

BALL STATE UNIVERSITY
RADIATION PROTECTION PROCEDURES*

USER'S GUIDE

At Ball State University, there are two categories of material users. Authorized Users and Supervised Users. Authorized Users must have faculty status and experienced use of radioactive materials. Faculty desiring Authorized User status must provide evidence of radiation experience and training and be approved by the Radiation Safety Committee. Supervised Users work under the supervision of an Authorized User. All users are required to attend annual Radiation Safety Training sessions. In addition, Supervised Users must be appropriately trained for use of materials in the Authorized User's laboratory.

Procedures for New Users

Approval for the new use of radioactive materials is given by the Radiation Safety Committee and obtained by submitting a Radiation Project Approval form detailing the project, requested material and its activity, use location, monitoring plans, users, and waste plan. Please note: in vivo studies using radioactive materials are prohibited under the terms of our NRC license. The Radiation Safety Committee will review new-use application for approval (or disapproval). _____

*This document has been approved by the University Radiation Safety Committee, the governing body in such matters. Copies are available from the University Radiation Safety Officer.

In order to expedite the work of the Radiation Safety Committee, there has been established a Radiation Safety Officer (RSO), who acts as the committee's executive officer. Initial contacts should be made with this individual who will make approval forms available.

The Radiation Safety Officer will prepare documentation of the proposal and will ascertain whether the use is proper, whether the potential user has the necessary background and training, and whether any proposed purchases of radioactive materials conform to the terms of the Ball State Byproduct Material License. In vivo studies using radioactive materials are **not** allowed under our license. If in the RSO's judgment the proposal is straightforward, routine and non-controversial, conforms to all rules and regulations, and has negligible impact on the environment, the RSO is empowered to act for the Radiation Safety Committee. Any proposals of a questionable nature are to be referred to the full committee.

The person wishing to use radioactive isotopes will need to determine quantities required, how the material is to be handled, how the radiation level is to be monitored, where the material is to be used, and how radioactive waste is to be disposed of. This can be done in part by conferring with the Radiation Safety Officer.

Training Session

A formal training session for authorized and supervised users will be offered annually. Training will be provided by the RSO and is mandatory. Each user will verify that he/she understands the material in the "User's Guide" by signing a tear-off sheet. Students will participate in the training sessions and will receive individual instructions from their mentors on procedures in specific laboratory situations. A multiple-choice test will be administered to participants following the training session. Individuals who are authorized at other times of the

year will be asked to view a CD-Rom of the training session and will receive individual instructions from the RSO.

Purchasing Materials

It is a requirement of the license that all purchases of radioactive material be made by the Radiation Safety Officer. To ensure compliance, this can be done by routing the purchase order through the RSO for signature before submitting the purchase order to Purchasing. Approval may also be obtained electronically. The requisition must also specify delivery of the shipment to the Biology stockroom, CL 128.

The Radiation Safety Officer will determine that the shipment has arrived in good order, verify that no breakage and subsequent contamination have occurred, and transfer the material to the person requesting it.

Monitoring

The Radiation Safety Officer will provide new users with sources of information of a technical nature, copies of federal regulations, health physics data, monitoring procedures, and other needed information. The RSO may require inexperienced users to work for a time period under the close supervision of a person already experienced in radiation techniques.

The Radiation Safety Officer will obtain film and/or ring badge service for users, where such use is warranted by the amount and type of radiation to be encountered. Film and/or ring badges are to be exchanged at monthly intervals by the Radiation Safety Officer.

Laboratory Rules and Regulations

1. Eating, drinking, smoking, and the application of cosmetics in the laboratory are specifically forbidden in areas where radioactive materials are being used.
2. Pipetting or the performance of any similar operation by mouth suction is prohibited.

3. Generally, laboratory protective clothing will not be required considering the rather low levels of activity to be encountered at the University. In special cases, the Radiation Safety Officer may require special gear, especially gloves (see Statement #6 below). In any case, protective clothing shall be left in the laboratory.
4. Before leaving the radiation area, if there is any likelihood of contamination, the hands shall be washed first then checked with a beta-gamma survey meter.
5. If, in the course of working, personal contamination is suspected, a survey with a suitable instrument shall be made immediately, to be followed by the required cleansing. Routine precautionary surveys shall be made at intervals.
6. No person shall work with active materials while having breaks in the skin on the hands without using disposable plastic gloves. Gloves shall always be used when working with levels of activity of a millicurie or higher.
7. Radioactive wastes are kept in individual laboratories until notified that there will be a waste pick-up. Radioactive wastes with half-lives of 120 days or less are retained until the exposure rate is indistinguishable from background radiation exposure. Short-lived and long-lived waste materials will be stored for a maximum of 2 years.
8. Active liquid wastes shall be poured into a labeled container. Low-levels of H-3 and C-14 are disposed of in the sanitary sewage system provided: (a) the material is water-soluble or dispensed in water; (b) release occurs in concentrations no higher than 3×10^{-4} $\mu\text{Ci/ml}$; (c) no more than 800 μCi is dumped per month and no more than 5 Ci of H-3 and 1Ci of C-14 is dumped by the entire university per year; (d) only designated drains are used for disposal; (e) toxic chemical wastes may not be dumped; and (f) records are kept on a form provided for this purpose of all wastes disposed of by this method.

9. Active solid wastes and contaminated materials shall be placed in labeled radioactive trash cans. Separable non-contaminated papers or packaging materials shall be placed in regular trash containers. Do not mix non-radioactive waste with radioactive waste.
10. "Good Housekeeping" in the laboratory shall be maintained at all times. Spillage should be prevented, but in the event of such an accident, the following procedure shall be followed:
 - a. The liquid shall be contained with absorbent paper, while WEARING protective gloves.
 - b. All disposable materials contaminated by the spill and by the cleaning operation shall be placed in a radioactive trash can.
 - c. The area of the spill must be marked and the type of radioactivity (e.g., I – 125) indicated.
 - d. The appropriate authorities and the RSO are to be notified.
11. In general, wash water shall not be discharged into the public water sewage system if it contains appreciable activity above background, when measured with a counter type survey meter. (If a contamination does not rinse out easily, the apparatus may be soaked in a "contaminated" cleaning solution or disposed of in a radioactive trash can.)
12. In general, active substances and contaminated materials are to be retained within the laboratory, and at specific places within the laboratory. Except for properly enclosed samples being taken to the counting area, no transfer of activity shall be made without specific instructions from the person in charge.
13. In general, no person shall work in a radioisotope laboratory without wearing an approved type of dosimeter (usually film badge). Exceptions may be made for certain types of tracer work where most dosimeters are ineffective.

14. All wounds, accidents, spills or other emergencies related to radioactivity shall be reported to the person in charge of the laboratory and the Radiation Safety Officer.
15. Glassblowing, welding, brazing, soldering, etc., should never be permitted on equipment contaminated with radioactive materials unless done under controlled circumstances where inhalation of radioactive dust and fumes cannot occur.
16. Users will survey their work areas weekly, when radioactive material is being used, to assure that there is no radioactive contamination. Areas using carbon-14, sulfur-35, and tritium will be wiped with a piece of filter paper and counted in the Beckman Liquid Scintillation System; areas using Phosphorous-32 and gamma emitters will be surveyed with an end window G.M. detector. Levels of contamination considered acceptable are essentially zero. Records of surveys are to be preserved in a logbook system within each area where isotopes are used. All work using radioactive materials that could produce airborne particles or gases will be conducted in hoods. In the event that particulates may be produced, the sampling program contained in NRC Guide 89.23 will be implemented.
17. Radioactive materials are to be kept in containers marked with the standard appropriate "radiation" labels. When not in use, they are to be kept in locked storage, that is either in locked cabinets, or hoods or refrigerators in rooms which are kept locked when not in use. Gamma emitters are to be stored in lead shields of a thickness appropriate to the level of activity.
18. Any area where sufficient radioactive materials are located for a person to receive 5 millirem/hour or more of whole body radiation, will be designated a restricted area and must be posted with a "radiation area" sign.

Area Surveys

In order to assure that there is no radioactive contamination in approved laboratories, all laboratories using radioactive materials in chemical form are surveyed monthly by the RSO designated student assistant. These surveys will not be announced in advance, but efforts will be made to conduct them in the presence of the person in charge.

In addition, during periods when work is in progress, it is required by the terms of the license that persons actually working in the various laboratories conduct for themselves surveys of their own areas (see #16 above). Surveys are to be made to determine the presence of radioactive contamination on laboratory working surfaces, floors, clothing, hands, etc. Dated records of any subsequent decontamination efforts are to be kept in a logbook provided for the laboratory by the Radiation Safety Officer.

Emergency Procedures

Every effort should be made to avoid radioactive spills, inhalation, or ingestion of radioactive materials, or exposure to large doses of radiation. However, the possibility of such an event, possibly fire related, is always present. In the event of a minor mishap, the procedures to be followed are as follows:

1. **Minor Spills**
 - a. Notify persons in the area that a spill has occurred.
 - b. Prevent the spread of contamination by covering the spill with drop-absorbent paper.
 - c. Mark off contaminated area. Do not allow anyone to leave the contaminated area without being monitored .
 - d. Promptly notify and report the incident to the Radiation Safety Officer
(#5-8066, 286-1974).

- e. Clean up the spill, wearing disposable gloves and using absorbent paper; ideally, this is to be performed by RSO and/or RSO's staff.
- f. Put contaminated gloves and any other contaminated disposable material in bag.
- g. Survey spill area with appropriate survey meter or technique. Also, check hands, clothing and shoes for contamination.
- h. Allow no one to return to work in the area unless approved by the RSO.
- i. Cooperate with and follow the instructions of the RSO and/or RSO's staff.

2. Personnel Decontamination

If personnel contamination is suspected, first identify contaminated areas with survey meter. Do not use decontamination methods that will spread localized material or increase penetration of the contaminate into the body (e.g., by abrasion of the skin).

Irrigate any wounds profusely with tepid water and clean with a swab. Follow with soap or detergent and water (and gentle scrubbing with a soft brush, if needed).

Decontamination of wounds should be accomplished under the supervision of a physician.

Use the following procedures on intact skin:

- a. Wet hands and apply detergent.
- b. Work up good lather, keep lather wet.
- c. Work lather into contaminated area by rubbing gently for at least 3 minutes. Apply water frequently.
- d. Rinse thoroughly with lukewarm water (limiting water to contaminated areas).
- e. Repeat above procedures several times, gently scrubbing residual contaminated areas with a soft brush, if necessary.

- f. If the radiation level is still excessive, initiate more powerful decontamination procedures after consultation with the Radiation Safety Officer.

In the unlikely event of major releases of activity through fire, explosion, etc., the following more drastic procedures are necessary.

3. Major Releases of Activity

- a. If possible, cut off the release of radioactive materials from the source to the environment, but avoid breathing in high concentrations of radioactive material. Close windows and hood front.
- b. Evacuate people from room and close doors. Remove contaminated shoes and laboratory coats at laboratory door to avoid tracking or the spreading of radioactive material.
- c. Report incident as soon as possible to the Radiation Safety Officer, or if he/she is not available, to the alternate Radiation Safety Officer and to the Office of the Provost #5-1333.
- d. Report incident as soon as possible to campus police.
- e. If there is any possibility of airborne contamination, steps should be taken to shut off hoods and ventilation equipment of the area affected. This is done by locating the Building Mechanic, or, if that fails, the campus police will locate the appropriate building maintenance supervisors.
- f. Seal doors with tape if airborne material is involved and if there is no net flow of air into room (i.e., as a result of exhaust through hoods).
- g. Lock or guard the doors and post appropriate signs warning against entry.

- h. Assemble in nearby room with other personnel suspected of being contaminated. Wash off suspected exposed areas of the skin, if there is a delay in performing a survey. Do not leave the control area until you have been thoroughly surveyed for contamination.
- i. Major decontamination procedures should be attempted only by personnel experienced in radiation protection.
- j. If a person should inhale, ingest, or otherwise be exposed to large doses of radiation, that individual should be taken to the Health Center and the RSO is notified.

Implementation of Procedures

Those persons, who are to use radioactive materials at Ball State University, will as deemed necessary by the Radiation Safety Officer, be issued copies of the procedures as described above. After becoming familiar with the procedures, they will remove the form appended to the end of this document, sign and return it to the Radiation Safety Officer.

Faculty who are already using radioactive materials are also expected to follow these procedures and to participate in annual training sessions. Such participation is a requirement for continued approval as a radiation user.