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⚡ UC IRVINE RADIATION SAFETY NEWSLETTER ⚡

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Prepared and distributed by the staff of the Radiation Safety Division of EH&S

The purpose of this newsletter is to keep radioactive material users at UC Irvine informed regarding campus radiation safety policies and procedures including tips to improve safety. Visit the EH&S website (www.ehs.uci.edu) under "Radiation & Laser Safety" for more information.

AUTHORIZED RADIOISOTOPE LABORATORIES

Each *Radiation Use Authorization (RUA)* includes a list of the rooms which are authorized by that RUA for the use and storage of radioisotopes**. *Under no circumstances should other rooms be used for radioisotope use or storage until EH&S is first notified and the new rooms are added to the RUA.*** EH&S will only add the new rooms to the RUA after verifying that they are suitable for use involving radioisotopes. This evaluation includes the following factors:

- Office areas may not be used for radioisotope use or storage.
- Rooms in which radioisotopes are stored must be lockable so that unauthorized persons will not have access to them after-hours. Ideally, in cases in which multiple research groups share rooms (a common practice in buildings such as Sprague Hall, Hewitt Hall, etc.), it is highly advisable for each research group to store their radioisotopes in lockable freezers, refrigerators, drawers or in separate rooms under the sole control of their Principal Investigator and his/her research group.
- Radioisotope labs must have floors and walls which can be easily decontaminated – no carpeting or wallpaper is allowed.
- Radioisotope labs may not be situated such that personnel in adjacent uncontrolled office areas, corridors, service rooms, etc., can be exposed to significant amounts of radiation. This is primarily the case when large quantities of high-energy gamma radiation-emitting radioisotopes are used.
- It is ideal when radioisotope labs are interconnected or immediately adjacent to each other so that it is not necessary to transport radioisotopes between buildings, to other floors in the same building, or to rooms a sizable distance down the hallway on the same floor.

USING A GEIGER COUNTER FOR ESTIMATING RADIOACTIVE SURFACE CONTAMINATION

Although Geiger counters can be very useful in providing you with a ***qualitative*** indication that radioactive contamination is present (yes, there is contamination or no, there is not contamination), using these radiation detectors for the ***quantitative*** purpose of determining the level of contamination present is a complicated problem.

The effectiveness of your Geiger counter depends upon the detection efficiency of the instrument. Some facts about detection efficiency are provided below:

- A Geiger counter typically detects only a small percentage of the radiation that is actually being emitted by a spot of radioactive contamination; therefore, measured counts per minute (cpm) are not equal to actual radioactive disintegrations per minute (dpm).
- The instrument's detection efficiency is defined to be cpm/dpm x 100%, or the actual percentage of disintegrations per minute detected by the meter in use.
- The following parameters all affect detection efficiency:
  - **Shielding**

    The materials present between the radioactivity and the detector (i.e., dust, liquid, etc.) can greatly reduce the amount of radiation detected. Even air provides significant shielding for low-energy beta particles such as those emitted by ^{14}C, ^{35}S, and ^{33}P. For example, the maximum range of ^{35}S beta particles in air is less than one foot.
  - **Geometry**

    The radiation from a spot of contamination is emitted in a *4π geometry* meaning in all directions (up, down, to the right, etc.) but a detector placed directly over the contamination is only seeing at best about half of the sphere of emissions, or about a *2π geometry*. This means that, in theory, a detector placed almost in contact with a small spot of contamination is likely to only see only about half of the emissions.
  - The distance of the detector surface from the contamination and the thickness of the detector window can greatly affect the count rate measured.
  - The greater the surface area of the detector, the more efficient it will be. This is why EH&S uses "pancake" Geiger counter probes, which have a relatively high surface area, when we perform contamination monitoring.
- On the average, Geiger counters with pancake probes have a counting efficiency that is about 25 - 30% for ^{32}P beta particles and less than 5% for ^{14}C and ^{35}S betas (since the air and the detector window absorb so much of the beta radiation). The counting efficiency for ^{3}H betas is 0% since the beta particles are too weak to make it through the detector window of the Geiger counter.

MEMORABLE QUOTE

Every experiment proves something. If it doesn't prove what you wanted it to prove, it proves something else.

Origin Unknown

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DEFACING RADIOACTIVE MATERIAL LABELS

Never dispose of anything in the regular trash which is contaminated with radioactivity or which identifies an item as possibly being radioactive or potentially contaminated. **This includes anything with the word "radioactive" or the radiation symbol on it.** Boxes in which radioisotope shipments were received have been checked for contamination by EH&S so they do not need to be disposed of as radioactive waste unless they were contaminated in your lab. Once all of the radioactive symbols and inscriptions are defaced, these boxes may be disposed of in the regular trash. This goes for anything containing the radiation symbol or related inscriptions such as *yellow radiation caution tape*. Deface or remove the labels before putting the items in the regular trash.

As a reminder, never place any items in the regular trash which are identified as hazardous in any way. This includes items labeled with the hazard symbols below. Trash collectors or landfill personnel could believe that the hazardous material is still inside when in reality it is just the "clean" outer box being discarded. This can cause substantial problems such as landfills temporarily shutting down operations until it is shown that conditions are safe!

RADIOISOTOPE SHIPMENT OUTER CONTAINERS

All outer containers for radioisotope vials (often called "pigs") can be disposed of by saving them and giving them to EH&S personnel at the time of a radioactive waste pickup from your lab. At present there is no additional charge for this service. Radioactive contamination monitoring of these "pigs" must be performed by lab personnel prior to their release to EH&S, and the radioactive material labels and inscriptions need to be defaced in advance of the waste pickup. If they are found to be contaminated, they must be cleaned prior to disposal. Make sure the vials that contained the radioisotope have been removed. If desired, plastic "pigs" that contain no lead can be disposed of with the dry radioactive waste. However, since lead is a hazardous material, all "pigs" containing lead must be disposed of through EH&S – never put them in with your dry radioactive waste!

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RADIOACTIVE CONTAMINATION-REMOVING CLEANING PRODUCTS

Several products are available which are marketed on the basis of their usefulness in cleaning up radioisotope spills. The two most popular products in this category are *Radiacwash* and *Radcon*. However, these products are pricey and are not much better in cleaning up relatively minor spills than common household cleaners like *Formula 409* and *Lysol Kitchen Cleaner*. Always be sure to contact EH&S for assistance in the decontamination effort if you have a large spill.

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☞ **If you have any questions about radiation safety, please contact EH&S at 949-824-6200. We will be happy to assist you with any radiation safety-related matter!**