NRC FORM 313M (9-81) 10 CFR 35	U.S. NUCLEAR REGULATORY COMMISSION APPLICATION FOR MATERIALS LICENSE – MEDICAL	Approved by OMB 3150-0041 Expires 9-30-83

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

Missouri Delta Communith Hospital
Highway 61, North
Sikeston, Mo. 63801

TELEPHONE NO.: AREA CODE(314 471 1600

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

Missouri Delta Community Hospital
Highway 61, North
Sikeston, Mo. 63801

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Robert S. Colbert, M.D.

TELEPHONE NO.: AREA CODE(314 471-1600

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO. _____
c. ☒ RENEWAL OF LICENSE NO. 24-12876-02

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

Robert S.Colbert, M.D.
Laghaieh Rezvani, 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.)*

Robert S. Colbert,M.D.
See previous application for license No. 24-12876-02

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	
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	2 curies
10 CFR 35.100,SCHEDULE A, GROUP IV	X	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		
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	1,500

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

NRC FORM 313M (9-81)

Applicant
Check No. 22961
Amount $580
Type of Fee FC Ren
Date Check Rec'd 10/24/84
Received By

RECEIVED BY LFMB
Date 10/24/84
Log 00121
By
Orig. To RIII
Action Compl.

8506110138 850522
REG3 LIC30
24-12876-02 PDR

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	**15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL** *(Check One)*
[ ] Names and Specialties Attached; and	[X] Appendix G Rules Followed; or
[X] Duties as in Appendix B; or *(Check One)*	[ ] Equivalent Rules Attached
[ ] Equivalent Duties Attached	**16. EMERGENCY PROCEDURES** *(Check One)*
8. TRAINING AND EXPERIENCE	[X] Appendix H Procedures Followed; or
[X] Supplements A & B Attached for Each Individual User; and	[ ] Equivalent Procedures Attached
[ ] Supplement A Attached for RSO.	**17. AREA SURVEY PROCEDURES** *(Check One)*
9. INSTRUMENTATION *(Check One)*	[X] Appendix I Procedures Followed; or
[X] Appendix C Form Attached; or	[ ] Equivalent Procedures Attached
[ ] List by Name and Model Number	**18. WASTE DISPOSAL** *(Check One)*
10. CALIBRATION OF INSTRUMENTS	[X] Appendix J Form Attached; or
[ ] Appendix D Procedures Followed for Survey Instruments; or *(Check One)*	[ ] Equivalent Information Attached
[X] Equivalent Procedures Attached; and	**19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS** *(Check One)*
[X] Appendix D Procedures Followed for Dose Calibrator; or *(Check One)*	[ ] Appendix K Procedures Followed; or N.A.
[ ] Equivalent Procedures Attached	[ ] Equivalent Procedures Attached
11. FACILITIES AND EQUIPMENT	**20. THERAPEUTIC USE OF SEALED SOURCES**
[X] Description and Diagram Attached	[ ] Detailed Information Attached; and N.A.
12. PERSONNEL TRAINING PROGRAM	[ ] Appendix L Procedures Followed; or *(Check One)*
[X] Description of Training Attached	[ ] Equivalent Procedures Attached
13. PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL	**21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES** (e.g., Xenon – 133)
[X] Detailed Information Attached	[X] Detailed Information Attached
14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS *(Check One)*	**22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS**
	[ ] Detailed Information Attached N.A.
[X] Appendix F Procedures Followed; or	**23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b**
[ ] Equivalent Procedures Attached	[ ] Detailed Information Attached N.A.

TRAINING AND EXPERIENCE

Robert S. Colbert, M.D. ----- Radiology
(See previous license No. 24-12876-02)

Laghaieh Rezvani, M.D.
(Supplements are enclosed)

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Medical Isotopes Committee

Jerry Costin, R.T. -- Registered Nuclear Medicine Technologist
Robert S. Colbert, M.D. -- Radiologist, Radiation Safety Officer
Joyce Williams, R.N.
Jude Williams -- BioMedical Engineer
Donald Cento, M.D. -- Pathologist
Michael Chouinard, MD-Internal Medicine, Hematology-Oncology
Kim Moss, R.T. -- Registered Nuclear Medicine Technologist
Bob Rimel,R.T. -- Registered Nuclear Medicine Technologist
Pat Glass -- Secretary

Responsibility

The committee is responsible for:

1. Ensuring that all individuals who work with or in the vicinity of radioactive material have sufficient training and experience to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.

2. Ensuring that all use of radioactive material is conducted in a safe manner and in accordance with NRC regulations and the conditions of the license.

Duties

1. Be familiar with all pertinent NRC regulations, the terms of the license, and information submitted in support of the request for the license and its amendments.

2. Review the training and experience of all individuals who use radioactive material (including physicians, technologists, physicists, and pharmacists) and determine that their qualifications are sufficient to enable them to perform their duties safely and in accordance with NRC regulations and the conditions of the license.

3. Establish a program to ensure that all individuals whose duties may require them to work in the vicinity of radioactive material (e.g. nursing, security, and housekeeping personnel) are properly instructed as required by 19.12 of 10 CFR Part 19 .

4. Review and approve all requests for use of radioactive material within the institution.

5. Prescribe special conditions that will be required during a proposed use of radioactive material such as requirements for bioassays, physical examinations of users and special monitoring procedures.

6. Review the entire radiation safety program at least annually to determine that all activities are being conducted safely and in accordance with NRC regulations and the conditions of the license. The review shall include an examination of all records, reports from the radiation safety officer, results of NRC inspection, written safety procedures, and the adequacy of the institution's management control system.

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7. Recommend remedial action to correct any deficiencies identified in the radiation safety program.

8. Maintain written records of all committee meetings, actions, recommendations, and decisions.

9. Ensure that the byproduct material license is amended, when necessary, prior to any changes in facilities, equipment, policies, procedures, and personnel, as specified in the license.

Meeting Frequency

The medical isotopes committee shall meet as often as necessary to conduct its business but not less than once in each calendar quarter.

APPENDIX C

INSTRUMENTATION

1. Survey meters

   a. Manufacturer's name: Victoreen Model 7400 Cutie Pie

   Manufacturer's model number: 740-0 740-F

   Number of instruments available: 2

   Minimum range: 0 mR/hr to 25,000 mR/hr

   Maximum range: _____ mR/hr to _____ mR/hr

   b. Manufacturer's name: Geiger Survey Meter

   Manufacturer's model number: #PSM -700 Geiger Mueller Tule Eon 5114

   Number of instruments available: 2

   Minimum range: 0 mR/hr to 50 mR/hr

   Maximum range: _____ mR/hr to _____ mR/hr

2. Dose calibrator

   Manufacturer's name: Picker Isotope Calibrator

   Manufacturer's model number: 632-507

   Number of instruments available: 1

3. Instruments used for diagnostic procedures

Type of Instrument	Manufacturer's Name	Model No.
Gamma camera	Picker	883232
Radx ventilation	Radx	Vc-1203-3
Computer	ADAC 2800	2081-3001B

4. Other (e.g., liquid scintillation counter, area monitor, velometer)

Picker lab monitor 0,30,000 CPM 3 available

Beckman Gamma
4,000 counting system ------- (1) -

Beckman DP 5,000
Data reduction system ------- (1) - In vitro stidies

No. 10

CALIBRATION OF INSTRUMENTS

Calibration of instruments is done yearly by G.E. Smith & Associates,
919 Herbert, Pasadena, Texas 77506.
Calibration certificate is Texas License No. 11-991

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No. 11

Sketch of the Nuclear Medicine Department is enclosed.
The Department consists of three adjacent rooms, one leading into another. The entrance from the outside to the department is through a door marked No. 1, This door leads into the scanning room. Door 2 and 3 are kept locked at all times. The Nuclear Medicine Department is in the basement of the hospital and is surrounded by hallway on one side, physical therapy on the second side a utility tunnel on the third side and the fourth side is dirt. The hallways and tunnel areas are only transiently occupied.
Room 1 is the scanning room and measures 18'10" X 12'8" X 9'6".
Room 2 is used as the office and measures 11'10" X 12'8" X 9'6".
Room 3 is the hot lab. This room is equipped with counters and stainless steel seamless table tops. Counter top covers 2 sides of the room and has areas for storage of the generator, waste storage, work area, sink and dose calibrator. (Hot lab sketch is enclosed.)
The counter top is lined with aborbent paper. The generator is kept behind lead bricks. The radiation exposure at the outter surface to the lead bricks is no more than 1 mR per hour. All other radioactive materials are stored in the area marked D, also lead lined.
The dose preparation area B is next to the generator storage area. All packages are received, handled and checked in this area too.

Ventilation -- The hot lab has an exhaust of 454 cubic ft. per minute and the imaging room has an exhaust of 323 cubic ft. per minute. The air from these rooms is exhausted into the atmosphere above the roof line of the hospital. None is recirculated.

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No. 12

Personnel Training Program

All personnel are certified Nuclear Medicine Technologist. Ancillary personnel which includes nursing, housekeeping and security personnel have been informed about radiation hazards and the appropriate precautions. Personnel are properly instructed before assuming duties with or working in the vacinity of radioactive materials and whenever there is a significant change in the duties, regulations or the terms of a license. The Nuclear Medicine personnel are acquainted with all the terms ofthe license and all rules and regulations pertinent to the license and radiation safety. They are familiar with the radioactive material used or stored and the potential hazards associated with that radioactive material. They are familiar with radiation safety procedures appropriate to their duties. They are, of course, familiar with the pertinent Nuclear Regulatory Commission regulations and the rules and regulations of the license ofthe hospital. They know what actions to take in case of emergencies or unsafe conditions and to report unsafe conditions to the radiation safety officer. They have copies of NRC regulations, copies of the license and all pertinent available notices and Nuclear Regulatory regulations, and their right to be informed of their radiation exposure.

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October 10, 1984

No. 13

Procedures for Ordering and Receiving Radioactive Material

All ordering of radioactive materials is the responsibility of the trained and registered Nuclear Medicine Technologist only. Packages received during off duty hours are brought to the Radioisotope Department by the carrier. If any damage is evident to the package then the Chief Technician of the Nuclear Medicine Department is immediately called. If he cannot be located then the Radiation Safety Officer is then called.

Examining Incoming Packages

1. All packages received are examined by the Chief Technician for leakage, contamination and/or damage. Rubber gloves are worn at all times while handling and opening packages. The following procedure is followed.

   a. If the package is a Generator (Group III) it will be taken to the Hot Lab and then examined for proper radiation levels and radiation levels are verified as indicated on the outside of the package.

   b. The package will be monitored for surface radiation levels and exposure rates recorded. If surface exposure rate is more than 200 mR per hour proceed with caution and notify by phone the Regional Nuclear Regulatory Commission Office.

   c. If the outter package has any leakage or stain record the condition. If stains are present wipe 100 sq. cm. with a dry wipe assay and record. If the wipe has greater than 0.01 mC. (22,000 DPM), proceed with caution. Extradite notification to the NRC office.

   d. After the outter package has been checked and discarded, if uncontaminated, the inside package will be tested in the same manner as above.

   e. All the routine Radiation Safety Regulations will be followed by the technicians working in the Nuclear Medicine Department and copies of routine radiation safety regulations and emergency procedures are posted in the Hot Lab.

APPENDIX J

WASTE DISPOSAL

Note: In view of the recent problems with shallow-land burial sites used by commercial waste disposal firms, NRC is encouraging its licensees to reduce the volume of wastes sent to these facilities. Important steps in volume reduction are to segregate radioactive from nonradioactive waste, to hold short-lived radioactive waste for decay in storage, and to release certain materials in the sanitary sewer in accordance with §20.303 of 10 CFR Part 20.

1. Liquid waste will be disposed of (check as appropriate)

_____ In the sanitary sewer system in accordance with §20.303 of 10 CFR Part 20.

_____ By commercial waste disposal service (see also Item 4 below).

_____ Other (specify): Held until back ground level is reached.

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 in a low background area 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 will be disposed of as normal trash.**

_____ Disposed of by commercial waste disposal service (see also Item 4 below).

_____ Other (specify): _____

_____

3. Other solid waste will be (check as appropriate)

__X__ Held for decay* until radiation levels, as measured in a low background area 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.

_____ Disposed of by commercial waste disposal service (see also Item 4 below).

_____ Other (specify): _____

_____

4. The commercial waste disposal service used will be

_____
(Name) (City, State)

NRC/Agreement State License No. _____

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* Be sure that waste storage areas were described in Item 11 and that they are surveyed periodically (Item 17).

** These generators may contain long-lived radioisotopic contaminants. Therefore, the generator columns will be segregated so that they may be monitored separately to ensure decay to background levels prior to disposal.

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A. Quantities to be used

1. We estimated a patient load of 5 per week or 260 per year with an average use of 10 millicuries of ^{133}Xe per patient.

2. Possession Limit - 1. 5 curies ^{133}Xe.

B. Use and Storage Areas

1. a. Storage area - Hot Lab - measures 7'3" X 12'8" X 9'6" and is adjacent to the lab area. The hot lab is completely equiped with lead shield and 2 x 4 x 8 lead bricks. ^{133}Xe will be stored in a Model No. 150 Radx Xenon-Kow II which is completely lined with 1/4 inch lead.

b. Imaging room - measures 18'10" x 12'8" x 9'6". The Nuclear Medicine Department is in the basement of the hospital and is surrounded by a hallway on one side, physical therapy, a utility tunnel, and the fourth side is dirt.

All uncontrolled areas are considered to be only transiently occupied.

2. Ventilation

A. The Hot Lab has an exhaust of 454 ft^3/min, and the imaging room has an exhaust rate of 323 ft^3/min. The air from these rooms is exhausted into the atomosphere above the roofline of the hospital. None is recirculated.

C. Procedures for routine use

^{133}Xe will be procured from General Electric in 0.5 or 1.0 curie ampules and the ampules will be crushed, diluted to 100 ml volume and dispensed in a Radx Model 150 Xenon-Kow II transfer system in strict accordance with the manufacturer's instruction. After each use the sealing "O" rings on the Xenon-Kow II will be inspected for cracks and damage. Any evidence of damage will result in a change of rings.

Withdrawals from the Xenon-Kow II will be done with a lead-shielded glass syringe. All personnel handling ^{133}Xe doses will wear finger badges in addition to their whole body badges in order to assess exposure to the extremities.

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^{133}Xe will be administered to patients via a Radx Model 101 Ventil-Con in accordance with Radx instructions for use. Face masks or mouthpieces with nose clamps will be used to prevent loss of ^{133}Xe during the patient study.

Exhaled ^{133}Xe will be collected in a Radx Model 120 Xenon Trap. This model has a built-in saturation detector which gives an audio-visual signal when the ^{133}Xe in the trap exhaust port reaches 1×10^{-2} uCi/ml.

D. Emergency Procedures

In case of accidental release of ^{133}Xe, the following procedures will be followed:

1. Hot Lab - The room will be evacuated. The Xenon Trap will be put in the room and turned on, and the room closed. The room will not be reopened until a minimum of 10 complete air changes have taken place.

2. Imaging room - Same procedure as for Hot Lab.

Neither room will be reopened for use until the radiation level in the room as determined by a low level survey meter shows less than 0.1 mr/hr.

E. Air Concentration of ^{133}Xe in Restricted Areas

1. Hot Lab - The Xenon-Kow II is a non-pressurized system and, therefore, is not prone to leaks. However, some ^{133}Xe will be lost in the transferring process. We plan to use one curie each three weeks; therefore, the following assumptions are made:

   Assumptions:

   1% per curie loss in transfer operations spread over the three-week life, or 10 mCi/3 weeks, or 3,333 uCi/week.

2. Imaging Room

   Assumptions:

   a. 5 patients per week.

   b. 1 out of 20 patients will disconnect from the machine and exhale entire lung contents of ^{133}Xe into the room.

   c. 10 mCi of ^{133}Xe used per patient.

d. The Ventil-Con is reported by Radx to lose approximately 1% per day by diffusion through membranes and the Ventil-Con is normally loaded with 50 mCi of Xenon; thus 2.5 mCi are lost per week.

e. The Xenon Trap activates a warning system when the concentration in the exhaust port exceeds 1×10^{-2} uCi/ml. It is assumed for this calculation that the level is at this for the washout period of each patient.

Trap pumps at 5 liters/minute
Average washout time = 10 minutes
Xenon loss per patient through trap = 5×10^{3} ml/min. x 10 mins. x 1×10^{-2} uCi/ml = 5×10^{2} uCi/pt.

It should be emphasized that this is a maximum figure and that the dynamics of ^{133}Xe adsorption on charcoal would dictate that once ^{133}Xe begins to pass through the system, its concentration grows geometrically which would activate the alarm and the charcoal cartridge would be replaced.

3. Integrated Total ^{133}Xe Escape

^{133}Xe per week lost into the room contribution from:

Xenon-Kow II.....3.3 mCi
Ventil-Con.....2.5 mCi
Patients.....2.5 mCi (weekly avg./1year)
Xenon Trap (0.5 mCi/pts. x 5 per wk.)2.5 mCi
10.8 mCi
1.08×10^{4} uCi/wk.

Area exhaust rate (Imaging Room and Hot Lab) = 777 $ft.^3$/min. = 1.9×10^{6} $ft.^3$/40 hr./wk. = 5.2×10^{10} ml/40 hr. wk.

$$^{133}Xe \text{ concentration/40 hr. wk.} = \frac{1.08 \times 10^{4} \text{ uCi/wk.}}{5.2 \times 10^{10} \text{ ml/wk.}}$$

$$= 2.1 \times 10^{-7} \text{ uCi/ml} \quad .$$

This figure is well below the MPC of a restricted area as set forth in 20.103 of 10 CFR Part 20 as 1×10^{-5} uCi/ml.

F. Concentration in Unrestricted Areas

The ^{133}Xe lost into the Hot Lab and Imaging Room as described in Section E, (1) and (2) will be exhausted into the atmosphere above the roofline of the hospital. This constitutes an unrestricted area and 20.106 of 10 CFR 20 requires that the concentration averaged over a period of one year not exceed 3×10^{-7} uCi/ml.

1. ^{133}Xe/year exhausted to the atmosphere

Contribution from Hot Lab and Imaging Room = 1.08×10^4 uCi/wk. x 52 wks.
$= 5.6 \times 10^5$ uCi

2. Air flow per year

Exhaust Rate (Hot Lab & Imaging Room) = 777 ft.^{3}/min.

Exhaust per year = 7.8×10^2 ft.^{3}/min. x 60 min. x 24 hrs. x 365 days
$= 4.1 \times 10^8$ ft.^{3}
$= 1.16 \times 10^{13}$ ml.

3. Average Concentration per year =

$$\frac{5.6 \times 10^5 \text{ uCi/ml}}{1.16 \times 10^{13} \text{ ml/yr}} = 4.83 \times 10^{-8} \text{ uCi/ml}$$

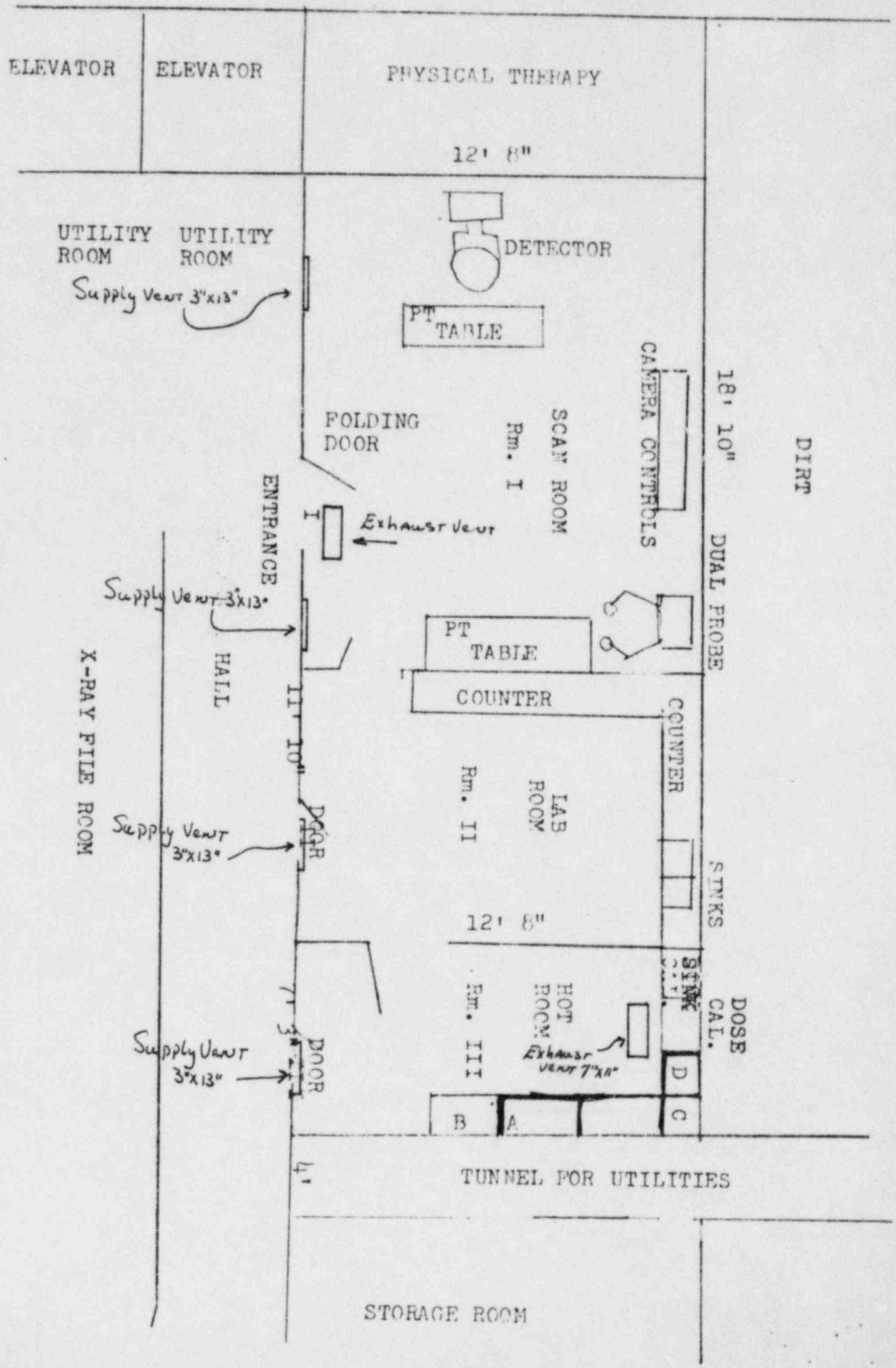
This is well below the MPC of 3×10^{-7} and since the calculations represent worse conditions, the safety margin appears adequate.

G. Adsorption onto Charcoal Traps

The Xenon Trap from Radx has a GM detector system monitoring the exhaust port of the trap. It is designed in such a fashion that when the unit is first turned on, the alarm activates for a few seconds to indicate that the system is functional. The alarm is set to activate when the concentration in the exhaust port exceeds 1×10^{-2} uCi/ml. The exhaust will empty into the imaging room and has been considered in previous calculations (See E.2.e.).

Saturated filters will be plugged and placed in storage behind a minimum 1/4 inch lead shielding in the Hot Lab (See 3.1.a.) for a period of not less than 15 half lives. Since the filter is plugged and completely sealed, it is not anticipated that it will contribute to the ^{133}Xe air concentration.

1. The alarm system on the Radx Trap will be calibrated weekly using the attached procedure supplied by the manufacturer.



A. GENERATOR

B. WORK AREA

C. STORAGE OF RADIOACTIVE WASTE

D. STORAGE OF OTHER ISOTOPE

Program for Maintaining Occupational
Radiation Exposures As Low As Reasonably Achievable

MISSOURI DELTA COMMUNITY HOSPITAL

I. Management Committment

a. We, the management of the Missouri Delta Community Hospital are committed to the program described in this paper for keeping exposures (individual and collective) as low as reasonably achievable (ALARA). In accord with this committment, we hereby describe an administrative organization for radiation safety and will develop the necessary written policy, procedures and instructions to foster the ALARA concept within our institution. The organization includes a Radiation Safety Committee (RSC) and a Radiation Safety Officer (RSO).

b. We will perform a formal annual review of the radiation safety program including ALARA considerations. This shall include reviews of operating procedures and past exposure records, inspections, etc., and consultations of outside consultants.

c. Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposures unless the cost, in our judgement, is considered to be unjustified. We will be able to demonstrate, if necessary, that improvements have been sought, that modifications have been considered, and that they have been implemented where reasonable. Where modifications have been recommended but not implemented, we will be prepared to describe the reasons for not implementing them.

d. In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

II. Radiation Safety Committee (RSC)

a. Review of Proposed Users and Uses

1. The RSC will thoroughly review the qualifications of each applicant with respect to the types and quantities of materials and uses for which he has applied to assure that the applicant will be able to take appropriate measures to maintain exposure ALARA.

2. When considering a new use of by-product material, the RSC will review the efforts of the applicant to maintain exposure ALARA. The user shall have systematized procedures to ensure ALARA, and shall have incorporated the use of special equipment such as syring shields, rubber gloves, etc., in his proposed use.

3. The RSC will ensure that the user justifies his procedures and that dose will be ALARA (individual and collective).

b. Delegation of Authority

(The judicious delegation of RSC authority is essential to the enforcement of an ALARA program.)

1. The RSC will delegate authority to the RSO for enforcement of the ALARA concept.

2. The RSC will support the RSO in those instances where it is necessary for the RSO to assert his authority. Where the RSO has been over-ruled, the Committee will record the basis for its action in the minutes of the Committee's quarterly meeting.

c. Review of ALARA Program

1. The RSC will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

2. The RSC will perform a quarterly review of occupational radiation exposure with particular attention to instances where Investigational Levels in Table I below are exceeded. The principle purpose of this review is to assess trends in occupational exposure as an index of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded (see Paragraph VI).

3. The RSC will evaluate our institution's overall efforts for maintaining exposures ALARA on an annual basis. This review will include the efforts of the RSO, authorized users, and workers as well as those of management.

III. Radiation Safety Officer (RSO)

a. Annual and Quarterly Review

1. Annual review of the Radiation Safety Program. The RSO will perform an annual review of the Radiation Safety Program for adherence to ALARA concepts. Reviews of specific procedures may be conducted on a more frequent basis.

2. Quarterly review of Occupational Exposures. The RSO will review at least quarterly the external radiation exposures of authorization users and workers to determine that their exposures are ALARA in accordance with the provisions of paragraph VI of this program.

3. Quarterly review of records of Radiation Level Surveys. The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.

b. Education Responsibilities for an ALARA Program

1. The RSO will schedule briefings and educational sessions to inform workers of ALARA program efforts.

2. The RSO will assure that authorized users, workers and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that management, the RSC and RSO are committed to implementing the ALARA concept.

c. Cooperative Efforts for Development of ALARA Procedures

Radiation workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

1. The RSO will be in close contact with all users and workers in order to develope ALARA procedures for working with radioactive materials.

2. The RSO will estable procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and encourage the use of those procedures.

d. Reviewing Instances of Deviation from Good ALARA Practices

The RSO will investigate all known instances of deviation from good ALARA practices; and, if possible, determine the causes. When the cause is known, the RSO will require changes in the program to maintain exposures ALARA.

IV. Authorized Users

a. New Procedures Involving Potential Radiation Exposures

1. The authorized user will consult with, and receive the approval of, the RSO and/or RSC during the planning stage before using radioactive materials for a new procedure.

2. The authorized user will evaluate all procedures before using radioactive materials to ensure that exposures will be kept ALARA. This may be enhanced through the application of trial runs.

b. Responsibility of the Authorized User to Those He Supervises

1. The authorized user will explain the ALARA concept and his committment to maintain exposures ALARA to all of those he supervises.

2. The authorized user will ensure that those under his supervision who are subject to occupational radiation exposure are trained and educated in good health physics practices and in maintaining exposures ALARA.

V . Establishment of Investigational Levels in Order to Monitor Individual Occupational External Radiation Exposures

The Missouri Delta Community Hospital hereby establishes Investigational Levels for occupational external radiation exposure which, when exceeded, will initiate review or investigation by the Radiation Safety Committee and/or the Radiation Safety Officer. The Investigational Levels that we have adopted are listed in Table I below. These levels apply to the exposure of individual workers.

TABLE I

		Level I*	Level II**
1.	Whole body; head and trunk; active blood-forming orgnas; lens of eyes; or gonads		
	a. Diagnostic Radiologic Technologist	250 mR	375 mR
	b. Nuclear Medicine Technologist	125 mR	375 mR
	c. Radiation Therapy Technologist	125 mR	375 mR
2.	Hands and forearms; feet and ankles	1875 mR	5625 mR
3.	Skin of whole body	250 mR	2250 mR

* Calendar Quarter levels

The NRC has emphasized that the Investigational Levels in this program are not new dose limits, but as noted in ICRP Report 26, "Recommendations of the International Commission on Radiological Protection," serve as check points above which the results are considered sufficiently important to justify further investigations.

The Radiation Safety Officer will review current occupation radiation exposures, reported by the commercial supplier of personnel monitoring devices, results of personnel monitoring, not less than once in any calendar quarter, as is required by 10 CFR 20, 20.401. The following actions will be taken at the Investigational Levels as stated in Table I.

a. Quarterly exposure of individuals to less than Investigational Level I.

   Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table I values for the Investigational Level I.

b. Personnel exposures equal to or greater than Investigational Level I, but less than Investigational Level II.

   The RSO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I. He will report the results of his reviews at the first RSC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the exposure is required unless deemed appropriate by the Committee. The Committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.

c. Exposure equal to or greater than Investigational Level II.

The RSO will investigate in a timely manner the cause (s) of all personnel exposures equating or exceeding Investigational Level II and, if warranted, take action. A report of the investigation, actions taken, if any, and a copy of the individual's Form NRC-5 or its equivalent will be presented to the RSC at the first RSC meeting following completion of the investigation. The details of these reports will be recorded in the Committee minutes. Committee minutes will be sent to the management of this institution for review. The minutes, containing details of the investigation, will be made available to NRC inspectors for review at the time of the next inspection.

In cases where a worker's or a group of worker's exposures need to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis that it is consistent with good ALARA practices for that individual or group. Justification for a new Investigational Level greater than Level II will be documented.

The Radiation Safety Committee will review the justification for, and will approve, all revisions of Investigational Levels II. In such cases, when the exposure equals or exceeds the newly established Investigational Level II, those actions listed in paragraph C above will be followed.

VI . Action Levels

The specific yearly action levels have been established at the Missouri Delta Community Hospital.

The specific action levels established by this institution are as follows:

TABLE II

	Kind or Class of Operation	Action Level (whole body)
1.	Radiation Therapist	2000 m rem/yr
2.	Radiation Technologist (Diagnostic Radiology)	1000 m rem/yr
3.	Nuclear Medicine Technologist	500 m rem/yr
4.	Cobalt Therapy Technologist	500 m rem/yr
5.	Nurse and All Other Personnel	500 m rem/yr
6.	Pregnant Women	200 m rem/gestation period

The radiation levels have been established on past history of radiation exposure.
Note: The higher level for Radiation Therapist is for exposure due to implants.

VII. Persons Who Receive Occupational Radiation Exposure

a. The worker will be instructed in the ALARA concept and its relationship to his working procedures and work conditions.

b. The worker will know what recourses are available if he feels that ALARA is not being promoted on the job.

VIII. Signature of Certifying Official

Robert S. Colbert

Robert S. Colbert, M.D.
Radiation Safety Officer

Harold L. Jones

Harold L. Jones, Administrator
Missouri Delta Community Hospital

Revised date: September 13, 1983

NRC FORM 313M SUPPLEMENT A (9-81) — U.S. NUCLEAR REGULATORY COMMISSION

TRAINING AND EXPERIENCE
AUTHORIZED USER OR RADIATION SAFETY OFFICER

1. NAME OF AUTHORIZED USER OR RADIATION SAFETY OFFICER	2. STATE OR TERRITORY IN WHICH LICENSED TO PRACTICE MEDICINE
Laghaieh Rezvani, M.D.	Missouri #R7c93

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
American Board of Radiology	Diagnostic Radiology	June, I983

4. TRAINING RECEIVED IN BASIC RADIOISOTOPE HANDLING TECHNIQUES

FIELD OF TRAINING A	LOCATION AND DATE(S) OF TRAINING B	TYPE AND LENGTH OF TRAINING: LECTURE/LABORATORY COURSES (Hours) C	TYPE AND LENGTH OF TRAINING: SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION	Univ. of MO Health SciencesCtr. Truman VA Medical Center Columbia MO I98I-I983 Pahlavi Univ. Shiraa/Iran	> I00 Hours	200 Hours
b. RADIATION PROTECTION	I974-I977 "	> 30 Hours	60 Hrs
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	"	> 20 Hours	80 Hrs
d. RADIATION BIOLOGY	"	> 20 Hours	90 Hrs
e. RADIOPHARMACEUTICAL CHEMISTRY	"	> 30 Hours	I00 Hrs

5. EXPERIENCE WITH RADIATION. *(Actual use of Radioisotopes or Equivalent Experience)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Tc 99M	3500 mCi	Univ. of MO . Health Sciences Center Truman VA Hospital Columbia, MO Nemazee Hospital Shiraz/Iran	530 Hours of work over a 5 years period	Laboratory procedures and nuclear medical clinical uses on humans
Mo-99	I000 mCi			
I-I3I	200 mCi			
I-I25	8 mCi			
Yb-I69	I5 mCi			
Xe-I33	I00 mCi			
Galium	30 mCi			

NRC FORM 313M SUPPLEMENT B
(9-81)

U. S. NUCLEAR REGULATORY COMMISSION

PRECEPTOR STATEMENT

Supplement B must be completed by the applicant physician's preceptor. If more than one preceptor is necessary to document experience, obtain a separate statement from each.

1. APPLICANT PHYSICIAN'S NAME AND ADDRESS

FULL NAME

Laghaieh Rezvani, M.D.

STREET ADDRESS

26 Green Meadows

CITY	STATE	ZIP CODE
Sikeston	MO	63801

KEY TO COLUMN C

PERSONAL PARTICIPATION SHOULD CONSIST OF:

1-Supervised examination of patients to determine the suitability for radioisotope diagnosis and/or treatment and recommendation for prescribed dosage.

2-Collaboration in dose calibration and actual administration of dose to the patient including calculation of the radiation dose, related measurements and plotting of data.

3-Adequate period of training to enable physician to manage radioactive patients and follow patients through diagnosis and/or course of treatment.

2. CLINICAL TRAINING AND EXPERIENCE OF ABOVE NAMED PHYSICIAN

ISOTOPE A	CONDITIONS DIAGNOSED OR TREATED B	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION C	COMMENTS *(Additional information or comments may be submitted in duplicate on separate sheets.)* D
I-131 or I-125	DIAGNOSIS OF THYROID FUNCTION	20	(Drug used is Disida)
	DETERMINATION OF BLOOD AND BLOOD PLASMA VOLUME		
	LIVER FUNCTION STUDIES	30	
	FAT ABSORPTION STUDIES		
	KIDNEY FUNCTION STUDIES	98	
	IN VITRO STUDIES		
OTHER			
I-125	DETECTION OF THROMBOSIS		
I-131	THYROID IMAGING	55	(In the years of 74-77)
P-32	EYE TUMOR LOCALIZATION		
Se-75	PANCREAS IMAGING		
Yb-169	CISTERNOGRAPHY		
Xe-133	BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES	2 58	
OTHER			
Tc-99m	BRAIN IMAGING	120	
	CARDIAC IMAGING	90	(Includes Gated, T120I, Infarct, Istpass)
	THYROID IMAGING	23	
	SALIVARY GLAND IMAGING		
	BLOOD POOL IMAGING	6	(Includes G.I. Bleed, Mecke's)
	PLACENTA LOCALIZATION		
	LIVER AND SPLEEN IMAGING	280	
	LUNG IMAGING	75	(Includes Venogram)
	BONE IMAGING	290	
OTHER			(Galium, Indium-III, Gastric Emptying)

PRECEPTOR STATEMENT *(Continued)*

2. CLINICAL TRAINING AND EXPERIENCE OF ABOVE NAMED PHYSICIAN *(Continued)*

ISOTOPE A	CONDITIONS DIAGNOSED OR TREATED B	NUMBER OF CASES INVOLVING PERSONAL PARTICIPATION C	COMMENTS *(Additional information or comments may be submitted in duplicate on separate sheets.)* D
P-32 *(Soluble)*	TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA, AND BONE METASTASES		
P-32 *(Colloidal)*	INTRACAVITARY TREATMENT		
I-131	TREATMENT OF THYROID CARCINOMA	I	
	TREATMENT OF HYPERTHYROIDISM	8	
Au-198	INTRACAVITARY TREATMENT		
Co-60 or Cs-137	INTERSTITIAL TREATMENT		
	INTRACAVITARY TREATMENT		
I-125 or Ir-192	INTERSTITIAL TREATMENT		
Co-60 or Cs-137	TELETHERAPY TREATMENT		
Sr-90	TREATMENT OF EYE DISEASE		
	RADIOPHARMACEUTICAL PREPARATION		
Mo-99/ Tc-99m	GENERATOR	17	
Sn-113/ In-113m	GENERATOR	105	
Tc-99m	REAGENT KITS		
Other			

3. DATES AND TOTAL NUMBER OF HOURS RECEIVED IN CLINICAL RADIOISOTOPE TRAINING

May and June 1976 (2 months)
April 1982 (one month)
May 1983 (2 weeks)
Total Hours 530

4. THE TRAINING AND EXPERIENCE INDICATED ABOVE WAS OBTAINED UNDER THE SUPERVISION OF:

a. NAME OF SUPERVISOR
Richard A. Holmes, M.D.

b. NAME OF INSTITUTION
UMMC and V.A. Hospital

c. MAILING ADDRESS
I Hospital Drive

d. CITY
Columbia, Missouri 65201

5. MATERIALS LICENSE NUMBER(S)
24-00513-32 24-15235-03

6. PRECEPTOR'S SIGNATURE
Richard A. Holmes, MD

7. PRECEPTOR'S NAME *(Please type or print)*
Richard A. Holmes, M.D.

8. DATE
9/27/84

NRC FORM 313M SUPPLEMENT B
(9-81)

CONTROL NO. 77632

GPO 880-813