RADIATION SAFETY PROGRAM MANUAL VETERANS ADMINISTRATION WADSWORTH MEDICAL CENTER

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Los Angeles, California

NUCLEAR MEDICINE ULTRASOUND SERVICE

Revised June, 1977 Reviewed Sept. 1979 Reviewed June 1981

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W. H. BLAHD, M. D. Chief, Nuclear Medicine Ultrasound Service

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The instructions contained in this manual are for the protection of our patients, visitors. and employees.

Those involved in the use of, having access to, or working in areas where radioactive materials are used or stored, will without exception, observe these instructions.

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William K. Anderson Director

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VETERANS ADMINISTRATION WADSWORTH MEDICAL CENTER

RADIATION SAFETY MANUAL

1. Introduction

In recent years rapid developments in nuclear medicine have led to an unprecedented expansion in the use of radioactive materials for diagnosis, therapy and research. As a licensee of the Nuclear Regulatory Comission, the Veterans Administration Hospital, Los Angeles (VAH), has a legal as well as a moral obligation to provide for the safety of its personnel from the radiation hazards necessarily accompanying the use and handling of radioactive materials. In order to fulfill this obligation it is required (Federal Register, Title 10. Chapter 1, Part 30, Paragraph 24, Item 2) that a Radioisotope Committee be established by the VAH. It is the responsibility of this Committee to evaluate and approve all proposals for the diagnostic and therapeutic use of radioactive materials with the VAH, including all research proposals.* Radioactive materials may not be used in the VAH or any of its related structures without prior approval of the VAH Radioisotope Committee. It is the further responsibility of this Committee to formulate a Radiation Safety Program and to appoint a Radiation Safety Officer who will be specifically responsible for effecting this program. The Radiation Safety Officer is concerned only with the radiation safety aspects of radioisotope applications, and all proposals must have his approval.

2. Procurement of Radioactive Materials

The procurement of all radioactive materials will be under the control of the Nuclear Medicine Service and the Radiation Safety Officer. An approved Radioisotope Research Protocol must have been received by the Nuclear Medicine Service before the radioisotope use may begin. In addition to the protocol, the user must fill out an application for use of radioactive materials (See Appendix I). Upon approval of this application, a radioisotope permit will be issued to the user by the Radiation Safety Officer (See Appendix IA). No one will be permitted to utilize any quantity of radionuclide within the VA Wadsworth Hospital without this specific authorization. Furthermore, each individual radioisotope purchase request must be approved by the Radiation Safety Officer the purchasing officer will place the order.

In some instances, amendments to the VAH Radioactive Materials License will be required before procurement action can be taken. Applications for required amendments to the VAH Radioactive Materials License are the responsibility of the Nuclear Medicine Service.

*Does not apply to sealed radioactive sources used exclusively by the Radiation Therapy Service.

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3. Control of Radioactive Materials

The primary requisite of an effective Radiation Safety Program is the precise knowledge of the location and distribution of all radioactive materials present within the VAH and its related structures at all times. The Radiation Safety Officer must have adequate knowledge and control of all such radioactive materials. It is necessary that the Radiation Safety Officer be promptly notified of the arrival at the VAH of any radioactive materials from any outside source. This includes:

- a. The transfer of any radioactive materials from another institution; the receipt of any gift of radioactive materials from private or commercial sources, and radioactive materials received from any other sources by any means.
- b. Any radioactive specimens of blood, urine, tissue, etc., brought onto the VAH premises for analysis of any kind.
- c. Any radioactive animals, dead or alive, or parts thereof, brought onto the premises for any purpose whatsoever.

It is incumbent upon the recepient of any radioactive material to inform the Radiation Safety Officer upon the arrival of such materials at the VAH. Such notification can be made by telephoning Ext. 3528. Notification must also be made within 24 hours by written memo to the Radiation Safety Officer, c/o Nuclear Medicine Service, Room 0091, Bldg. 500.

In order to comply with the Nuclear Regulatory Commission Regulations concerning a permanent record of the disposition of all radioactive materials, it is equally essential to inform the Radiation Safety Officer of the transfer of any VAH owned radioactive materials for use off the VAH premises. Written notification of such transfers must be supplied to the Radiation Safety Officer before the transfer of the radioactive material is effected. A copy of the official radioisotope transfer form is reproduced in Appendix 1B. This form can be obtained from the Radiation Safety Officer.

4. General Responsibilities of Personnel Engaged in the Handling of Radioactive Materials.

All personnel engaged in the handling of radioactive materials at the VAH, whether or not they are employees of the VAH, come under the jurisdiction of the Radiation Safety Officer. Personnel so engaged will be issued film badges or other personnel monitoring instruments, when appropriate. Each person issued any type of monitoring device is responsible for returning same at specified times to the Radiation Safety Officer for evaluation. In addition, a biological assay program will be provided for specified personnel.

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Personnel participation in this program will be determined by the extent of potential radiation hazard. The biological assay program will include whole body radio-activity monitoring and/or urinary radioactivity measurements. other biological assay procedures may be performed as indicated.

Pre-use medical examinations are required of all individuals engaged in the handling of radioactive materials. These examinations include a chest X-ray, a complete blood count and urinalysis.

5. General Rules for Safe Handling of Radioactive Materials

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All personnel engaged in handling radioactive materials on approved projects should be familiar with the general concepts of radiation safety and the safe handling of radioactive materials. The following general rules must be observed:

- a. Maintain radiation exposure at the lowest possible level, specifically less than 90 mr/wk total body exposure.
- b. Film badges will be issued by the Radiation Safety Officer when appropriate. They should be worn at all times.
- c. Survey hands, shoes and clothing for radioactivity before leaving the laboratory.
- d. Use the following protective measures when indicted:
 - Protective clothing must be worn whenever contamination is possible.
 - Gloves and respiratory protective devices when necessary. Gloves should always be worn whenever there is a break in the skin below the elbow.
 - Remote pipetting devices -- never pipette radioactive solutions by mouth.
 - Perform radioactive work within a hood whenever there is a possibility of airborne contamination.
 - Keep laboratory work areas neat and clean, cover benches with absorbent paper -- change once weekly.
 - 6. Confine work with radioisotopes to metal trays whenever possible to minimize danger of spills.
 - 7. Avoid smoking, eating and drinking in radioisotope work areas. Refrigerators must not be used jointly for food and radioactive material storage.
 - 8. Wash hands and arms thoroughly before eating, smoking, drinking or leaving laboratory.

- e. Label all containers which contain radioactive materials with red and yellow radioactive stickers indicating isotope and date. Post room with radioactive signs to alert all personnel to the fact that radioactive materials are present.
- f. Segregate all glass ware and equipment used for radioactive materials. These items should not be mixed with other glassware and equipment unless they are completely free of contamination.
- g. Transport radioactive materials in such a manner as to insure adequate shielding and to minimize spillage or breakage.

6. Responsibility of Supervisors or Principal Investigators.

Supervisors and pricipal investigators have the following responsibilities:

- a. Discuss all new research procedures which involve the use of radioactive materials with the Radiation Safety Officer.
- b. Provide Radiation Safety Officer with the names of all employees under their supervision who will be working with radioactive materials. No one under the age of 18 will be employed in laboratories using radioactive materials. Pregnant females will not be permitted to work in laboratories in which radioactive materials are used.
- c. Instruct all employees for whom they are responsible in the application of approved radiation safety practices. Notify the Radiation Safety Officer whenever there is any change in personnel.
- Follow proper procedure for procurement of radioactive materials by purchase or transfer.
- e. Be certain that all radiation areas are properly posted, and that radioisotopes are properly stored, to prevent theft.
- f. Maintain an accounting of the radioactive materials in their laboratories. Specifically, a log must be maintained indicating isotopes received, disbursed, remaining balance and amounts consigned to waste. A monthly inventory report is required on forms supplied by the Radiation Safety Officer.
- g. Report all accidents involving radioactive materials -- spills, ingestions or inhalations, loss or theft, to the Radiation Safety Officer.
- h. Make non-radioactive "runs" on new procedures to test feasibility of new equipment and techniques.

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 Maintain minimum quantities of radioactive nuclides in the labs. The Radiation Safety Officer will store larger quantities for future distribution.

7. Routine Area Monitoring Surveys.

All areas (laboratories, hospital wards, clinics, etc.) in which radioactive materials are stored or employed will be routinely monitored by the Radiation Safety Officer or his designee. Such surveys will be conducted at least once a month under usual circumstances and more often as necessary to insure adequate control of any existing radiation hazards. Routine area monitoring data become part of the permanent files of the Radiation Safety Officer.

8. Disposal of Radioactive Waste.

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The disposal of radioactive waste materials at the VAH is the responsibility of the Radiation Safety Officer. All wastes are placed in appropriate containers provided in the radioactive waste shed, Bldg. 346. Key is available from RSO. Before beginning any work involving radioactive materials the problem of waste disposal must be discussed with the Radiation Safety Officer and proper procedures clearly delineated.

General Rules Regarding Storage and Disposition of Radioactive Waste:

- a. Absolutely no radioisotopes with half lives exceeding 100 days are to be thrown down the drain (see Appendix II for exceptions).
- b. All waste containers are to be appropriately labeled. Labels must indicate the amount and kind of radioactive waste.
- c. Liquid waste must be stored in a manner which minimizes container spillage or breakage. Proper pH must be maintained to minimize volatilization.
- d. Requests for radioactive waste removal, including animal carcasses, should be made by phoning the Radiation Safety Officer or his designee at Ext. 3528.
- e. Animal carcasses are to be disposed of according to Research Service Information Bulletin No. 62-1, October 26, 1962. (see Appendix IV).
- f. Deactivate any infectious material prior to consigning to radioactive waste.
- g. Cap all needles and place in suitable container to preclude puncture injuries.

9. Accidents.

All accidents involving radioactive materials must be reported <u>immedi-</u> ately to the Radiation Safety Officer at Ext. 3528, Nuclear Medicine Service. For off-duty assistance, see Appendix IC. a. Area contamination.

Radiation Safety Officer will evaluate the hazard and will advise as to the proper procedures for decontamination.

b. Personnel contamination.

In the event of personnel contamination the following first aid measures should be taken immediately:

1. Surface or external contamination.

External or surface contamination should be treated by washing with pure soap and copious amounts of warm water, avoiding organic solvents or abrasive soaps which make the skin more permeable to the contaminating substances. Wash for at least 2 minutes and not longer than 3 minutes. Give special attention to areas between the fingers and around the fingernails. Repeat not more than 3 or 4 times if radioactivity persists.

2. Contaminated wounds.

When the skin is lacerated by glassware or injured by hypodermic needles or other instruments containing radioactive materials, immediately wash the wounded area thoroughly under a stream of cold water. If the radioactive material is unusually toxic, apply a tourniquet to the injured extremity tight enough to occlude the veins without stopping the arterial pulse. After first aid measures have been taken, report immediately to the Radiation Safety Officer at Ext. 3528, Nuclear Medicine Service.

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3. Ingestion of radioactive material.

Accidental ingestion or swallowing of radioactive materials should be treated like acute poisoning of other types. Large volumes of water with or without emetics should be swallowed followed by throat stimulation by the fingers to induce vomiting. After first aid measures have been taken, report immediately to the Radiation Safety Officer, Ext. 3528, Nuclear Medicine Service.

10. Recommended Reading.

a. Veterans Administration Departments of Medicine and Surgery Manual, Research Program, M-3 Part 1 Change 3, June 13, 1958, and Federal Register Title 10 - Atomic Energy, Chapter 1, Parts 19 and 20 - Standards for Protection Against Radiation, Dec. 1970, and subsequent amendments.

- b. Raulation Protection, Jacob Shapire arvard Univ. Press, 1972.
- c. National Institutes of Health, Radiation Safety Guide, DHEW Publication No. (NIH) 73-18, 1972.
- d. Nuclear Medicine, William H. Blahd; McGraw-Hill, 1971.
- e. The Physics of Radiology, Harold E. Johns; Charles Thomas Co., 1969.
- f. The Basic Physics of Radiation Therapy, Joseph Selman, M. D., Charles Thomas Co., 1970.
- g. NCRP Report #39, Basic Radiation Protection Criteria, Jan., 1971.
- h. ICRP Publications 2, 4, 5, 6, 7, and 10.

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 Powsner and Raeside, Diagnostic Nuclear Medicine, Grune and Stratton, 1971.

APPENDIX I

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APPLICATION FOR USE OF RADIOACTIVE MATERIALS VETERANS ADMINISTRATION HOSPITAL

Name and Title of Appli	icant	(s):
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List all personnel who will handle radioactive materials:

(2)	*Give brief	outline of	Applicant's	experience	in	handling
	radioactive	isotopes:				

(3) Isotope requested:

(4) Chemical form:

(5) Total quantity you will possess Supplier: at any one time:

(7) Is the radioactive material to be used in:
a. humans
b. animals
c. "in vitro"
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No. of doses to be used:

(8) Describe briefly the purpose for which the radioactive substance will be used:

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Application for Use of Radioactive Materials (continued)

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- (9) Radioactive Waste Disposal How do you plan to dispose of radioactive wastes? Quantities disposed of:
- (10) *Outline briefly your facilities for handling radioactive isotopes and the room(s) where they will be used:

)	Signature of Applicant:	(12)	Approved by:
	Date:		Date:
			Remarks or limitations: -

*Items (2) and (10) need not be completed if applicant already has an approved permit from this committee.

APPENDIX IA

VETERANS ADMINISTRATION HOSPITAL Radioisotope Permit

A permit is hereby issued authorizing the individual(s) named herein to utilize radioisotopes listed for the purpose(s) and at the place(s) designated below. This permit is subject to all applicable rules and regulations of the VA Hospital and in particular to the provisions of Title 10, Part 20, Code of Federal Regulations, Chapter 1, "Standards for Protection Against Radiation". Radioisotopes specified herein shall be used only on the hospital premises and by, or under the supervision of, the named individual(s).

INDIVIDUAL USER(S)

1. NAME:

2. DEPARTMENT OR LABORATORY:

3. EXPIRATION DATE:

 Radioisotopes: (element and mass number) Chemical and/or physical form: Maximum possession amount at any one time:

7. Authorized Use:

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A. RESTRICTIONS:

APPROVED BY:

CHAIRMAN, RADIOISOTOPE COMMITTEE

RADIATION SAFETY OFFICER

APPENDIX IB

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TRANSFER OF RADIOACTIVE MATERIAL

Date:	
Nuclide and chemical form:	
Source:	Batch date:
Quantity:	Released by
Delivered to:	signature
For use in:	Location:
Received by	Dosage:
signature	

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APPENDIX IC

Off-Hour Emergencies

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The following personnel are available for any emergency occuring after the usual working hours.

 L. W. Wetterau, Jr., - Radiation Safety Officer Phone number 767-8867

- Jerome J. Gambino, Ph.D. Phone number 451-2253
- W. H. Blahd, M.D. Chief, Nuclear Medicine Service Phone number 454-8231

 Manual Tubis, Ph.D. - Chief Clinical Biocher.ist Phone number 826-6410

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APPENDIX II

SEWAGE DISPOSAL OF RADIOISOTOPES

Dilute solutions of radioactive material with half lives of less than 100 days may be discharged directly into the sewer (with no spilling and followed by copious quantities of water) providing that maximum permissible levels as indicated in the Federal Register, Title 10, Chapter 1, Part 20, Appendix B, Table 1, Column 2, are not exceeded. Part of this table listing important isotopes and concentrations is reproduced below.

$1 \times 10^{-3} \mu C1/m1$
5 x 15-2 µCi/ml
4 x 10-3 µCi/ml
$2 \times 10^{-2} \mu Ci/ml$
$2 \times 10^{-3} \mu Ci/ml$
$3 \times 10^{-7} \mu Ci/ml$
$2 \times 10^{-3} \mu Ci/ml$
9 x 10-3 µCi/ml
5 x 10 ⁻⁴ µCi/ml
$4 \times 10^{-3} \mu Ci/ml$
5 x 10-4 µCi/ml
3 x 10 ⁻³ µCi/ml
$3 \times 10^{-3} \mu Ci/ml$
$2 \times 10^{-3} \mu Ci/ml$

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APPENDIX III

HANDLING INSTRUCTIONS FOR EMPLOYEES DEALING WITH RADIOACTIVE ANIMALS

Animals which have had radioisotopes administered to them can present a hazard, both to the individuals working with them and to the success of the experiment as well. When using radioisotopes in animals, one must be sure that the cages are well labled, away from much foot traffic, and properly maintained in order to minimize the hazards arising from isotope use. Hazards which are likely to be encountered when using radioisotopes on animals are listed below:

- External personnel exposure resulting from gamma emitting isotopes which have been used in an animal.
- Internal radiation exposure resulting from accidental ingestion of isotopes which have been applied to animals.
- Cross contamination of radioisotopes from one radioactive experiment to another.
- Room contamination which can result in the spread of radioisotopes to a non-radioactive use area.

These problems will be discussed in detail and means to minimize them will be instituted. In any case not discussed in detail, the wise course of action to follow is to discuss the entire investigative proposal with the Radiation Safety Officer (RSO), Bldg. 500, Rm. 0091, Ext. 3528, before beginning the experiment. The RSO will furnish proper handling instructions, tailored to the individual investigator's needs.

1. Methods of minimizing external exposure problems.

- a. Maintain the greatest distance possible between the worker and the gamma emitting animal to make full use of the inverse square law. This law, simply stated, implies that if the distance from a radioactive source is doubled, the dose is reduced by a factor of four.
- b. When the distance cannot be minimized, the amount of time spent in the proximity of the radioactive animal should be kept at a minimum.
- c. When a. and b. are not possible for any reason or when the dose rate as determined by the RSO is found to be high, lead shielding of the proper thickness should be placed between the worker and the animal. This is a clumsy technique and should only be attempted following consultation with the Radiation Safety Officer.

- d. Following the experiment and/or the death of the animal, waste disposal proceedings should be initiated. Again, these should be discussed with the Radiation Safety Officer prior to the experiment. Animals will be placed in plastic bags and turned over to the Radiation Safety Officer for disposal. A knowledge of the amount of radioactivity in the animal is essential for record keeping purposes. For further information on this subject, see Research Service Bulletin No. 62-1, a copy of which is attached. (Appendix IV).
- 2. Methods of minimizing internal exposure.
 - a. When handling radioactive animals or applying radioisotopes to animals, it is required that the handler wear gloves which can be thrown away when contaminated. This will prevent the transfer of radioisotopes from hand to mouth, and is equally important when handling excreta or animal parts which may be radioactive.
 - b. Wearing of lab coats or other protective clothing is mandatory when handling radioactive animals. This will not only prevent individual contamination, but also will preclude the spread of contamination to non-radioactive areas. These coats are to be washed after use and should not be worn away from the scene of the experiment.
- 3. Methods of minimizing cross contamination.
 - a. This is a rather insidious process whereby the radioactive materials used in one experiment turn up unexpectedly in the results of another. Since some experiments utilize only minute amounts of radioisotope while others use large amounts, it is easy to visualize the confusion when large amounts of unknown radioisotopes appear suddenly in a low-level experiment.
 - b. Cross contamination can result from mishandling, from contaminated protective clothing, from contaminated cages, food and water supplies, and from airborne materials being transferred from cage to cage. Fortunately, few isotopes are used on this station which will present an airborne contamination problem.
 - c. Handling animals with contaminated gloves or clothing, or re-use of contaminated cages and accessories is prohibited. Clothing should be handled as in 2-b above. Contaminated cages should be allowed to decay where possible, and then be thoroughly washed. Following washing, they will be surveyed by the RSO for radioactivity before permanently marked and will not be used in non-radioactive experiments.

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4. Room contamination problems.

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- a. These problems can best be avoided by maintaining radioactive animals in a separate room and maintaining high standards of housekeeping in that room. Feces, cage linings and urine should be stored in appropriate containers within plastic bags. These items should not be allowed to accumulate. The Radiation Safety Officer will advise as to the safe storage and/or disposal of these items in each individual case.
- b. In case any of the above mentioned items are spilled, they should be cleaned up immediately, utilizing absorbent, disposable materials. All materials used in cleaning up a spill should be placed in plastic containers to preclude the possibility of further contamination spread. It is essential that spills be cleaned up without delay. This will prevent spreading of the contamination and will prevent contamination of individuals working in the area. Always notify the Radiation Safety Officer about spills at once so that he can advise on proper cleaning procedures and can monitor the area after it has been cleaned up.
- c. Lab coats, gloves, and shoe covers (when used) should not be worn from room to room. They should always remain in the area in which they were used. Observation of this simple rule will do much to prevent the spread of contamination. Mops and other floor cleaning equipment used in a radioisotope room should also not be used elsewhere. It should also be noted that transportation of animals from room to room, or building to building should not be attempted following the administration of radioisotopes. It is also wise to provide all radioactive animals with cages that facilitate the cage cleaning process. Labeling of these cages with radiation warning tape, signs, etc., is mandatory. The Radiation Safety Officer will furnish these labels upon request.

APPENDIX IV

Veterans Administration Hospital (Wadsworth)

Los Angeles, California

Research Service Information Bulletin No. 62-1

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TO: All Research Investigators and Personnel

SUBJECT: Procedures for Disposition of Animals Containing Radioisotopes.

1. All animal carcasses containing radioactive materials at any level must be disposed of by the radiation Safety Officer.

- A. When the animal in question expires, please notify the Radiation Safety Officer, Ext. 3528 to arrange for prompt disposal.
- B. This disposal will be implemented by placing the animal or animals in the plastic bags, and subsequent transport to the radioactive waste shed, Bldg. 346. Access to this bldg. is available by appointment with the Radiation Safety Officer, or his designate.
- C. Bagged carcasses must be labeled as to type of radioactive substance used, amount and date. This labeling must be done on tags obtained from the Radiation Safety Officer.

2. Upon receipt of animal remains, the Radiation Safety Officer will arrange for their disposal. This will generally consist of:

- A. Freezing carcasses until enough are assembled to make disposal practicable.
- B. Final disposal, along with other radioactive waste materials accumulated will not occur more often than once quarterly.
- 3. These procedures are effective immediately.

/S/ LUCIEN B. GUZE, M.D. Chief of Staff for Research and Education

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APPENDIX V

EMERGENCY PROCEDURE FOR RADIOISOTOPE SPILLS*

IF SPILL IS ON A PERSON:

- Wash contaminated area immediately with soap, hand brush, and copious amounts of warm water, for a period of between two and three minutes, giving special attention to the areas between the fingers and around the fingernails.
- 2. Notify the Radiation Safety Officer, Ext. 3528.
- 3. If clothing was also contaminated, remove all contaminated clothing and place it in a plastic bag for decontamination by the RSO.
- 4. Before you return to work you must:
 a. Be monitored by the RSO for any residual contamination.
 b. Make a report of the incident to the RSO.

IF THE SPILL IS IN AN AREA OR ON AN APPARATUS:

- Notify the Radiation Safety Officer, Ext. 3528, before attempting decontamination.
- 2. Always confine spill to its original area. This includes taking note of all people who have passed through the contaminated area, and all apparatus in the area at the time of the spill.
- 3. Decontaminate as soon as possible to insure better results.
- 4. Wear disposable gloves during decontamination. If spill was a liquid, blot up excess with paper towels. If spill was a powder, blot with a dampened paper towel. Do not spread by rubbing.
- 5. Decontaminate area using soap powder with a minimal amount of water, working from the outside toward the middle. Blot to dry.
- 6. All undecontaminatable objects, including apparatus and glassware plus used paper towels and gloves, should be placed in a plastic bag for monitoring and disposal by the RSO.
- 7. Wash your hands as specified above.

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- 8. Before returning to work in the spill area:
 - a. All personnel involved in the spill must be monitored for contamination.
 - b. The person most intimately involved in the spill must report the spill to the RSO for the purpose of minimizing chances of a recurrence of the incident.

*A spilled radioisotope is any radioisotope, in any form, outside its proper container.

The area must be monitored by the RSO; the uccontamination bag must be removed; and the area must be certified as safe by the RSO.

SPILLS CAN BE AVOIDED OR MINIMIZED BY FOLLOWING THESE GUIDELINES:

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- Wear your lab coat whenever handling or in the presence of radioisotopes. If you spill on it, it is less embarrassing to remove the coat than personal clothing.
- Always wear your film badge; it is our only legal record of whole body dosage.
- Have your decontamination materials readily available: gloves, paper towels, soap powder, plastic bags, hand soap.
- 4. Use trays and absorbent paper, which confine spills and make decontamination easier.
- 5. Be sure of the safety of your procedures before attempting them with radioisotopes.
- Know the properties of your radioactive solution: volatility, solubility, toxicity, etc.
- Confine your use of isotopes to a specific area, an area out of the main flow of traffic.

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 If you have any questions concerning radiation safety do not hesitate to call the RSO, Ext. 3528. HOSPITAL SUPPLEMENT

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 HOSPITAL MANAGEMENT OF PATIENTS WHO HAVE RECEIVED THERAPEUTIC DOSES OF RADIOACTIVE MATERIALS.

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The administration of therapeutic quantities of radioactive isotopes to patients is the exclusive responsibility of the Veterans Administration Hospital's Nuclear Medicine Service. Most of the radioisotopes administered to patients by the Nuclear Medicine Service are for diagnostic purposes and, therefore, represent little real hazard to physicians or nurses, since the usual diagnostic dose of radioisotopes is quite small. When a therapeutic dose comprising 10 millicuries or more of any radioisotope is administered, the patient who receives this dose will present some hazard not only to the physicians and nurses caring for him, but also for other patients in his vicinity.

All matters relating to radiation safety are the responsibility of the Nuclear Medicine Service Radiation Safety Officer. Nevertheless, it is the duty of all hospital personnel who have, or will have, personal contact with radioactive patients to minimize personal exposure insofar as possible. This may be accomplished by maintaining a specified maximum distance from the radioactive patient. (see Table 1)

When in doubt as to the nature or amount of radioisotope administered to a patient, the patient's clinical record should be consulted. Patients who have received radioisotopes will have 5" x 8" card (VA Form 10-212) within their clinical folder. This card will indicate the amount and type of radioisotope administered and the date of administration. If any doubt remains, please discuss the situation with the Radiacion Safety Officer.

General Rules:

- A physician must be in attendance whenever a therapeutic dose of a radioactive isotope is administered to a patient.
- Following the oral administration of a therape tic dose of a radioactive isotope, the patient receiving said therapeutic dose must not leave the hospital grounds for at least one hour.
- All patients who receive therapeutic doses of radioactive isotopes exceeding 30 millicuries must remain in the hospital for a 24-hour period.

Hospital Management of Patients - Radioisotopes

4. All nurses and physicians having contact with a patient who has received a therapeutic dose of a radioactive isotope must wear film badges or pocket dosimeters (these devices will be provided by the Nuclear Medicine Service).

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- 5. Protective outer clothing and disposable gloves must be worn by personnel handling bed pans, urinals, vomitus or excreta, or contaminated linens from patients who have received therapeutic quantities of radioactive isotopes. Hands must be washed immediately if they come in direct concact with radioactive vomitus or excreta.
- 6. A patient who has received more than 10 millicuries of a radioactive isotope should be confined to a bed which is at least 6 feet from other patient beds. Reference should be made to Table 1 to determine the permissible time that nurses or physicians can spend with such patients.
- 7. A container of waterproof design must be placed by the patient's bed to contain vomitus in the event vomiting occurs. Any items contaminated by vomitus must be placed in the plastic bag and retained for radioactivity monitoring.
- There are no general rules which apply to the handling of radioactive excreta unless specific instructions have been issued by the Nuclear Medicine Service Radiation Safety Officer. Specific instructions will be provided for incontinent patients.
- 9. The Radiation Safety Officer, Nuclear Medicine Service, must be notified in the event of any accident, such as spillage of radioactive vomitus or excreta. Under no circumstances should spills be left unattended, since accidental contamination of personnel or other patients may occur. A spill should be confined by placing absorbent paper over it and the area of spill should be immediately restricted. Any material used to clean up a spill is usually contaminated and must therefore be retained for radioactivity monitoring by the Nuclear Medicine Service Radiation Safety Officer. Such items should not be used to clean any other area until they have been properly monitored.

The Nuclear Medicine Service Radiation Safety Officer is located in Room 0091, Bldg. 500, and can be contacted by calling Ext. 3528 during working hours. After working hours, call 767-8867. Other Nuclear Medicine Service personnel who may be contacted in an emergency are:

Dr. Jerome J. Gambino, 451-2253 Dr. W. H. Blahd, 454-8231

- In special or unusual situations involving patients who have received radioactive isotopes, specific instructions will be issued in writing by the Nuclear Medicine Service Radiation Safety Officer.
- Instructions concerning handling of deceased patients who have recently received therapeutic quantities of a radioactive isotope are given in Section II of this supplement.

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Initial Dose	Maximum d on M. P.	ys* (based		
I-131	2 ft.	3 ft.	4 ft.	6 ft.
200	10 min.	20 min.	40 min.	80 min.
150	15 min.	30 min.	60 min.	2 hrs.
100	20 min.	40 min.	80 min.	2-1/3 hrs.
50	40 min.	80 min.	2-1/3 hrs.	over 4 hrs.
25	80 min.	2-1/3 hrs.	over 4 hrs.	over 4 hrs.

*After the second day, all times may be doubled and after the fifth day, doubled again.

These distances also apply to visitors. No one under 18 years of age will be permitted to visit a patient who has received a therapeutic dose of radioisotopes.

Distance restrictions are not applicable when P-32 (Phosphorous-32) is administered since no radiation is detectable outside the patient's body.

Martin S.

II. SAFE HANDLING OF CADAVERS CONTAINING RADIOACTIVE ISOTOPES.

If a patient dies shortly after receiving a large therapeutic dose of a radioisotope, the handling of the body may pose problems of radiation exposure for the pathologist and for the embalmer. While members of these groups are rarely exposed to radioactivity, it is important for them to recognize the existence of this problem, and to know how to meet it.

The patient who is radioactive will have a 5" x 8" card, VA Form 10-212, within his clinical record folder. After death, the individual responsible for reviewing the Clinical Chart, prior to referral of the patient to pathology/mortuary will place the card (VA Form 10-212) on top of the record folder so that it will be seen instantly by pathology personnel.

Mortuary Handling of Radioisotope Patients After Death.

All patients who receive therapeutic doses of radioisotpes within 60 days of death should be considered a possible hazard. Whenever possible, Radiation Safety Officer, Nuclear Medicine Service, should be informed if a radioactive patient is received in the mortuary. Call Ext. 3528, or after hours, 767-8867.

If Radiation Safety Officer determines that radiation dose rate is less than 30 mr at body surface, embalming can proceed. All body fluids removed should be transferred directly down a suitable sink drain, with no splashing or spillage. Embalming personnel should always wear rubber gloves and protective gowns when handling radioactive cadavers.

Cremation is no problem unless the body contains more than 30 mCi. If this is the case, it may be necessary to store the cadaver for a period of time prior to cremation.

Safe Handling of Cadavers Containing Radioisotopes When Autopsy is Performed.

1. Double thickness of gloves and protective gowns, glasses, etc., are required if patient is known to contain more than 5 mCi of any radioisotope.

2. If more than 5 mCi of radioactivity is present, always consult the Radiation Safety Officer.

3. All body fluids should be flushed/aspirated directly into a sewer.

APPENDIX:

Dose of Radio- isotope		Days Elapsed Since Treatment												
131 _I	1	2	3	4	6	8	10	15						
60 mCi 50 40 30	18 mCi 15 12 9	16 mCi 13 10 8	14 mCi 12 9 7	12 mCi 11 8 6	10 mCi 9 7 5	8 mCi 7 5 4	6 mCi 5 4 3	4 mCi 3 2 2						
20 10	6	3	2	2	2	1	1	1						

Activity Remaining in Thyroid Following Therapeutic Dose+

Remaining in Metastases Following Therapeutic Dose

100 mCi 75	20 15	18 13	16 12 8	14 11 7	12 9 6	977	7	4 3 2	
35 20	7	6 4	- 3	53	4 2	32	2 1	1	

Amount Remaining in Injected Cavity

32p (1)	1	2	3	4	6	8	10	15
20 mCi 15 10	19.1 14.2 9.5	18.15 13.7 9.0	17.2 13.0 8.6	16.4 12.3 8.2	14.9 11.2 7.5	13.5 10.2 6.8	12.2 9.2 6.1	9.7 7.2 4.8
5*	4.7	4.5	4.3	4.1	3.7	3.4	3.1	2.4 -

*This amount of 32p can be dangerous if gloves, aprons, and glasses are not used.

 Assume approximately 20% of activity will be in fluid within cavity. Remainder will be absorbed on serosal surfaces.

+Note on Tables: Values below horizontal lines indicate amounts of remaining activity that are considered to be safe for autopsy or embalming procedures, provided that gloves, aprons, and eyeglasses are utilized.

- 4. Organs containing high concentrations of isotopes, such as the thyroid after 1311 administration, should be removed first and stored several days in a safe place before examination.
- 5. If Radiation Safety Officer is not available, please refer to table appended. This table will enable the pathologist to perform an autopsy with a minimum of radiation exposure. Whenever possible, a radioactive cadaver should not be autopsied without consultation with the Radiation Safety Officer.

Special Precautions for Pathologists to Follow When Therapeutic Doses of Radioisotopes Have Been Administered.

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 ¹³¹I in large amounts usually indicates thyroid therapy or thyroid cancer therapy. When autopsy is performed on such a cadaver, it is advisable to remove the thyroid first. Dissections must be performed with long handled forceps and scissors. The removed gland should be stored in an out-of-the-way place, carefully labeled as to its origin, date, and approximate amount of radioisotope contained.

 32 P present, as chromic phosphate colloid, in large amounts usually indicates either intraperitoneal or intrapleural administration for the purpose of reducing the formation of fluid resulting from metastatic lesions. 32 P as inorganic phosphate, is used for the treatment of polycythemia vera and as an aid in palliative therapy of cancer patients.

Twenty-four hours after cavitary administration of ³²P, chromic phosphate, as a colloidal suspension, approximately 20% of the ³²P would remain in the cavity fluid while the balance of radioactivity is absorbed on the serous surfaces. Any excessive handling of organs in the contaminated cavity should be avoided. Aspirate all fluids before beginning dissection. Wear double heavy rubber gloves and glasses. All organs removed should be placed in an enamel pan and rinsed thoroughly (no splashing) before handling. Always handle with forceps, and always wear gloves.

- 2. If the pathologist/embalmer is injured during autopsy or embalming, work should be halted, gloves washed and removed, and the wound flushed with running water. All wounds should be checked for residual contamination, with washing and checking repeated if necessary. Any injury should be immediately reported to the Radiation Safety Officer.
- 3. Contaminated laundry should be turned over to the Radiation Safety Officer for storage for a suitable decay period before washing. Instruments should be soaked in detergent and rinsed in running water. Before instruments are re-used, they are to be checked by Radiation Safety Officer. All radioactive liquid wastes should be flushed down sewer.

- 4. Special care should be taken to prevent contamination of autopsy room floor and the spread of the contamination to other parts of the hospital.
- 5. Any solid radioactive wastes should be saved for disposal in plastic bags. Consult with Radiation Safety Officer for handling of these items.

6. Suggested protective items for the pathologist:

a. Geiger counter.

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b. Pocket dosimeters and charger.

c. Plastic aprons, shoe covers, and eye glasses.

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History

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