FORM NRC-313M
(8-78)
10 CFR 35

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIALS LICENSE -- MEDICAL

Approved:
GAO R0557

INSTRUCTIONS - *Complete Items 1 through 26 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 26 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to : Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20 and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 26 and the appropriate fee enclosed.*

1.a. NAME AND MAILING ADDRESS OF APPLICANT *(Institution, firm, clinic, physician, etc.)* INCLUDE ZIP CODE

Irving M. Greenberg, M.D.
West Park Medical Plaza
Highland Park, Illinois

TELEPHONE NO.: AREA CODE( ) _____ _____

1.b. STREET ADDRESS(ES) AT WHICH RADIOACTIVE MATERIAL WILL BE USED *(If different from 1.a.)* INCLUDE ZIP CODE

SAME as 1a 12-01211-07
030-14085

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Radiation Protection Consultants,
Ronald D. Edwards Ltd.
TELEPHONE NO.: AREA CODE (312) 282 1888

3. THIS IS AN APPLICATION FOR: *(Check appropriate item)*

a. [X] NEW LICENSE
b. [ ] AMENDMENT TO LICENSE NO. _____
c. [ ] RENEWAL OF LICENSE NO. _____

4. INDIVIDUAL USERS *(Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)*

Irving M. Greenberg, M.D.
Brent M. Greenberg, M.D.
Steven Chiu, M.D.

5. RADIATION SAFETY OFFICER (RSO) *(Name of person designated as radiation safety officer. If other than individual user, complete resume of training and experience as in Supplement A.)*

Irving M. Greenberg, M.D.

6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE

RADIOACTIVE MATERIAL LISTED IN:	ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS *(In millicuries)*
10 CFR 31.11 FOR IN VITRO STUDIES	X	as needed
10 CFR 35.100, SCHEDULE A, GROUP I	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP II	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP III	X	as needed
10 CFR 35.100,SCHEDULE A, GROUP IV	--	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V	--	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI	--	

ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS *(In millicuries)*
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM	X	50
PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES		
PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA		
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.	X	100

6.b. RADIOACTIVE MATERIAL FOR USES NOT LISTED IN ITEM 6.a. *(Sealed sources up to 3 mCi used for calibration and reference standards are authorized under Section 35.14(d), 10 CFR Part 35, and NEED NOT BE LISTED.)*

ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	MAXIMUM NUMBER OF MILLICURIES OF EACH FORM	DESCRIBE PURPOSE OF USE

INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

For Items 7 through 23, check the appropriate box(es) and submit a detailed description of all the requested information. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right corner of each page. If you indicate that an appendix to the medical licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide: Regulatory Guide 10.8 , Rev. _____ Date: _____

7. MEDICAL ISOTOPES COMMITTEE	
	Names and Specialties Attached; and
	Duties as in Appendix B; or *(Check One)*
	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
	Supplements A & B Attached for Each Individual User; and
	Supplement A Attached for RSO.
9. INSTRUMENTATION *(Check One)*	
X	Appendix C Form Attached; or
	List by Name and Model Number
10. CALIBRATION OF INSTRUMENTS	
X	Appendix D Procedures Followed for Survey Instruments; or *(Check One)*
	Equivalent Procedures Attached; and
X	Appendix D Procedures Followed for Dose Calibrator; or *(Check One)*
	Equivalent Procedures Attached
11. FACILITIES AND EQUIPMENT	
X	Description and Diagram Attached
12. PERSONNEL TRAINING PROGRAM	
X	Description of Training Attached
13. PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL	
X	Detailed Information Attached
14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS *(Check One)*	
X	Appendix F Procedures Followed; or
	Equivalent Procedures Attached

15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL *(Check One)*	
X	Appendix G Rules Followed; or
	Equivalent Rules Attached
16. EMERGENCY PROCEDURES *(Check One)*	
X	Appendix H Procedures Followed; or
	Equivalent Procedures Attached
17. AREA SURVEY PROCEDURES *(Check One)*	
X	Appendix I Procedures Followed; or
	Equivalent Procedures Attached
18. WASTE DISPOSAL *(Check One)*	
X	Appendix J Form Attached; or
	Equivalent Information Attached
19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS *(Check One)*	
X	Appendix K Procedures Followed; or
	Equivalent Procedures Attached
20. THERAPEUTIC USE OF SEALED SOURCES	
	Detailed Information Attached; and
	Appendix L Procedures Followed; or *(Check One)*
	Equivalent Procedures Attached
21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (e.g., Xenon – 133)	
X	Detailed Information Attached
22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS	
	Detailed Information Attached
23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b	
	Detailed Information Attached

24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	Searle Diagnostics	Monthly
		TLD	Des Plaines, Illinois	
		OTHER (Specify)		
b. FINGER		FILM		
	X	TLD	Searle Diagnostics Des Plaines, Illinois	Monthly
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

25. FOR PRIVATE PRACTICE APPLICANTS ONLY

a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL

NAME OF HOSPITAL: Northwest Hospital

MAILING ADDRESS: 5645 West Addison

CITY: Chicago | STATE: IL | ZIP CODE:

b. ATTACH A COPY OF THE AGREEMENT LETTER SIGNED BY THE HOSPITAL ADMINISTRATOR.

c. WHEN REQUESTING THERAPY PROCEDURES, ATTACH A COPY OF RADIATION SAFETY PRECAUTIONS TO BE TAKEN AND LIST AVAILABLE RADIATION DETECTION INSTRUMENTS.

26. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Parts 30 and 35, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

a. LICENSE FEE REQUIRED
(See Section 170.31, 10 CFR 170)

(1) LICENSE FEE CATEGORY: L # 3457

(2) LICENSE FEE ENCLOSED: $ 190.00

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*
X Irving M. Greenberg M.D.

(1) NAME *(Type or Print)*
Irving M. Greenberg, M.D.

(2) TITLE
Physician

c. DATE
April 7, 1979

FORM NRC-313M (8-78)

Control No. 01683

PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the Nuclear Regulatory Commission on Form NRC-313M. This information is maintained in a system of records designated as NRC-3 and described at 40 Federal Register 45334 (October 1, 1975).

1. AUTHORITY Sections 81 and 161(b) of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2111 and 2201(b)).

2. PRINCIPAL PURPOSE(S) The information is evaluated by the NRC staff pursuant to the criteria set forth in 10 CFR Parts 30-36 to determine whether the application meets the requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations, for the issuance of a radioactive material license or amendment thereof.

3. ROUTINE USES The information may be used: (a) to provide records to State health departments for their information and use; and (b) to provide information to Federal, State, and local health officials and other persons in the event of incident or exposure, for their information, investigation, and protection of the public health and safety. The information may also be disclosed to appropriate Federal, State, and local agencies in the event that the information indicates a violation or potential violation of law and in the course of an administrative or judicial proceeding. In addition, this information may be transferred to an appropriate Federal, State, or local agency to the extent relevant and necessary for a NRC decision or to an appropriate Federal agency to the extent relevant and necessary for that agency's decision about you. A copy of the license issued will routinely be placed in the NRC's Public Document Room, 1717 H Street, N.W., Washington, D.C.

4. WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVIDING INFORMATION Disclosure of the requested information is voluntary. If the requested information is not furnished, however, the application for radioactive material license, or amendment thereof, will not be processed.

5. SYSTEM MANAGER(S) AND ADDRESS Director, Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555.

CALIBRATION OF DOSE CALIBRATOR

A. Sources Used for Linearity Test:

Check as appropriate

____ First elution from new Mo-99/Tc-99m generator

or

_X_ other* (specify) Tc^{99m} Calibrated Standard

B. Sources Used for Instrument Accuracy and Tests:

Radionuclide	Activity (mCi)	Accuracy
57 Co	.200	+-5%
133 Ba	.200	+-5%
137 Cs	1	+-5%
other	____	____

C. ____ The procedures described in Appendix D Section 2 will be used for calibration of the dose calibrator.

or

_X_ Equivalent procedures are attached.

*Must be equivalent to the highest activity used.

Annual calibrations will be performed by:

Radiation Protection Consultants
5213 W. Lawrence Ave.
Chicago, Illinois
NRC License 12-13370-01
Ill. License IL-00374-01

INSTRUMENTATION

1. Survey meters

   a. Manufacturer's name: VICTOREEN

      Manufacturer's model number: 498

      Number of instruments available: 1

      Minimum range: 0 mr/hr to 1 mr/hr
      Maximum range: 100 mr/hr to 1000 mr/hr

   b. Manufacturer's name: _____

      Manufacturer's model number: _____

      Number of instruments available: _____

      ranges: _____

      Minimum range: _____ mr/hr to _____ mr/hr
      Maximum range: _____ mr/hr to _____ mr/hr

2. Dose calibrator

   Manufacturer's name: RADX

   Manufacturer's model number: MARK V

   Number of instruments available: 1

Hospital _____ NRC License NO. _____

Date _____

Control No. 01683

3. Diagnostic instruments

Type of Instrument	Manufacturer's Name	Model No.
GAMMA CAMERA	SEARLE	LFOV

4. Other

Hospital _____ NRC License NO. _____

Date _____

WASTE DISPOSAL PROCEDURES

1. Liquid Waste will be disposed of
Check as appropriate

__X__ By commercial waste disposal service (see also No. 4 below)

__X__ In the sanitary sewer system in accordance with Section 20.303 of 10 CFR Part 20.

____ Other (specify): _____.

2. Mo-99/Tc-99m generators will be:
Check as appropriate

____ Returned to the manufacturer for disposal

__X__ Held for decay until radiation levels as measured with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated and the generators disposed of as normal trash. (Note: this method of disposal may not be practical for generators containing long-lived radioactive contaminants)

____ Disposed of by commercial waste disposal service (see also No. 4 below)

____ Other (specify): _____
_____.

3. Other Solid Waste will be:
Check as appropriate

__X__ Held for decay until radiation levels as measured with a low-level survey meter and with all shielding removed) have reached background levels. All radiation labels will be removed or obliterated and the waste will be disposed of in normal trash.

__X__ Disposed of by commercial waste disposal service (see also No. 4 below)

____ Other (Specify): _____
_____.

4. The commercial waste disposal service used will be: _____
NUCLEAR ENGINEERING CORP. Louisville, Kentucky.
(Name) (City. State)

NRC/Agreement State License No. _____

LABORATORY RULES FOR THE USE OF RADIOACTIVE MATERIAL

1. Wear laboratory coats, or other protective clothing at all times in areas where radioactive materials are used.

2. Wear disposable gloves at all times while handling radioactive materials.

3. Monitor hands and clothing for contamination after each procedure or before leaving the area.

4. Use syringe shields for preparation of patient doses and administration to patients except in circumstances, such as pediatric cases, where their use would compromise the patient's well-being.

5. Do not eat, drink, smoke or apply cosmetics in any area where radioactive material is stored or used.

6. Assay each patient dose in the dose calibrator prior to administration. Do not use any doses that differ from the prescribed dose by more than 10%.

7. Wear personnel monitoring devices (Film badge or TLD) at all times while in areas where radioactive materials are used or stored. These should be worn at chest or waist level.

8. Wear TLD finger badges during elution of generator and preparation, assay, and injection of radiopharmaceuticals.

9. Dispose of radioactive waste only in specially designated receptacles.

10. Never pipette by mouth.

11. Survey generator, kit preparation, and injection areas for contamination after each procedure or at the end of the day. Decontaminate if necessary.

12. Confine radioactive solutions in covered containers plainly identified and labelled with name of compound, radionuclide, date, activity, and radiation level if applicable.

13. Always transport radioactive material in shielded containers.

14. When opening containers of liquid radioiodine:

    a. gloves will be worn

    b. open only in well ventilated room

    c. use lead shield protection barrier.

PERSONNEL TRAINING PROGRAM AND FREQUENCY

All personnel who will be involved in the receipt, handling, use or disposal of radionuclides will be instructed in all or parts of the following subjects:

a. Areas where radioactive material is used or stored.

b. Potential hazards associated with radioactive material.

c. Radiological safety procedures appropriate to their respective duties.

d. Pertinent NRC regulations.

e. The rules and regulations of the licensee.

f. The pertinent terms of the license.

g. Their obligation to report unsafe conditions.

h. Appropriate response to emergencies or unsafe conditions.

i. Their right to be informed of their radiation exposure and bioassay results.

Training will be such that clerical, nursing, housekeeping and security personnel will have lectures to their understanding.

The time involved for the lectures or the listed topics will total approximately eight hours.

Personnel will also be instructed on the above topics during:

a. Annual refresher course.

b. Before assuming their duties in the vicinity of radioactive material.

c. Whenever a significant change in duties, regulations or conditions of the license occurs.

Hospital _____ NRC License NO. _____

Date _____

PROCEDURES FOR OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL

1. Visually inspect package for any sign of damage (e.g., wetness. crushed). If damage is noted stop procedure and notify Radiation Safety Officer.

2. Measure exposure rate at three (3) feet from package surface--record. If >10 mR/hr--stop procedure and notify Radiation Safety Officer.

3. Measure surface exposure rate and record. If >200 mR/hr--stop procedure and notify Radiation Safety Officer.

4. Put on gloves.

5. Open the outer package (following manufacturer's directions, if supplied) and remove packing slip. Open inner package to verify contents (compare requisition, packing slips, and label on bottle) check integrity of final source container (inspect for breakage of seals or vials, loss of liquid, discoloration of packing material). Check also that shipment does not exceed possession limits.

6. Wipe external surface of final source container with moistened cotton swab or filter paper held with forceps, assay and record.

7. Monitor the packing material and packages for contamination before discarding:

   a. if contaminated, treat as radioactive waste.

   b. if not, obliterate radiation labels before discarding in regular trash.

CALIBRATION OF SURVEY INSTRUMENTS

Check appropriate items

X 1. Survey instruments will be calibrated at least annually and following repair.

X 2. Calibration will be performed at two points on each scale. The two points will be approximately 1/3 and 2/3 of full scale. A survey instrument may be considered properly calibrated when the instrument readings are within ± 10% of the calculated or known values for each point checked. Readings within ± 20% are considered acceptable if a calibration chart or graph is prepared and attached to the instrument.

X 3. Survey instruments will be calibrated

___ a. By the manufacturer

___ b. At the licensee's facility

(i) Calibration source
Manufacturer's name _____
Model no. _____
Activity in millicuries _____
Accuracy _____
Traceability to primary standard _____

(ii) The calibration procedures in Appendix D, Section I will be used.

or

(iii) The step-by-step procedures, including radiation safety procedures are attached.

X c. By a consultant or outside firm

(i) Name: Instrument Calibration Center
(ii) Location: 5213 West Lawrence Avenue
Chicago, Illinois

(iii) Procedures and sources

X have been approved by NRC and are on file in License No. 12-14821-01

___ are attached

Hospital _____ NRC License No. _____

Date _____

Control No. 01683

EMERGENCY PROCEDURES

Minor Spills:

1. NOTIFY: Notify persons in the area that a spill has occurred.

2. PREVENT THE SPREAD: Cover the spill with absorbent paper.

3. CLEAN UP: Use disposable gloves and remote handling tongs. Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Include all other contaminated materials such as disposable gloves.

4. SURVEY: With a G.M. Survey Meter, check the area around the spill, your hands and clothing for contamination.

5. REPORT: Report incident to the Radiation Safety Officer.

Major Spills:

1. CLEAR THE AREA: Notify all persons not involved in the spill to vacate the room.

2. PREVENT THE SPREAD. Cover the spill with absorbent pads, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.

3. SHIELD THE SOURCE. If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

4. CLOSE THE ROOM. Leave the room and lock the door(s) to prevent entry.

5. CALL FOR HELP. Notify the Radiation Safety Officer immediately.

6. PERSONNEL DECONTAMINATION. Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin. flush thoroughly and then wash with mild soap and lukewarm water.

RADIATION SAFETY OFFICER _____

OFFICE PHONE: _____

HOME PHONE: _____

SURVEY PROCEDURES

A. All elution, preparation and injection areas will be surveyed daily with G-M survey meter and decontaminated if necessary.

B. Laboratory areas where only small quantities of radioactive material are used (less than 100 uCi) will be surveyed monthly.

C. All other laboratory areas will be surveyed weekly.

D. The weekly and monthly survey will consist of:
   1. A measurement of radiation levels with a survey meter sufficiently sensitive to detect 0.1 mR/hr.
   2. A series of wipe tests to measure contamination levels. The method for performing wipe tests will be sufficiently sensitive to detect 100 dpm.

E. A permanent record will be kept of all survey results, including negative results. The record will include:
   1. Location, date, and type of equipment used.
   2. Name of person conducting the survey.
   3. Drawing of area surveyed, identifying relevent features such as active storage areas, active waste areas, etc.
   4. Measured exposure rates, keyed to location on drawing (point out rates that require corrective action).
   5. Detected contamination levels, keyed to locations on drawing.
   6. Corrective action taken in the case of contamination or excessive exposure rates, reduced contamination levels or exposure rates after corrective action, and any appropriate comments.

F. Area will be cleaned if the contamination level exceeds 100 dpm/100 cm^2.

PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. The Nuclear Medicine Technologists will place all orders for radioactive material and will ensure that the requested materials and quantities are authorized by the license and that possession limits are not exceeded.

2. During normal working hours carriers will be instructed to deliver radioactive packages directly to the Nuclear Medicine Department.

3. During off-duty hours security personnel will accept delivery of radioactive packages in accordance with the procedures outlined in the memorandum.

XENON INFORMATION

Format will follow appendix M of the NRC Medical Licensing Guide.

A.(1) (a) 10 studies per week
(b) 10 millicuries per patient

(2) Possession limit - 100 ma

B.(1) See attached diagram (areas)

(2) See attached diagram (ventilation)

(3) The room will be under negative pressure. The air flow rates will be checked every 3 years or more often if necessary. This will be accomplished by a qualified individual.

C.(1) See attached. (procedures)

(2) XDS Delivery and Trap System from Nuclear Associates. Delivery model 36-103 Trap 36-023

(3) Either full face masks or mouth pieces with nose clamps will be used to reduce leakage.

D. Emergency Procedures

(1) Turn fan speed up to maximum.

(2) Leave room imediately. Close door.

(3) Wait 5 minutes before returning to room.

(4) Survey room for radiation level.

E.(1) 100 Ma maximum activity per week. 1×10^5 microcuries per week (A)

(2) Estimated loss 20% (f)

(3) Room volume - 12' x 15' x 8' = 1440 ft^3

Ventilation rate - 300 CFM exhaust
250 CFM incoming

300 CFM x 6.797×10^7 ml/40 hour week = 2.04×10^{10} ml/40 hr week

(4) $\frac{1 \times 10^5}{2.04 \times 10^{10}} \times .20 = 0.9 \times 10\text{-}6$

F.(1) $\frac{10 \text{ patients}}{\text{weeks}} \times \frac{10 \text{mci}}{\text{patient}} \times \frac{10^3 \text{uCi}}{\text{mci}} \times \frac{52 \text{ weeks}}{\text{year}} = 5.26 \times 10^6$ uCi/yr

F. (continued)

$5.26 \times 10^6 \times .20 = 1.05 \times 10^6$ uCi/year

1.3×10^6 uCi/year would be the activity to be exhausted per year. This is from the estimated leakage from patient and trap system.

1.484×10^{10} ml/year x 300 ft^3/min. = 3.55×10^{13}ml/year

$\frac{1.3 \times 10^6 \text{uCi/year}}{3.55 \times 10^{13} \text{ ml/year}} = .3 \times 10^{-7}$ uCi/ml released at the exhaust point.

2.(a) The leakage from the trapping device will be exhausted to the roof top vent through the exhaust vent system assuming a leakage rate of approximately 5% from the unit. This would give the following:

$\frac{100 \text{ MCi}}{\text{week}} \times .05 = 5$ MCi leakage rate per week. $5\text{MCi} = 5\text{x}10^3\text{uCi}$

$\frac{5 \times 10^3}{1.22 \times 10^8} = 4.09 \times 10^{-10}$ uCi /ml

$.4 \times 10^{-10}$ uCi/ml would be the average amount of Xenon exhausted per week from the trap system.

(b) The trapping device will be checked weekly using a balloon to collect expelled Xenon gas. The balloon will then be checked using a GM survey meter for excessive activity. The level of saturation will be determined by this method. Also, when excessive levels of Xenon are collected in the balloon, the charcoal filters are replaced.

(c) The saturated filters will be placed in sealed containers which are then placed in the drum for routine disposal with the regular radioactive waste. This container is stored in a locked room and access to the room is by authorized personnel only.

The roof area where the exhaust vent is located is an unrestricted area by its location. No intake vents, windows or volitable units are located within 75 feet of the vent.

PROCEDURES FOR USE WITH XENON-133

1. All doses are checked in a dose calibrater prior to administration.

2. The Xenon is kept shielded prior to its' use by lead bricks.

3. Position of the patient for posterior view, and using a flood source, position the lungs so that they are included in the camera's field of view.

4. Place an oxygen tank next to the Xenon system. Take a piece of 1/4 inch plastic tubing and attach one end to the oxygen tank and the other end to the chrome fitting marked "oxygen" which is located on the control panel in the bottom left hand corner.

5. Turn the oxygen tank valve to 5 lbs. PSI. Leave the valve on during the entire study period.

6. Set the camera for Xenon-133.

7. Place the Pulmonex as close to the patient as possible and set the handle to the "start" position. The number "1" will appear under the handle.

8. Set the air flow control to 70. (This is an arbitrary figure that can be changed to accomodate the patient's breathing pattern.)

9. Set the timer to 9 minutes.

10. Place the mouthpiece in the patient's mouth. Clip the patient's nose closed. (A face mask may be used in place of the mouthpiece. In this event, no nose clip is necessary.)

11. Have the patient breathe briefly on "start" to become accustomed to breathing with a mouthpiece. The "from patient" bag will move slightly as the patient exhales.

12. Press the button on the front panel to add oxygen to the "to patient" bag. Only add a small amount of oxygen. Hold the button for a second, or at the most, two seconds. (The bag will only move slightly. Do not fill it up.) More oxygen can be added later if the patient requires it. In many cases it is possible not to add any oxygen and perform the entire study on ambient air. In all cases the oxygen is only to enrich the air in the circuit.

13. Switch the handle to "single breath equilibrium #2." With a gun or a syringe filled with Xenon puncture the mouthpieces' rubber with the needle and add the Xenon as you have the patient take a deep inspiration. Have the patient hold is breath for as long as possible and then continue to breathe normally. Advise the patient to breathe slowly and normally. Observe both breathing bags moving through the front panel windows. Add oxygen if the patient requires it.

PROCEDURES FOR USE WITH XENON-133 (CONT'D)

14. When the patient reaches equilibrium (1 or 2 minutes) the counting rate on the camera stabilizes. Switch to "washout #3." Take washout data on the camera. (Typical framing: 1st picture, 15 sec.; 2nd picture, 30 sec.; 3rd picture, 60 sec.) Have the patient breathe normally slowly.

15. Carefully watch the "from patient" bag. If it blows up tight, the patient is breathing to fast. Advise him to mormalize his breathing and increase the air flow speed.

16. Continue washout until the patient is free of Xenon. Additional time can be added by turning the timer switch further clockwise.

17. When the washout is complete remove the mouthpiece from the patient. Restart the trap and set the timer at 1/2 the time it took the patient to washout, i.e. 6 minute washout, set the timer at 3 minutes. The trap will now purge the system with ambient air.

18. Check the operation of the trap by filling a plastic bag or balloon from the port in the trap marked "vent". Hold the bag in front of the gamma camera. If the count is considerably above background:

    a.) Trap is running to fast.

    b.) Drierite cartridge (moisture trap) is exhausted or not present.

    c.) Charcoal cartridge is exhausted.

    This check should be performed at regular intervals.

THIS STUDY IS NOW COMPLETE.

19. To prepare for next study:

    a.) Reset the handles in the original start position.

GK/jd