

WEST VIRGINIA SCHOOL OF OSTEOPATHIC MEDICINE

RADIATION SAFETY PROCEDURES MANUEL

FIRST EDITION

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The foregoing procedures have been developed by the Acting Radiation Protection Officer of West Virginia School of Osteopathic Medicine. Adherence to these regulations is necessary if we, as a medical school, are to continue to advance in our nuclear science activities.

It is important that all individuals associated with the use of radioactive materials, comply with the policies of the Radiation Safety Committee, so that we may be assured that effective radiation safeguards are being practiced with the medical school.

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INTRODUCTION

Ionizing radiation is being used effectively at the West Virginia School of Osteopathic Medicine for clinical diagnosis, teaching and research purposes. It is recognized that its use is not without some risks, however small to the user, to other individuals and to the environs. Therefore, to minimize these risks, radiation exposure to people and environs should be kept as low as practical. National and international scientific organizations have proposed guidelines for the use of radioactive materials and radiation-producing machines and the Federal and State Governments have established regulations controlling the use of radiation.

A license is issued to institutions that perform a variety of tasks with many different radionuclides and who have demonstrated that they have knowledge and capability for performing this work safely. A committee composed of individuals knowledgeable in the various applications of radiation administer the license. This committee must approve in advance the purchase and use of all radioactive materials. The WVSOM Committee grants capable individuals permission for use of radioactive material. The individuals are responsible to the WVSOM Radiation Safety Committee, for the safe use of radioactive material.

This booklet is provided to define the proper procedure for procuring and using radioactive materials at WVSOM. The procedures are based on NRC Federal Regulations and must be followed if we are to continue to use radiation in our work. Unless other provisions are approved in writing by the Radiation Safety Committee, the procedure set forth in this booklet must be used by all personnel at WVSOM.

RADIATION SAFETY COMMITTEE

The Radiation Safety Committee will be composed of:

- (a.) Chairman of each department or a member of the department, appointed by the chairman.
- (b.) A member of the medical staff, expert in one or several of the following: internal medicine, hematology, therapeutic radiology and nuclear medicine.
- (c.) The administration.
- (d.) Business Office.
- (e.) Radiation Protection Officer.

The licensees and department heads will be given a list of the members of the WVSOM Radiation Safety Committee at least once every year, and informed when any changes occur. The committee will meet at least once every three months.

The responsibilities of the Radiation Safety Committee are:

1. To establish the radiation safeguards to be used at WVSOM.
2. To enforce the radiation safety practices outlined in this booklet.
3. To develop criteria by which to evaluate the qualifications of all individuals working with radioactive materials.
4. To approve or disapprove the use of radioactive materials to individuals.
5. To maintain a current file of Federal, State and local regulations, pertinent to the radiation safety program.
6. To maintain records of committee action.
7. To review plans for all new building and modifications of existing structures where ionizing radiation is to be used.
8. To maintain a radiation training program dedicated to teaching the fundamentals of radiation safety.

The Radiation Safety Committee will be responsible to the President of WVSOM. Problems concerning the safe use of radiation will be dealt with in the following order until satisfactory corrections have been made; the individual; the laboratory director; the Radiation Safety Committee; the appropriate Dean or Administrator, the President of WVSOM.

The Radiation Protection Officer or the Radiation Safety Committee may stop any work that in his or the committees opinion, may be a radiological hazard.

INDIVIDUAL IN-HOUSE LICENSING

No one may use radioactive material, regardless of the quantity, until he has been approved for its use by the WVSOM Radiation Safety Committee. Ordinarily, approval will be granted to only those who have had formal training in radioisotope techniques and theory, or who have had extensive experience using radioactive materials. The individual must demonstrate that he is capable of using radioactive materials safely.

Applications for use of radioactive materials may be obtained from the Radiation Protection Officers. The completed application should be returned to the Radiation Protection Officer. The Radiation Protection Officer will review the application, and inspect the applicants facilities and equipment, to insure adequacy for the use specified in the application. The Radiation Protection Officer will attach a report of his findings to the application and forward them to the chairman of the Radiation Safety Committee.

Copies of the application will be forwarded to the members of the Radiation Safety Committee for their approval. Any disapproval will be made in writing and returned to the chairman of the Radiation Safety Committee. The Chairman may ask for additional information from the applicant or the Radiation Protection Officer, or he may hold the application for discussion at the next Radiation Safety Committee meeting.

If the application is disapproved, it will be returned to the applicant together with reasons for disapproval. If the application is approved, a In-House license will be granted for conditions specified in the application, and any additional conditions specified by the Radiation Safety Committee.

Requests for changes in possession limits or uses similar to a previous In-House license require only the approval of the Radiation Safety Officer and the Chairman of the Radiation Safety Committee.

The Radiation Safety Committee may revoke an In-House licensing if an individual refuses to abide by the procedures and regulations, or if the individual habitually creates radiation hazards.

In-House licenses must be reviewed every 2 years.

The possessor of an In-House license is responsible for:

1. The safe use of radioactive material in his possession.
2. The training of personnel working with radioactive material or radiation producing equipment (WVSOM courses will be available periodically). Every individual working with radioactive materials must be familiar with these procedures.
3. Making available properly operating radiation detection instruments.
4. The procurement of all material and equipment needed for the safe use of and storage of radioactive material, or radiation producing equipment.
5. Maintaining records showing the receipt, use, disposal and transfer of all radioactive material (Radioactive Material Record forms are available from the Radiation Safety Officer).
6. Making certain all personnel working in radiation areas or with radioactive materials, wear radiation detection badges.
7. Notifying the Radiation Safety Committee of transfers of radioactive material to areas other than those stated on the license application.
8. Notifying the Radiation Safety Committee of any changes in personnel.
9. Making certain all radionuclides used for injection into humans are pure, sterile and pyrogen free.

INDIVIDUAL RESPONSIBILITIES

The success of the Radiological Safety Program at WVSOM depends on the individual handling the material, or using a device that produces ionizing radiation. The individual is responsible for:

1. Safe use of the material or machine with which he is working.
2. Reporting any defective equipment or radiation survey instrument to his supervisor or Radiation Protection Officer.
3. Being familiar with the WVSOM Radiation Safety Procedures and any administrative control that may apply to his work.
4. Proper labeling of all vials and containers, containing radioactive material.
5. Proper storage of all radioactive materials.
6. Immediate notification to the Radiation Protection Officer and the Radiation Safety Committee in the event of an emergency, or a situation that may create a radiological safety hazard.
7. Wearing of the radiation detector badge in a location on the body that will give the most accurate measurement of exposure.
8. Reporting immediately to his supervisor and Radiation Safety Committee of any lost or stolen radioactive material.
9. Wearing of adequate protective clothing (if the individual is not aware of what protective clothing is needed, he should contact the Radiation Protection Officer).
10. Continuing to review the Radiation Safety Procedures Manual and improving educational standards, regarding his work and radiation safety.

PROCUREMENT OF RADIOACTIVE MATERIALS

Only those individuals with a In-House Radiation License issued by the Radiation Safety Committee, may receive radioactive material. In order to receive radioactive material, one must submit a requisition in duplicate (original and one copy) to the Radiation Protection Officer, stating the full description of the material needed, the activity, the catalogue number, and the vendor. The requisition must be signed by the In-House license holder. If special handling of the shipment is necessary, the procedure should be worked out between the license holder and the vendor, and stated on the requisition.

The Radiation Protection Officer will check the information on the requisition to determine if the In-House license holder has been granted approval to receive the isotope in the form desired and if the amount of the order, plus the amount on hand does not exceed the quantity stated. If all specifications are fulfilled, the requisition will be approved.

The Radiation Protection Officer will not assume any responsibility for the material delivered to the WVSOM receiving office. If the order is late or not delivered, tracing material and correcting the order will be the responsibility of the In-House license holder.

Radioactive material will be delivered to the Receiving Department. The Receiving Department will notify the Radiation Protection Officer. When the Receiving Department is closed, the radioactive material will be delivered to the WVSOM Security Guard, who will notify the Radiation Protection Officer.

The Radiation Protection Officer will perform the necessary wipe tests and exposure rates on all contact surfaces. The Radiation Protection Officer will maintain a log of all radioactive shipments, stating the isotope, the chemical form, the activity, the purchase order number, the vendor, the In-House license holder, the date received and results of wipe tests and radiation survey.

The Radiation Protection Officer will notify the In-House license holder to pick up the isotope. Before the material is used, a survey must be made to determine the radiation contamination and radiation level of the package. This information will be given to the Radiation Protection Officer during the next day.

STORAGE OF RADIOACTIVE MATERIAL

Each In-House license holder will designate specific locations for storage of radioactive materials. The storage area must have prior approval by the Radiation Protection Officer. When the storage area is located in a laboratory or office, it must have adequate shielding (less than 2 mR/hr.). If the storage area is in a hallway or area open to the public it must have adequate shield to insure the exposure rate does not exceed 0.5 mR/hr. Storage facilities in hallway or area open to the public must be locked at all times. Radioactive material that are volatile or powdery, or that might become airborne, must be kept in a hood. All storage facilities must be labeled with the conventional radiation symbol and bear the words "Caution Radioactive Material" ("Danger" may be used in place of "Caution"). All storage containers must be labeled with a standard radiation symbol, and the identity and quantity of the nuclide in the container.

USE OF RADIOACTIVE MATERIAL

Prior using any radioactive material, an individual must receive training and/or indoctrination from the In-House license holder and the Radiation Protection Officer, regarding the safe handling of material and equipment. The individual must be familiar with the contents of the Radiation Safety Procedures Manual, and any administrative controls. He must obtain a radiation detection badge and any biological samples, if required.

PROCEDURES FOR WORKING WITH RADIOACTIVE MATERIALS

Work with radioactive materials will be performed only in those areas approved by the Radiation Safety Committee. Any work that may produce airborne contamination must be performed in hoods, designated by the Radiation Safety Committee. These hoods have adequate filters to prevent radionuclides from being dispersed to the outside air. Therefore, any work with volatile or powdery radioactive material must be approved by the Radiation Safety Committee.

To reduce the probability of a costly clean-up operation, the work area should be lined with a protective covering. If liquids are involved, the lining should be an absorbent material, with a water repellent back.

An instrument capable of detecting radioactive material must be available to monitor the area and hands at frequent intervals. The hands must be monitored before eating, smoking or applying cosmetics. The area must be monitored when the work is finished or when leaving for the day.

All work areas must be posted with signs with the conventional radiation symbol. All containers used for storage of radioactive materials must be labeled with the conventional radiation symbol. Counting vials do not have to be labeled.

PIPETTING of radioactive materials BY MOUTH IS PROHIBITED. Eating will not be permitted in areas where radioactive materials are used. Smoking and drinking may be permitted in areas where microcurie quantities are used and frequent surveys indicate contamination is not a problem. The individual must be aware of the potential hazard of internal deposition of radionuclides from smoking, drinking and applying cosmetics. If there is any doubt, then smoking, drinking and applying cosmetics should be suspended. The Radiation Protection Officer will determine areas where eating, smoking, drinking are prohibited.

Minor skin breaks must be covered with waterproof bandages before handling any radioactive material. Persons having deep cuts or large abrasions will not be permitted to work with radioactive materials. Rubber gloves should be worn whenever hand contamination is probable. Gloves known to be contaminated should be washed before removal.

Contaminated gloves and bench paper should be disposed of according to proper procedures, approved by the Radiation Safety Committee. A dry waste disposal barrel will be available for contaminated gloves, paper, etc. A liquid waste disposal barrel will be available for liquid wastes.

USE OF RADIONUCLIDES IN EXPERIMENTAL ANIMALS

The WVSOM Radiation Safety Committee must be informed of all investigations, requiring administration of radionuclides to experimental animals. Each investigator will be responsible for notifying the Radiation Safety Committee and the Animal Care Committee, of the intended use of radioactive materials in animals.

The following items must be carefully considered and provided for, according to the type of radioisotope used and the requirement of the experiment:

1. In most instances it is preferred that animals given radioisotopes be housed in a separate room. Special ventilation, surface preparation, drainage or other room design requirements should be considered. All rooms containing radioactive material must be properly posted.
2. When high level radiation is anticipated, portable radiochemical glove boxes should be used.
3. Standard animal cages can be used if isotopes can be easily removed by mechanical washing. If decantamination is difficult, arrangements must be made for metabolism cages or other unusual caging requirements.
4. Adequate utensils and instructions must be provided when radioactive materials are added to food or drinking water.
5. Routes and form of excreted radiolabeled material must be taken into consideration in regard to safe handling of animal bedding, cages, room surfaces and room air.
6. Animal care technicians must be given explicit instructions and provided with necessary protective and monitoring devices to assure their safety.
7. Plastic backed absorbent pads, plastic bags and other items should be used in animal wards for containment of isotope spillage or waste.
8. Animal carcasses, contaminated bedding and equipment must be surveyed for radioactivity and provisions made for decontamination or disposal.

WASTE DISPOSAL OF RADIOACTIVE MATERIAL

All radioactive waste will be disposed by the Radiation Safety Committee. The Committee will furnish labeled containers for solid and liquid waste. Plastic bags will be provided for disposal of animal carcasses as large as a dog and for liners for solid waste containers. Special containers, if needed, must be provided by the user and approved by the Radiation Safety Committee. Liquid wastes must be stored in noncorrodible and unbreakable containers. All waste containers must be labeled with the conventional radiation symbol and words "Caution Radioactive Material". In addition, the isotopes, amount and dates, must be noted on the package.

The In-House license holder will be responsible for the storage of animal carcasses if they have to be held for periods longer than a month, or if their size prohibits storage in the freezer.

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Washwater is the only radioactive waste a In-House license holder is permitted to discard. Equipment used to contain activities greater than one millicurie should be rinsed and the rinse water discarded in the liquid waste container.

PERSONNEL MONITORING

Any person who is likely to receive an entire body exposure of 300 mRem or an extremity exposure of 4,000 mRem, or more in a three month period, must have a record of the estimated exposure received.

Any person entering a high radiation area must wear a radiation detector badge. External radiation exposure will be determined from the radiation badges. Exposure from internal emitters will be determined by the biological samples.

Radiation detection badges must be worn at or above the hip level in a position that most accurately reflects the highest exposure of the body.

If there is a suspected accidental inhalation, ingestion or skin puncture, involving radioactive material, the Radiation Safety Committee should be contacted immediately.

The Radiation Safety Committee shall maintain a permanent record of all personnel exposures.

POSTING AND LABELING

The Radiation Safety Committee shall maintain a supply of signs and labels for posting and labeling radiation areas, and radioactive material containers. The In-House license holder is responsible for obtaining special signs or labels needed. The license holder is responsible for proper labeling areas and storage containers where radioactive materials are kept.

SURVEY

Laboratory and personnel surveys are conducted to inform the user of the radiological hazard he is creating. It is required that surveys be performed and records maintained.

Many situations that require monitoring are obvious, i.e., a spilled radioactive liquid or an unshielded gamma source, however, others are more subtle. Area surveys will be made when work is completed or at the end of the day. Personnel surveys will be made whenever the individual stops work for a coffee break, or lunch, or at the end of the work day.

Any smearable contamination observed greater than 100 cpm above background will be reported to the individual doing the work, and will be cleaned at the first available opportunity. Any smearable contamination observed greater than 1,000 cpm beta or gamma or 500 cpm alpha will be cleaned immediately, and the supervisor and Radiation Safety Committee informed.

Any skin contamination should be washed immediately with soap and water. If soap and water do not remove the contamination, contact the Radiation Protection Officer. Care should be taken not to spread the contamination to another part of the body.

To remove contamination from clothing, press masking tape to contaminated area, remove the tape and monitor tape and clothing. If tape does not remove contamination, contact the Radiation Protection Officer. If a liquid is used to remove contamination, remove the clothing. NEVER wear contaminated clothing home.

RADIATION SAFETY COMMITTEE RECORDS

The Radiation Safety Committee shall make and retain records as follows:

1. Personnel monitoring records - permanently.
2. Survey Records - permanently.
3. Receipt Records - 5 years.
4. Disposal Records - 5 years.
5. Instrument Calibration Records - 5 years.

IN-HOUSE LICENSE RECORDS

Every license holder is required to keep a record of receipt, use, and disposal of all radioactive material received. These records must show the quantity of material on hand at any time. The Radiation Protection Officer will not place any order for radioactive materials unless these records are maintained by individual license holders.

EMERGENCY PROCEDURES

Accidents will occur despite all safeguards. Individuals working with radioactive material must be capable of making a quick gross evaluation of an accident. Uncontrolled spread of radioactivity may entail spending large amounts of money for a clean-up and may result in large areas being closed for indefinite periods.

Proper procedures and speed are key elements in preventing the spread of a radionuclide in the event of an accident. Every accident has its unique problem, therefore, it is impractical to describe in detail, procedures to be taken in event of an accident. There are general guidelines which can be observed. They are:

1. Protect human life. At present, there is no radioactive material at WVSOM, which would prevent one from retrieving an injured person from a dangerous situation. If there is a possibility of airborne radionuclide, use something to cover the mouth and nose.
2. Protect property.

3. Prevent the spread of contamination beyond the confines of the immediate room, building or area by:
 - a. Turning off all fans and air conditioners and closing air vents. (It may be necessary to call maintenance).
 - b. Turn off hoods and close hood windows.
 - c. Restricting the movement of all persons suspected of being contaminated and preventing entry into the area. (If an elevator is involved, it may be stopped by flipping the emergency stop switch.
 - d. Withdraw to a safe distance.
 - e. Notify the Radiation Protection Officer and the Radiation Safety Committee.
 - f. Check the survey instrument before use, to be sure it is working properly and is not contaminated.

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