Medical Center

1500 East Woodrow
Wilson Drive
Jackson MS 39216

Veterans
Administration

July 17, 1985

In Reply Refer To: 586/115

Carol A. Connell
Radiation Specialist
Nuclear Materials Safety Section
U.S.N.R.C. Region II
101 Marietta Street, N.W.
Atlanta, Georgia 30323

Dear Madam:

Below is listed the additional information you requested in your letter of 6-19-85 for processing of the application for renewal of license No. 23-08786-01 (References: 18578;030-02261).

a. Calibration procedures for survey instruments:

This is performed by a consultant physicist quarterly using the following two calibration sources:

Source: CS-137
Manufacturer: New England Nuclear
Model No. None: Special fabrication for this individual
Activity or exposure rate: Source #1 12.56mCi;
Source #2 7.05mCi
Accuracy: ± 5%
Traceability to primary standard: traceable to National Bureau of Standards

b. Radiation Safety Training for Ancillary Personnel:

(1) In cases of radionuclide therapy (i.e. I^{131}) radiation safety training for involved nursing personnel is given in two forms:

(a) Written safety procedures - a copy of these was included in part 19 of the original submission.

(b) Verbal instructions from the Radiation Safety Officer given on a case-by-case basis.

(2) Housekeeping personnel working in areas where radioactive materials are stored or used are given "in-service" training in radiation safety yearly or whenever there is a turn-over in personnel. This training includes general information about the level of radiation hazard, recognition of warning signs and labels, and general safety precautions.

(3) Personnel working in research labs where radioactive materials are used receive "in-service" training in radiation safety on a yearly basis. This is conducted by the Radiation Safety Officer or another equally qualified person. Attached is a copy of the course outline presented at the last training session. Specific details of the course material are available at your request. It is encumbent upon each principal investigator to determine whether newly-hired employees need radiation safety training prior to beginning their duties.

c. (1) Personnel working with radioactive materials in the research division have their own set of safety regulations separate from those of the Nuclear Medicine department. A copy of these regulations is attached. Specific sections dealing with radiation safety are pages 10-12 and 23-24. The full Radioisotope Policy and Procedure Manual for the Research Division is available at your request.

(2) All radionuclide therapy doses are administered by the Nuclear Medicine physician(s). Technical personnel are not involved in any part of the procedure. The physician verifies the patient's identity and the correct chemical form and activity level of the radionuclide before administration.

d. Bioassays: We will be following the guidelines as established in Regulatory Guide 8.20 for I-125 and I-131. For H-3 we will be following the guidelines set forth in the attached NRC publication dated October 19, 1977.

Sincerely yours,

J. L. WARNOCK
Center Director

Enclosures: 3

for JAMES J. SMITH, M. D. (115)
Director, Nuclear Medicine Service
VA Central Office
Washington, D.C. 20420

7/25/85

Veterans Administration

Memorandum

Date: September 28, 1984

From: AA/ACOS for Research & Development (151)

To: Dr. Jane Sanders, (115)

Subj: Overview for Research Personnel Handling Radioisotopes or Frequenting Such Areas

1. Attached is an outline of material presented to Research employees on September 26, 1984 in a brief training session about the safe handling of radioisotopes.

I. Instructions to Workers Required by NRC

A. Instructions

B. Site of Required Postings

II. Nature of "Radiation"

A. Electromagnetic Radiation

B. Corpuscular Radiation

C. Ionizing Radiation

1. Indirectly-ionizing
   a. gamma rays, x-rays, bremsstrakling
2. Directly-ionizing
   a. subatomic particles
      1. beta particles, other high speed electrons
3. Interactions with matter

D. Spontaneous Nuclear "Disintegration"

1. Nuclear structure
2. Proton/neutron line of stability
3. Nuclear transitions
   a. Forms of energy emission
   b. Modes of radionuclide "decay"

III. Characteristics and Properties

A. Commonly Used Beta Emitters

B. Commonly Used Gamma Emitters

IV. Units of Measurement

A. Exposure

B. Intensity

C. Absorbed Dose

D. Dose-equivalent

V. Significance of Some Exposure Levels

VI. Protection From External Exposure

A. Time

B. Distance, Remote Handling

C. Shielding

D. Calculation of Potential Exposure Rates

E. "Permissible" Exposure Levels

VII. Protection From Internal Exposure

A. Safety Precautions in Handling Radioactive Materials

B. Decontamination

C. Biological Monitoring

D. Emergency Procedures

VIII. Radioactive Waste Disposal

A. Water-Soluble

B. ^{3}H, ^{14}C in LSC Media

C. Other Forms

a. Handling and Housing of Radioactive Animals
1. Disposal of excreta
2. Disposal of Carcasses

b. Insoluble Wastes Not Combustible

IX. Detection and Measurement of Radioactivity

A. Simple Ion Chamber

B. Proportional Counter

C. G-M Tube

D. Crystal Scintillator Detector

E. Personnel monitors
1. Film badge
2. TLD, finger dosimeter
3. Pocket ion dosimeter

F. Gamma Counter

G. Liquid Scintillation Counter

H. Autoradiography

X. Policy and Procedures Manual

Leland R. Collier
Administrative Officer

Attachment

RADIOISOTOPE POLICY AND PROCEDURE MANUAL

3. Long-term storage of radioactive wastes is discouraged and should be taken into consideration by the Radiation Safety Committee and the SRSO when applications for use are evaluated.

   a. Liquid wastes should be stored in corrosion-proof and shatter-proof containers and, if flammable, in an approved safety-cabinet.

   b. Volatile radioactive wastes must be sealed in suitable containers so that the possibility of escape into the atmosphere within the R&E building is remote.

   c. Refer to III.E.4 of this manual for storage sites for wastes qualifying for disposal via incineration. Any form of radioactive waste, combustible or not, which must be held for ten half-lives before it can be disposed of may be stored only at locations specifically approved by the SRSO.

D. Experimental Use of Radioisotopes

1. Only investigators and technicians who have been approved by the SRSO as outlined earlier will be allowed to perform experimental procedures (or design experiments for others to perform) involving radioisotopes at this Station, and then only for those compounds, amounts and intended uses specified in the approved application for use ("isotope form" and protocol).

2. Any deviation from the approved application necessitated by developments during the course of study must be approved by the SRSO if it involves changes in radionuclides, labeled compounds to be used, increased amounts to be kept on hand or handled, changes in applications such as from an *in vitro* to an *in vivo* system, and changes in personnel working with radioactive materials, for examples. Changes in disposal forms and routes and minor changes in other methodology may be approved by the RRSO only. Approval of such deviations from the approved application for use should be requested by means of a brief memorandum to the RRSO explaining the deviation, the necessity for it and any pertinent precautions to be taken.

3. All persons who design experiments utilizing radioactive materials and/or who physically handle and manipulate radioisotopes must have a thorough knowledge of the hazards involved, the protection required, and the techniques

necessary for monitoring, shielding, contamination control and safe disposal of each radionuclide and chemical and physical form they will be working with. Those who have had no formal training in radioisotope methodology or cannot otherwise demonstrate such qualifications must undergo in-service training before being permitted to design, supervise, or conduct experiments involving radioactive materials.

a. The radiation hazards incident to the presence, use and disposal of radioactive materials must be evaluated under the specific set of conditions at hand. This evaluation includes a physical survey of the location of the materials and equipment and monitoring the level of radioactivity present, i.e., contamination and exposure surveys. These surveys should be done as a part of each experiment and/or each time concentrated radioactive material is transferred from its original shipping vial or primary container. Where applicable, such surveys must include any or all of the following:

   i. When applicable, a suitable radiation monitor capable of detecting radiation of the type and energy level of the radioisotope in use should be used to survey the source material and the work space around it whenever the source or part of it is removed from its primary container.

   ii. Wipe tests should be performed as a part of each experiment to check for contamination of work surfaces, equipment, and disposal sites.

   iii. Persons working with weak beta emitters should have their urine assayed periodically.

   iv. Persons working with radioiodine reagents should have their thyroid gland monitored periodically and thermoluminescent dosimeters (TLD) should be worn on their fingers or hands.

   v. A film badge or TLD should be worn on the upper torso when appropriate, i.e., when working with high energy beta or gamma emitters.

   vi. An ionization chamber dosimeter should be worn in high-risk areas.

b. Coequally with measurement of exposure and contamination, adequate precautions must be taken to minimize these

hazards by appropriate laboratory practices and equipment:

No eating, drinking, smoking or application of cosmetics in radioisotope work area.

Never pipette by mouth.

Wear lab coats at all times in radioisotope areas and wear rubber or plastic gloves in any procedure where contamination of the hands is a possibility. Once donned, consider the gloves to be contaminated. Use a tissue to touch objects such as switches and knobs. Wash gloves before removal. Do not wear gloves out of the room in which used. Wear two pairs of gloves when working with radioiodine. Gloves should be worn when opening shipping vials of radioisotopes.

Cover work surfaces with plastic-backed absorbent paper.

All radioactive solution containers that can be tipped over should be worked with, while uncapped, on absorbent paper-lined nonporous seamless trays.

All radioactive solutions should be capped when not being added to or taken from.

Open all radioisotope containers in a fume hood in case they are not at atmospheric pressure or may otherwise produce an aerosol or dust.

Forceps, tongs or other suitable remote handling devices should be used as needed with significant surface dose rates. Use appropriate shielding.

Monitor all shipping vials and other containers of significant radiation sources to evaluate the hazard before deciding the level of protection to be employed.

Trial runs should be conducted using the non-radioactive isotope when non-routine or high-level procedures are to be conducted, so as to discover any unforeseen problems that may develop.

All containers of radioactive materials should be labelled with the name and amount of isotope. Investigator's name must be on shipping vial container.

Monitor all areas and equipment (including glassware) regularly for contamination. Re-monitor areas and equipment following decontamination to ascertain adequacy.

When working with radioiodine or any reaction or incubation that might release radioactive gasses or fumes (I_2, $^{14}CO_2$, HTO, etc.) use a well-ventilated fume hood and, with radioiodine, a hood with charcoal stock filter.

Double-bag all radioactive waste that must be stored. Do not let waste or contaminated materials accumulate unless absolutely necessary, i.e., for radioactivity to decay to disposable levels. Do not store radioactive solutions in breakable containers.

Wear personnel monitoring devices and have biological surveys conducted if appropriate for the isotope and level you work with. Consult your supervisor or the Radiation Safety Officer.

c. Procedures and precautions for use of radioactive material in animals include:

i. Small animals should be placed in non-porous, cleanable trays lined with absorbent paper for administration of radioactive materials whether orally or parenterally.

ii. If the animal(s) is to be returned to caging prior to sacrifice, the cage(s) must be labeled as to radionuclide, quantity per animal, date of administration, name of responsible investigator, method of excretion of isotope, and any special precautions or instructions necessary.

iii. If there is any possibility that the labeled compound administered can be metabolized to a respiratory product (e.g., $^{14}CO_2$ or tritiated water) it is required that the cage(s) housing the labeled animal(s) be kept in a well-ventilated fume hood if at all feasible. Otherwise, sufficient ventilation of the housing area must be provided so that the applicable limits of airborne concentration are not exceeded. See 10CFR20.203(d) for reference to limits and area labeling (warning) requirements.

iv. If the experimental conditions make it possible that the administered radionuclide will appear in the

I. EMERGENCY PROCEDURES

A. Spills

Accidental spillage of radioactive material is rare, but cannot be prevented absolutely, and may occur in any laboratory, in any hall or passageway traversed by messengers transporting such material, or in any hospital room or ward where a patient may vomit or be incontinent.

Except for a major accident to a shipping container or a serious spill in the hot laboratory, the amount of radioactive material involved in a spill will usually be small and the radiation from it will not constitute a serious hazard. The real danger is the spread of the contamination on shoes or other contaminated garments. The following is a general outline of the procedure to be followed in the event of a spill.

1. Confine the spill immediately, by dropping paper towels or other absorbent material onto it.

2. Put on waterproof gloves.

3. Check shoes for visible signs of contamination. If it appears possible that they are contaminated, remove shoes when leaving the contaminated region.

4. If fans, ventilators, or air conditions are operating in the area, they should be shut off. Preferably this should be done by someone not involved in the spill and therefore not likely to spread contamination.

5. Mark off or isolate in some way the entire suspect area and police it to be sure that nobody walks through it.

6. CALL THE RADIATION SAFETY OFFICER. If his number is not posted in a convenient place, and you do not know it, call the telephone operator, report an emergency and ask her to find the RSO.

7. In general, inexperienced personnel should not attempt to clean up a spill. It is better to wait a little while for the supervisor than to risk spreading the contamination by erroneous procedures. If the spilled material is covered and by-standers are kept a few feet away, there is little or no danger from the radiation.

8. If any of the spilled material has splashed onto a person or his clothing, immediate steps should be taken to remove it. Laboratory coats or outer garments should be taken off and left in the contaminated area. Hands or other skin areas should be washed thoroughly with soap. If it is certain that shoes or feet are not contaminated, it is permissible to walk to a washing facility, which subsequently, however, must be treated as a contaminated area until cleared by the RSO. If there is doubt about contamination of the feet, a washbowl and soap should be brought to the suspect area for cleaning them.

9. When the RSO arrives, he will bring decontamination materials and survey meter, and the clean-up operation will proceed under his supervision.

10. If the RSO is not immediately available, or cleanup must proceed without him, one person should do the work. He should put on waterproof gloves, shoe covers and a surgical face mask if it is available. He will then take up the spilled material with absorbent paper, which must be handled with forceps or tongs and deposit it immediately in a waterproof container. After as much as possible has been removed in this way, the surface should be washed with damp - not wet - rags held in forceps or tongs, always working toward the center of the contaminated area rather than away from it.

11. A survey meter should have been obtained from the office of the RSO, and careful monitoring carried out during this procedure on area and personnel. The meter should preferably be operated by someone who is not involved in the spill, so that he is not likely to contaminate the instrument.

12. Reduction of counting rate to five times background, over an area of 1 or 2 square feet or to ten times background over a few square inches is usually satisfactory, especially for short-lived nuclides. Eventually, the RSO should check the area and give it clearance.

13. When the operation is finished, gloves and other protective garments should be carefully checked for residual contamination. If any is found, the garments should be left with the other contaminated material for ultimate disposal by the RSO.

GUIDELINES FOR BIOASSAY REQUIREMENTS FOR TRITIUM

Nuclear Regulatory Commission

Division of Fuel Cycle and Material Safety

October 19, 1977

AB/REA

BIOASSAY REQUIREMENTS FOR TRITIUM

I. Conditions Requiring Bioassay

A. Routine Bioassay is required when quantities processed by an individual at any one time, or total amount processed per month, exceed those for the respective forms of tritium as shown in the attached Table 1.

B. Above 0.1 of, but less than, the levels in Table 1, routine bioassay is required unless a written justification is submitted for not performing bioassays.

C. Except as stated in I.D. below, bioassay is not required for process quantities less than 0.1 of those in Table 1.

D. Special bioassay measurements should be performed to verify the effectiveness of respiratory protection devices and other protective clothing. If an individual wearing a respiratory protective device or protective clothing is subjected to a concentration of tritium in air (in any form) such that his or her intake with no protection would have exceeded that which would result from exposure for 40 hours per week for 13 weeks at uniform concentrations of tritium in air as specified in Appendix B, Table I, Column I, 10 CFR 20,* bioassays should be

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*Multiplying the concentration given in Appendix B, 5×10^{-6} µCi/ml, by 6.3×10^{8} ml gives the corresponding quarterly intake of tritium by inhalation. This is assumed equal to the uptake of tritium (as HTO) by absorption through the skin unless the form of tritium in the air can be demonstrated to have lower uptakes. The total uptake, including skin absorption, would be assumed to be about 6.3 mCi, which delivers a dose commitment of about 1.25 rems to standard man.

performed to determine the resulting actual tritium intake. These special bioassay procedures should also be conducted, for personnel wearing respirators, if for any reason the average tritium concentration in air and the duration of exposure are unknown.

II. Who Should Participate

All workers involved in the processing of tritium, under conditions specified in I above, or sufficiently close that intake is possible, should participate.

III. What Types of Bioassays Should be Performed

A. Baseline (including Pre-employment, or Pre-operational Urinalysis, not more than one month prior to beginning work with tritium requiring bioassay under Section I above).

B. Routine Urinalysis

C. Post-operational. Within one month of last possible exposure to tritium.

D. Diagnostic. Within one week of any sample exceeding levels given as action points in Section V below. See V.A.2.(d).

IV. How Often

A. Initial Routine Samples

Within 48 hours following entry of an individual into an area where operations require bioassay according to Section I.A and

B above, and then every two weeks or more frequently thereafter as long as the individual is working with ^{3}H.

B. After 3 Months

The sampling frequency selected in accordance with Section IV.A above may be changed to quarterly if, after 3 months, the following 3 conditions are met:

(1) The average urinary tritium concentration from specimens obtained during the 3-month period does not exceed 3 μCi/l,

(2) Where measurements of the concentration of tritium in air are required as a condition of the license, the quarterly average concentration (μCi/ml) to which workers are exposed, multiplied by the factor 6.3×10^{8} ml, does not exceed 0.8 mCi, and

(3) The working conditions during the 3-month period, with respect to the potential for tritium exposure, are representative of working conditions during the period in which a quarterly urinalysis frequency is employed, and there is no reasonable expectation that the criteria given in (1) and (2) above will be exceeded.

V. Action Points and Corresponding Actions

A. Bi-Weekly or More Frequent Sampling

1. If urinary excretion rates exceed 5 μCi/liter, but are less

than 50 μCi/liter, the following course of action should be taken:

(a) a survey of the operations involved, including air and area monitoring, should be carried out to determine the cause(s) of exposure and evaluate potential for further larger exposures.

(b) Implement any reasonable corrective actions indicated in the survey that may lower the potential for further exposures.

(c) A repeat urine sample should be taken within one week of the previous sample and should be evaluated within a week after collection.

(d) Any evidence from (a) and (b) indicating that further work in the area might result in an employee receiving a dose commitment in excess of the limits established in §20.101 should serve as cause to remove the employee from work in this operation until the source of exposure is discovered and corrected.

2. If urinary excretion rates exceed 50 μCi/liter, the following course of action should be taken:

(a) Carry out all steps as in 1.(a) to (d) above.

(b) If the projected dose commitment exceeds 5 rems, report the incident to the NRC in accordance with §20.403 of 10 CFR Part 20.

(c) Refer the case to appropriate medical/health physics consultation for recommendations regarding therapeutic procedures that may be carried out to accelerate removal of tritium from the body and reduce the dose as low as reasonably achievable.

(d) Carry out repeated sampling (urine collections of at least 100 ml each) at approximately one-week intervals, at least until samples show an excretion rate less than 5 μCi/liter. If there is a possibility of long-term organic compartments of tritium that require evaluation, continue sampling as long as necessary to ensure that appreciable exposures to these other compartments do not go undetected.

B. Quarterly Sampling

Carry out actions at levels as indicated under A. above, and if the excretion rate continues to exceed 5 μCi/liter, also reinstitute biweekly (or more frequent) sampling for at least the next 6-month period, even when urinary excretion falls below 5 μCi/liter.

TYPES OF OPERATION	HTO FORM (& forms other than those on right-hand cols.)	HT or T_2 GAS IN SEALED PROCESS VESSELS	NUCLEOTIDE PRECURSORS	HTO MIXED WITH MORE THAN 10K_g OF INERT H_2O OR OTHER SUBSTANCES
PROCESSES IN OPEN ROOM OR BENCH, WITH POSSIBLE ESCAPE OF TRITIUM FROM PROCESS VESSELS	0.1 Ci	100 Ci	0.01 Ci	0.01 Ci/K_g
PROCESSES WITH POSSIBLE ESCAPE OF TRITIUM, CARRIED OUT WITHIN A FUME HOOD OF ADEQUATE DESIGN, FACE VELOCITY, AND PERFORMANCE RELIABILITY	1 Ci	1000 Ci	0.1 Ci	0.1 Ci/K_g
PROCESSES CARRIED OUT WITHIN GLOVEBOXES, ORDINARILY CLOSED, BUT WITH POSSIBLE RELEASE OF TRITIUM FROM PROCESS AND OCCASIONAL EXPOSURE TO CONTAMINATED BOX AND BOX LEAKAGE	10 Ci	10,000 Ci	1 Ci	1 Ci/K_g

Table 1

ACTIVITY LEVELS OR CONCENTRATIONS ABOVE WHICH BIOASSAY SHALL BE REQUIRED

Quantities present (< 10Kg) may be considered either the amount processed by an individual at any one time (when accidental intake is more likely), or the amount of activity entered into process (throughput) during any one month (when routine handling of repeated batches is the more likely source of exposure). Concentrations in the right-hand column may be used when activity in process is always diluted in more than 10K_g of other reagents, as in nuclear reactor coolant systems.