation Safety when disposal of larger quantities of such materials is necessary.)

Sharp objects, such as razor blades, needles, and broken glass, must be placed within puncture resistant containers before being placed into waste receptacles.

Biohazardous materials must be sterilized before being placed into waste receptacles. (Under no circumstances are animals, associated excreta, or tissue samples to be placed into solid waste receptacles.)

Radionuclide Segregation

All solid waste must be segregated into three classes of receptacles, based upon the half-lives of contaminating radionuclides:

" $T_{1/2} < 14$ days" Radionuclides with half lives of 14 days and less (e.g., P-32, In-111, etc.) **All radioactive markings and symbols must be removed or obliterated.**

" $T_{1/2} < 90$ days" Radionuclides with half lives of 90 days and less (e.g., S-35, I-125, Cr-51, P-33, etc.), whether alone or combined with shorter-lived isotopes from multiple label experiments. **All radioactive markings and symbols must be removed or obliterated.**

"All Isotopes" Radionuclides with half lives greater than 90 days (e.g., H-3, C-14, etc.), whether alone or combined with shorter-lived isotopes from multiple label experiments.

8.03 Liquid Waste Preparation

Definition

Liquid waste may consist of a variety of chemical constituents, provided that the waste is homogeneous, is "pourable," and is segregated by radioactive half-life.

Prohibited Materials

Although small amounts of non-soluble materials may be unavoidably present, liquid waste should generally not contain solid materials, especially plastic laboratory equipment such as pipette tips, microcentrifuge tubes, etc. (Indicate on the waste pickup form if the waste does contain solids and/or precipitates.)

Controlled Materials

Biohazardous liquids must be sterilized before being placed into waste containers. (Under no circumstances are animal excreta or homogenized tissue samples to be placed into liquid waste containers; these should be disposed of according to animal disposal policies.)

Small volumes of high concentration radioactive liquids (e.g., stock solutions) should not be placed into liquid waste containers. Instead, such liquids should be capped and stored separately for receipt and disposal by the Radiation Safety Office.

Voluntary Chemical/Physical Segregation

The generation of radioactive organic and/or hazardous materials (EPA-RCRA) solutions is strongly discouraged. When generation of such organic/hazardous waste solutions is unavoidable, it is preferable to segregate them from non-hazardous aqueous solutions.

Note: Although polymerized acrylamide may be present, liquid waste containing such material must meet the basics standards of being homogeneous and pourable; solutions which are not homogenous throughout the volume of the container may be returned to generators for separation.

In all cases, radioactive waste must be fully and accurately described on waste pickup forms.

Radionuclide Segregation

All liquid waste must be segregated based upon the half-lives of dissolved radionuclides:

" $T_{1/2} < 14$ days" Radionuclides with half lives of 14 days and less (e.g., P-32, In-111, etc.)

" $T_{1/2} < 90$ days" Radionuclides with half lives of 90 days and less (e.g., S-35, I-125, Cr-51, P-33, etc.), whether alone or combined with shorter-lived isotopes from multiple label experiments.

"All Isotopes" Radionuclides with half lives greater than 90 days (e.g., H-3, C-14, etc.), whether alone or combined with shorter-lived isotopes from multiple label experiments.

8.04 Scintillation Waste Preparation

Definition

Scintillation waste consists of liquid scintillation cocktails (including dissolved or suspended samples), autoradiography enhancement solutions, and associated containers such as used counting vials.

Campus policy defines all scintillation waste to be radioactive, regardless of non-detectability of radioactivity. All such waste must be disposed of by the Radiation Safety Office.

Packaging

Scintillation waste shall be packaged for pickup as either vials in the original holding trays, bulk vials in plastic-lined fiberboard boxes, or bulk liquids in original containers or carboys supplied by the Radiation Safety Office.

8.05 Animal Waste Preparation

Definition

Animal waste consists of carcasses, tissue samples, and excreta which may contain radioactive materials. Prior to generating radioactive animal waste, the experimental protocol must be reviewed and approved by the Radiation Safety Office, EH&S.

"Non-Radioactive" Animal Waste: Contains H-3 and/or C-14 at a combined concentration of less than 0.05 uCi / gram, averaged over the entire mass of the animal carcass, tissue, and/or excreta. Such waste may be disposed of through regular campus procedures and animal waste contractors, provided that written records are maintained of pertinent radionuclides, activities, and waste masses.

Radioactive Animal Waste: All animal waste that does not qualify as non-radioactive on the basis of combined H-3 and C-14 concentrations. Animal waste within this category must be disposed of as radioactive waste.

Preparation for Radioactive Disposal of Animal Waste

Animal waste must be carefully prepared before pickup by Radiation Safety Personnel:

- (a) All biohazardous waste must be sterilized;

- (b) All waste must be double bagged or placed inside airtight plastic containers;
- (c) All waste must be either completely frozen or dry at the time of pickup.

8.06 Miscellaneous Waste Preparation

Contact the Radiation Safety Office for detailed instructions concerning the disposal of radioactive materials which do not fall within the categorical definitions of solid, liquid, scintillation media or animal waste. (This is especially important during the planning of new protocols which may generate large volumes of such waste.)

One broad class of such miscellaneous waste includes items such as lead pigs, stock vials (with or without remaining activity), high concentration solutions (≥ 100 uCi / cm³), and radioactive sealed sources.