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

Veterans Administration Medical Ctr
4100 West 3rd Street
Dayton, Ohio 45428

TELEPHONE NO.: AREA CODE (513) 268-6511

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

Same

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Frank T. Bioe, Consultant
Nuclear Medicine Associates, Inc.
TELEPHONE NO.: AREA CODE (216) 641-5799

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO. _____
c. ☒ RENEWAL OF LICENSE NO. 34-05015-01

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

Refer to attached Item #8

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.)*

Kenneth R. Kattan, M.D. with consultation from Nuclear Medicine Assoc., Inc. Cleveland, Ohio 44125

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	3.0
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	3000
10 CFR 35.100, SCHEDULE A, GROUP IV	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V	X	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	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

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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. 1 Date: Oct., 1980

7. MEDICAL ISOTOPES COMMITTEE	
	Names and Specialties Attached; and
X	Duties as in Appendix B; or *(Check One)*
	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
X	Supplements A & B Attached for Each Individual User; and see attached Item #8
	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	
	Appendix D Procedures Followed for Survey Instruments; or *(Check One)*
X	Equivalent Procedures Attached; and
	Appendix D Procedures Followed for Dose Calibrator; or *(Check One)*
X	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)*	
	Appendix I Procedures Followed; or
X	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	R.S. Landauer, Jr. & Sons	Monthly
		TLD		
		OTHER (Specify)		
b. FINGER		FILM		
	X	TLD	R.S. Landauer, Jr. & Sons	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

MAILING ADDRESS

CITY | STATE | 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: Fee exempt

(2) LICENSE FEE ENCLOSED: $ Fee exempt

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*

X Khairoon M. Ally M.D.

(1) NAME *(Type or Print)*

X KHAIROON M. ALLY

(2) TITLE

X Chief, Nuclear Med Service

c. DATE

X 3/26/84

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NRC FORM 313M (9-81)

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 NRC Form 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.

RADIATION SAFETY COMMITTEE

The membership of this committee will consist of at least three members and will include:

1. the radiation safety officer
2. the hospital administrator or other administrative official directly responsible to the hospital administrator in the hospital's internal chain of command;
3. an authorized user for each type of use permitted by the license; and
4. a representative of the hospital's nursing staff.

The names and qualifications of the committee members will be documented in the committee's records, will be updated as necessary, and will be available for inspection by the NRC.

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1 of 3 pages
Prepared: 3/8/84
Lic. #34-05015-01

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APPENDIX B

RADIATION SAFETY COMMITTEE

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:

The committee shall:

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 materials (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 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 inspections, written safety procedures, and the adequacy of the institution's management control system.

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 Radiation Safety Committee shall meet as often as necessary to conduct its business but not less than once in each calendar quarter.

NAME OF AUTHORIZED USER	AUTHORIZATION
Khairoon M. Ally, M.D. Certified by American Board of Nuclear Medicine, 1976	All except in vitro
Lawrence A. Gilbert, M.D. Certified by American Board of Nuclear Medicine, 1983	All except in vitro
Nosrat M. Hillman, M.D. See attached C.V.	In vitro, any byproduct material listed in Section 31.11(a) of 10 CFR 31
Richard M. Steidle, M.D. See attached C.V.	In vitro, any byproduct material listed in Section 31.11(a) of 10 CFR 31

Item #8
1 of 1 page
Prepared: 3/8/84
Lic. #34-05015-01

CURRICULUM VITAE

Richard M. Steidl, M.D.

ORIGIN:	American, native born Caucasian ancestry
FAMILY STATUS:	Married to Virginia, nee Whitley New York City (Hunter College graduate) Two sons: Scott - Brown University Julliard School of Music James - University of Minnesota
MILITARY SERVICE:	United States Naval Reserve Pacific Fleet Honorably Discharged

Curriculum Vitae - Richard M. Steidl, M.D.

DEGREES:

Bachelor of Science - January, 1949
North Dakota State University
Major: Chemistry
Minor: Mathematics

Bachelor of Arts - June, 1950
University of North Dakota
Major: Chemistry
Minor: Medical Sciences

Bachelor of Science (Medicine) - June, 1951
University of North Dakota
Major: Medical Sciences

Doctor of Medicine - June, 1953
Albany Medical College
Albany, N.Y.

INTERNSHIP:

Presbyterian Hospital
Chicago, Illinois
July 1, 1953 through June 30, 1954

RESIDENCY:

Anatomical Pathology
University of Minnesota - Dr. James Dawson
July 1, 1957 through June 30, 1959

Clinical Pathology (Laboratory Medicine)
University of Minnesota - Dr. Gerald Evans
July 1, 1959 through June 30, 1961

Extra-Mural Training:

National Institute of Health (NINDB)
Bethesda, Maryland
January 1, 1960 to February 1, 1960
Muscle Pathology - Dr. G.M. Shy

Oak Ridge Institute of Nuclear Studies
Oak Ridge, Tennessee
March 6, 1961 to April 16, 1961

Brugmann Hospital
University of Brussels
Brussels, Belgium
Spring, 1961
Supra-vital and Enzymatic Methods in
Myopathology - Dr. Coers

Midland Center for Neurosurgery
Smethwick, England
Summer, 1961
Supra-vital and Enzymatic Methods in
Myopathology - Dr. A.L. Woolf

Curriculum Vitae - Richard M. Steidl, M.D.

Extra-Mural Training: (Con't)

Texas A and M College
College Station, Texas
December 4, 1961 to December 16, 1961
Activation Analysis (Slow Neutron)

CERTIFICATION:

National Board of Medical Examiners - 1954

Diplomate, American Board of Pathology
Anatomic Pathology - 1962
Clinical Pathology - 1962

PRACTICE OF MEDICINE:

Currently, Chief of Laboratory Service
Veterans Administration Medical Center
Dayton, Ohio
(Clinical Associate Professor of Pathology,
Wright State University)

Director of Clinical Laboratories
St. Mary's Hospital
Rhinelander, WI 54501
November 1, 1977 to February 15, 1982

Owner and Director of Laboratories
Doctors Diagnostic Laboratories
100 University Avenue S.E.
Minneapolis, Minnesota
(Served 1000 physicians in 3 states.)
1974 to 1977

Director of Laboratories
Mercy Hospital
Coon Rapids, Minnesota
Spring 1965 to January 1974

Director of Laboratories
Glenwood Hills Hospital
Minneapolis, Minnesota
Spring 1963 to Spring 1965

Assistant Professor; University of
Minnesota, 1962

Instructor; University of Minnesota,
1961

Kulm and Mohall, North Dakota
Family Practice
1954 to 1957

Curriculum Vitae - Richard M. Steidl, M.D.

PRESENT POSITION:

Chief of Laboratory Service responsible for a pathology group composed of 6 pathologists and 2 Ph.D.s (Chemistry and Microbiology). Administer budget and personnel for Laboratory Service composed of 59 full-time equivalent employees. Teach Wright State University Medical Students and Medical Technology Students.

CURRENT COMMITTEES:

Clinical Executive Board, member
Tissue Committee, Chairman
Labor Relations Advisory Comm., designate
Radiation Safety Comm., designate
Equipment Advisory Comm., designate
Tumor Board, designate
Committee on Cancer, designate
Data Validation Review, designate
Professional Standards Board for Physicians, Alternate member

LICENSURE (Area of Service of private laboratory):

State of North Dakota, 1954	#2400
State of Minnesota, 1957	#14318
State of Iowa, 1975	#28007
State of Wisconsin, 1977	#21362
State of Ohio, 1982	#47686

PROFESSIONAL SOCIETIES:

Fellow, College of American Pathologist, 1963
Fellow, American Society of Clinical Pathologists, 1963
Member, American Society of Cytology, 1974
Member, The International Academy of Cytology, 1975
Member, International Academy of Pathology, 1983
Charter Member, American College of Nuclear Medicine, 1973
Member, Ohio Society of Pathology, 1983
Member, Dayton Area Pathologists, 1982

CONTINUING MEDICAL EDUCATION:

16th Postgraduate Institute in Clinical Cytopathology; April 14-25, 1975; John Hopkins University School of Medicine; Baltimore, Maryland.

5th International Tutorial on Clinical Cytology; October 23-31, 1976; Intercontinental Hotel; Vienna, Austria.

3rd Anatomic Seminar and Workshops; January 22-23, 1977; The Florida Society of Pathologists.

Curriculum Vitae - Richard M. Steidl, M.D.

Graduate Course in Endocrine Pathology; April 4-9, 1977; Harvard Medical School; Boston, Mass.

Tutorial on Neoplastic Hematopathology; October 10-14, 1977; Pasadena, Calif.

International Academy of Pathology; March 6-10, 1978; Atlanta Hilton; Atlanta, Georgia.

Review in Clinical Microbiology; April 24-27, 1978; ASCP; Atlanta, Georgia.

Review in Clinical Chemistry; May 7-11, 1979; ASCP; Shoreham Hotel, Washington, D.C.

Immunology for Non-Immunologists; October 29 through November 2, 1979; Harvard Medical School; Boston, Mass.

International Academy of Pathology; February 25-29, 1980; New Orleans, LA.

A Short-term, Intensive Course in Dermalopathology; March 24-28, 1980; New York University, New York, N.Y.

International Academy of Pathology; February 27-March 4, 1983; Atlanta Hilton; Atlanta, Georgia.

OFFICES HELD:

Vice-Chairman, Excel (External Comparative Evaluation of Laboratories) Subcommittee of Survey Committee of College of American Pathologists.

NATIONAL RECOGNITION:

Who's Who in the Midwest, 16th Edition, 1978, (Pub: Marquis Who's Who, Inc.) and all subsequent editions.

Leaders in American Science, 8th Edition, 1968-69 (Pub: Who's Who in American Education, Inc.)

Dictionary of International Biography, Vol. XVI, 1979-80 Edition, Cambridge, England

CIVIC ACTIVITIES:

Board of Directors, Minneapolis Metropolitan Youth Symphonies, 1971 to 1974
President, Board of Directors, Minneapolis Metropolitan Youth Symphonies, 1973 to 1974

Curriculum Vitae - Richard M. Steidl, M.D.

AWARDS:

Recipient, City of Minneapolis Committee on Urban Environment Merit Award, 1976 for contributing most in category to make Minneapolis beautiful. (Restoration of marble, Pillsbury Library Building - Minneapolis landmark.)

PUBLICATIONS: Articles 4 and 6 listed below, were written under the sponsorship and for the College of American Pathologists.

1. "Myasthenic Syndrome with Associated Neutropathy; Report of a Case Including Response to Curare Therapy", Archives of Neurology, 6:451, June, 1962

2. "Glycogen-storage Disease of the Heart" with Ruttenbert, H.D., Carey, L.S., Edwards, J.E., American Heart Journal 67:469, April, 1964

3. "Actinomycotic Osteomyelitis of the Radius", with Gustillo, R.B., Woellner, R., The Bulletin, St. Louis Park Medical Center 9:31, 1965

4. "The Statistics of Quality Control for the Physicians Office Laboratory", PEP Educational Series (College of American Pathologists), Vol. 1, No. 2, April, 1974

5. "Should You Add Proficiency Evaluation Program To Your Office Lab" Minnesota Medicine, Vol. 3, Pages 191-192, March, 1976

6. "A Glossary of Terms in Quality Control (with Mathematical Examples)", Educational Series, College of American Pathologists Proficiency Evaluation Program, CAP-3600-4-77

CURRICULUM VITAE

NOSRAT M. HILLMAN, M.D.

BORN:	Bam, Iran	March 21, 1942
PERSONAL:	Married, two children	
EDUCATION:	Medical School of Tehran University (with honors)	1961- July 1967

PROFESSIONAL CAREER:

Rotating Internship, University Hospitals of the Medical School of the University of Tehran, Iran.	
Rotating Internship, Samaritan Hospital, Troy, New York.	Jan. - Dec. 1968
Residency in Anatomic and Clinical Pathology, Montefiore Hospital and Medical Center, Bronx, New York, under Dr. H. M. Zimmerman.	Jan. 1969 - Dec. 1972
One year of Clinical Hematology and Blood Banking, Montefiore Hospital and Medical Center, Bronx, New York, under Dr. Theodore Spaet.	July 1971 - June 1972
Instructor and Lecturer in Pathology, East Carolina University School of Medicine, Greenville, North Carolina.	Feb. 1973 - Sept. 1974
Associate Attending Pathologist in General Pathology and Forensic Pathology, Lenoir Memorial Hospital, Kinston, North Carolina.	Feb. 1973 - Sept. 1974
Assistant Attending Pathologist in Clinical and Anatomical Pathology, Roosevelt Hospital New York, New York, as well as Blood Banking.	Oct. 1974 - May 1975
Assistant Clinical Professor of Pathology, Columbia University, New York.	Oct. 1974 - June 1975
Assistant Attending Pathologist in Clinical and Anatomical Pathology, City Hospital at Elmhurst, New York.	July 1975 - June 1979
Blood Bank Director and Section Chief of Clinical Microscopy (Routine Hematology), City Hospital at Elmhurst, New York.	* see 2nd page July 1975 - June 1979
Instructor in Pathology, Mount Sinai School of Medicine.	June 1975 - June 1979
Chairman of Blood Transfusion Review Committee City Hospital at Elmhurst, New York.	July 1975 - June 1979
Chief, Clinical Pathology Section, VA Medical Center, Dayton, Ohio, Laboratory Service	Dec. 1979 - Present
Assistant Clinical Professor, Wright State University, Dayton, Ohio	Jan. 1980 - Present

(2)

Associate and Chief, Section of Hematology and Blood Bank, The Department of Pathology, The Bronx-Lebanon Hospital Center, Bronx, New York. Nov. 1978 - June 1979

LICENSURE:

FLEX Diplomate	December 1972
New York State	January 1973
North Carolina	May 21, 1973
ECFMG #087-683	
Clinical Laboratory Director and Blood Bank Directory License, Department of Health, City of New York.	1975
Ohio State	July 1979

CERTIFICATION:

Board Certified in Anatomic and Clinical Pathology	December 1973
Board Certified in Blood Banking (Immunohematology)	June 1979
Board Eligible in Hematopathology	

MEMBERSHIPS:

American Society of Clinical Pathologist (Fellow Member)
New York County Medical Society
Medical Society of the State of New York
College of American Pathologists (Fellow Member)
American Association of Blood Banks

RESEARCH:

Unpublished work on Electron Microscopy of Bone Marrow
Blood Group Typing on Tissue Sections

PUBLICATION:

Delayed Hemolytic Transfusion Reaction, Transfusion 19:548. 1979 **(See addendum)**

REFERENCES:

Dr. H. M. Zimmerman
111 East 210th Street
Bronx, New York 10467

Dr. Richard Rosenfield
Blood Bank Director
Mount Sinai Hospital
Fifth Avenue & 100th Street
New York, New York 10029

Dr. Rolf Zilversmit
Chief of Hematology Section
Department of Medicine
City Hospital Center at Elmhurst
79-01 Broadway
Elmhurst, New York 11373

Dr. Morton Spivack
Blood Bank Director
Montefiore Hospital
111 East 210th Street
Bronx, New York 10467

Dr. Sylvanus W. Nye
Lenoir Memorial Hospital
Department of Pathology
100 Airport Road
Kinston, N. C. 28501

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

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
Kenneth R. Kattan, M.D.	Ohio

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C
ABR	Radiology	
ABNM	Nuclear Medicine	

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	SUPERVISED LABORATORY EXPERIENCE (Hours) D
a. RADIATION PHYSICS AND INSTRUMENTATION			
b. RADIATION PROTECTION			
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY			
d. RADIATION BIOLOGY			
e. RADIOPHARMACEUTICAL CHEMISTRY			

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE

APPENDIX C

INSTRUMENTATION
Nuclear Medicine Department

1. Survey meters

   a. Manufacturer's name: Victoreen

      Manufacturer's model number: 493

      Number of instruments available: 1

      Minimum range: 0.0 mR/hr to 0.5 mR/hr

      Maximum range: 0.0 mR/hr to 50 mR/hr

   b. Manufacturer's name: Victoreen

      Manufacturer's model number: 470 A

      Number of instruments available: 1

      Minimum range: 0.0 mR/hr to 0.3 mR/hr & R/hr with rate

      Maximum range: 0.0 mR/hr to 1000 mR/hr & R/hr with rate

2. Dose Calibrator(s)

   Manufacturer's name: Capintec

   Manufacturer's model number: CRC-10R and CRC-12

   Number of instruments available: 2

3. Instruments used for diagnostic procedures

Type of Instrument	Manufacturer's Name	Model No.
Scanner	Cleon	Whole body
Camera	Picker-portable	Dyna-Mo
Camera	Medix	(Union Carbide)
Camera	Ohio Nuclear-portable	120

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

Nuclear Stethoscope	Bios	Model 300
Probe & Scaler	Nuclear Chicago	Model 8725

APPENDIX C

INSTRUMENTATION
Pathology Department

1. Survey meters

   a. Manufacturer's name: Victoreen

      Manufacturer's model number: CDV-700 6A (or equivalent)

      Number of instruments available: 1

      Minimum range: 0.0 mR/hr to 0.5 mR/hr

      Maximum range: 0.0 mR/hr to 50 mR/hr

   b. Manufacturer's name:

      Manufacturer's model number:

      Number of instruments available:

      Minimum range: mR/hr to mR/hr

      Maximum range: mR/hr to mR/hr

2. Dose Calibrator(s)

   Manufacturer's name:

   Manufacturer's model number:

   Number of instruments available:

3. Instruments used for diagnostic procedures

Type of Instrument	Manufacturer's Name	Model No.
Auto Well	Packard	A 500 CD

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

CALIBRATION OF INSTRUMENTS

A. Survey meters will be checked for operability prior to each use. This will be accomplished by holding the detector against an instrument check source or the dose calibrator sealed constancy source depending on the instrument or range to be tested. If any reading with the same geometry is not within ± 20% of the reading displayed after calibration, the instrment will be recalibrated. The reading obtained will be included on all recorded surveys.

The units will be calibrated after servicing and at least annually by the manufacturer or by Nuclear Medicine Associates, Cleveland, Ohio, in accordance with the procedure outlined in application for NRC license #34-16272-01. Records of these calibrations will be maintained and recommendations for repair will be followed. A survey meter will not be used beyond the anniversary of its last successful calibration.

Arrangements will be made for the availability of at least one survey meter while a unit is away for calibration or repair.

B. The dose calibrator will be calibrated as follows:

1. Sealed sources will be used to establish accuracy. They will consist of:

Nuclide	Suggested Activity	Activity (mCi)	Accuracy
Co-57	3 - 5 mCi	1 mCi or more	Within ± 5%
Ba-133	0.1 - 0.5 mCi	100 uCi or more	Within ± 5%
Cs-137	0.1 - 0.3 mCi	100 uCi or more	Within ± 5%

2. The accuracy of the assay of the above standards will be at least ± 5% and traceable to National Bureau of Standard sources.

3. The calibration procedure will be as follows:

   a. The dose calibrator will be checked for accuracy at annual intervals and following repair using sealed sources having energies which encompass that portion of the spectrum of energies for which the dose calibrator is used. Nuclides that will be used are listed in Item 1 above.

The activity displayed by the dose calibrator must agree with the stated assay within ± 5% of the limits of the standard's calibration accuracy. If the unit displays readings with an error greater than ± 5%, arrangements will be made for immediate repair or adjustment.

b. The dose calibrator will be checked for constancy each day of use. This will be accomplished using a Cs-137 standard. The sealed source will be placed in the chamber and the unit set to measure that nuclide. The activity displayed with background and decay considered, must fall within ± 5 of the predicted activity based on the value obtained at the time of the original accuracy test.

The daily constancy check will be extended to include verification of displayed activities using the same standard but with the dose calibrator set to measure each of the different nuclides to be assayed on that day. With background and decay considered, variation in displayed activities must fall within ± 5% of the activity shown at the time of the most recent accuracy check. If variations greater than ± 5% are noted, arrangements will be made for immediate repair or adjustment.

c. The dose calibrator will be checked for activity linearity at quarterly intervals and following repair. This test will be performed using the maximum dose received from a Radiopharmacy or the first elution from a new Mo-Tc generator. In the latter case, after assaying the entire elution vial, an aliquot will be drawn calculated to contain 200 mCi. The aliquot will be assayed for agreement with the calculated activity to within ± 5%. If 200 mCi cannot be spared for performance of linearity testing, an aliquot less that 200 mCi will be drawn and used. The reduced amount will then be established as the maximum activity to be employed for patient doses or kit preparation for the remainder of the quarter or until linearity testing can be repeated utilizing a greater activity. In this way, the accuracy of the unit will be assured in the measurement of activity from the maximum on hand to a quantity approximately the maximum amount drawn and assayed for kit preparation.

To reduce personnel exposure from a whole vial measurement of activity, an alternate method of obtaining a source for the activity linearity check may be used. An aliquot such as 0.5 to 1.0 ml will be withdrawn from the elution vial and assayed in a syringe. The concentration of the eluent can be determined by dividing the displayed activity by the volume in the syringe. A 200 mCi aliquot contained in the proper volume can then be withdrawn from the elution vial and used for the linearity test. If 200 mCi cannot be used, the amount used may be less but the same restrictions as cited in the paragraph immediately preceding will apply. In this way, the accuracy of the dose calibrator will also be assured in the measurement of activities approximating the maximum quantities used for kit preparation.

The linearity test will be continued by repeating the assay of the test aliquot several times a day over a two to three day period until a measurement is made in which the activity displayed is approximately the minimum dose likely to be used in a patient study and also less than the activity displayed during the annual accuracy check utilizing the standard with the energy similar to that of Tc-99m. In this way, the accuracy of the dose calibrator will be assured in the measurement of individual doses throughout the entire ranges of doses drawn for kit preparation and patient studies.

The above linearity test data will be plotted as a function of activity vs. time and compared to predicted activities vs. the same time. The acceptable range of error will be ± 5%. If test result error exceeds ± 5%, arrangements will be made for immediate repair or adjustment. The unit may be used in the interim using predetermined correction factors.

As an alternative procedure, the linearity test can be performed with the use of the Calicheck Kit from Calcorp, Inc. The manufacturer's instructions for use dated 3/2/82 will be followed. The source used shall be the first elution of a new generator or the activity of the largest dose obtained from a Radiopharmacy if a Radiopharmacy is used. Limits of acceptability and corrective actions will be as described above.

d. The dose calibrator will be tested for geometrical variation at the time of installation and following chamber or liner repair or replacement. This test will be performed using approximately 2 mCi of Tc-99m in a geometrical configuration approximating that of a point source. The source geometry will then be changed by dilution with assays performed at each step. A comparison will also be made to quantify the reduction in displayed activity caused by assaying sources in plastic versus glass containers.

The data will be analyzed relating the various readings to the reading acquired while the test source was in the geometry of the Co-57 accuracy standard. Correction factors will be used in clinical assays when geometry induced errors exceed ± 2%.

In the event the dose calibrator should fail or if it is away for repairs, the nuclear medicine program will be continued through the implementation of the following procedure:

1. A substitute dose calibrator will be acquired.

2. Eluents and/or doses will be assayed in a dose calibrator located at the nearest cooperating institutions having a functional and properly calibrated unit. If activities must be transported for this purpose, they will be shielded with sufficient lead to reduce levels to 2.0 mR/hr or less on contact with the shield, wrapped in sufficient absorbant toweling to absorb ten times the liquid volume contained in the vial or syringe, marked with labels indicating the presence of radioactivity, and carried by one occupational person assigned to this task throughout the entire trip. This same person will perform the assay, record the data, and return the activity to the location of authorized use.

Method #2 will be depended upon only in cases of medical emergency and until a functional dose calibrator can again be acquired. If only the activity of the eluent is known, mathematical calculations will be used to determine activity needed for patient doses.

The above assay techniques will enable the measurement of Technetium-99m and its Molybdenum-99 contaminant to within ± 10% of the true assay. Every effort will be made to expedite repair and return of the dose calibrator.

Diagnostic instrumentation will be calibrated as follows:

1. The camera pulse analyzer will be calibrated using Tc-99m and a uniform flood check will be performed each day of use. A Cobalt 57 source may also be used.

2. Probes and well detectors will be calibrated each day of use with a long lived nuclide, e.g., Cs-137, Ba-133, Co-57 or I-129.

FACILITIES AND EQUIPMENT DESCRIPTION

All radioactive sources are stored in such a manner (lead, concrete, refrigerator) so as to not exceed 2mR/hr at the surface of the barrier.

Mo-99/Tc-99m generator when used will be stored and eluted in the designated area. It will be shielded with lead bricks such that levels from all avenues of approach do not exceed 2.0mR/hr. Spent generators will be stored in the location identified in the attached diagram.

During elution, the eluate will be collected, assayed, and stored in a vial held in a quarter inch lead pig except during brief periods of transfer. Transfer of the eluate or portions of the eluate will be made by the use of syringes retained in lead shields designed for this purpose.

Eluates and compounds made from eluates will be drawn, synthesized, assayed and stored in lead vials or syringes such that levels as measured at contact with a low level survey meter do not exceed 2.0mR/hr except for brief periods during the actual transfer.

Radioactive materials obtained from radiopharmacy suppliers will be stored in their original shipping containers. If necessary, the doses will be placed behind additional shielding to reduce activity levels emitted from the container to 2mR/hr or less.

Syringe shields will be used on all accessories requiring the transfer of radiopharmaceuticals from vial to vial and in drawing up patient doses. Syringe shields will also be used in the administration of doses to patients except when the patient's well-being may be compromised. Under these circumstances, the dose containing syringes will be kept shielded up to the moment of injection.

Steps in the preparation of compounds requiring periods of heating, shaking, agitation or mixing will be performed utilizing lead shielding and/or mechanical or ultrasonic agitation equipment and/or remote handling devices (tongs, forceps, etc.) such that levels during the above period as measured by a low level survey meter do not exceed 2.0mR/hr.

Protective outer garments, such as laboratory coats and rubber gloves will be worn while handling radioactivity in uncontained form.

All possible set-ups will be made on easily cleanable trays. All trays and all other work surfaces will be covered with disposable absorbent paper.

A decontamination kit will be maintained in the department. It will include the following items:

DECONTAMINATION KIT

ITEM		PURPOSE
1.	Warning tape, chalk & signs	posting of area
2.	Plastic bags, small	shoe covers, wet containers
3.	Disposable gloves	hand protection
4.	Masking tape	fasten shoe covers, etc.
5.	Forceps, tongs	safe handling
6.	Large plastic bags	for contaminated material
7.	Sponges, 4 x 4	sopping up
8.	Paper towels	blotting & drying
9.	Radiac wash or detergent	detergent
10.	Scouring powder	friction
11.	Tags	identification
12.	Scissors	cut absorbent paper, etc.
13.	Whatman #1 filter paper	taking swipes following decontamination
14.	Chux	cover area following decontamination
15.	G-M survey meter	monitoring

Nuclear Medicine Department
Facilities and Equipment

Diagram

Air Supply
Air Exhaust
1 Scanner
2 Stethoscope
3 Camera
4 Lockable Door
5 Receipt Area
6 Generator
7 Kit Preparation
8 Isotope Storage
9 Dose Preparation
10 Waste Storage
11 Dose Calibrator
___ Refrigerator

Adjacent Areas

A Exterior
B Stairwell
C Hall

Sink
Lead Castle

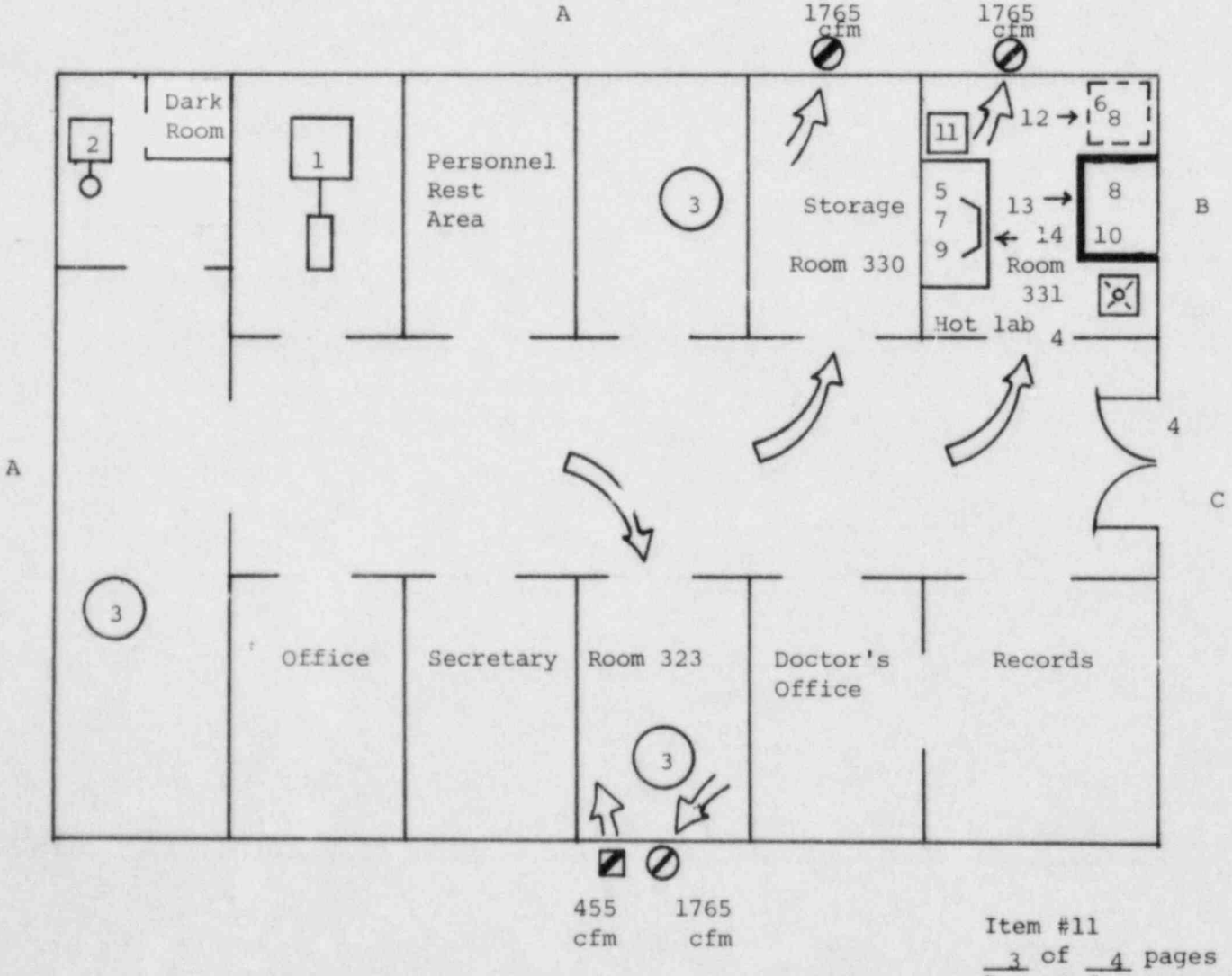
Lead Shielding

12 Lead Castle
2'L x 2'W x 1'H x 2"T

13 Concrete Vault
4'L x 2'W x 2'H x 5"T

14 Lead L-Shield
___L x 1.5'W x 2' H x ¼" T

6 Mfg. Generator shield
___L x ___W x ___H x ½" T



Item #11
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Prepared 3/8/84
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17114

Pathology Department
Facilities and Equipment

Diagram

Air Supply
Air Exhaust
___ Scanner
1 Uptake/Well
___ Camera
___ Lockable Door
2 Receipt Area
___ Generator
___ Kit Preparation
3 Isotope Storage
___ Dose Preparation
___ Waste Storage
___ Dose Calibrator
4 Refrigerator

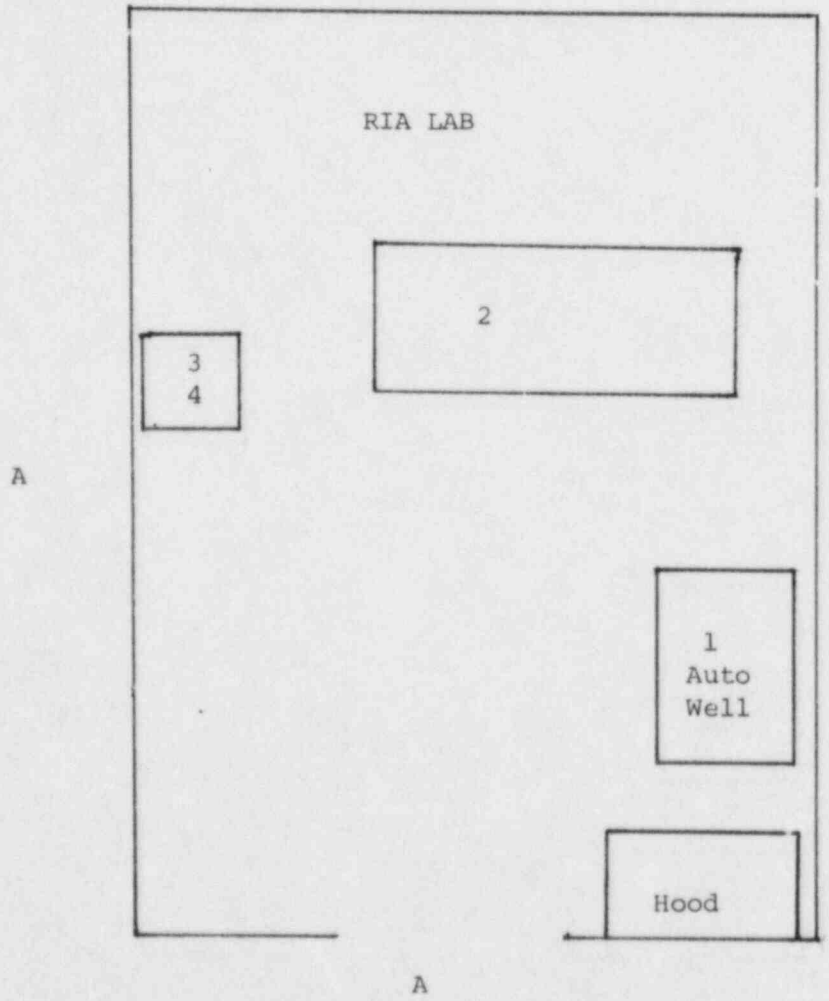
Sink
Lead Castle

Adjacent Areas

A Pathology Dept.

Lead Shielding

___ L x ___ W x ___ H x ___ T
___ L x ___ W x ___ H x ___ T
___ L x ___ W x ___ H x ___ T
___ L x ___ W x ___ H x ___ T



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PERSONNEL TRAINING PROGRAM

In accordance with Section 19.12 of 10 CFR, Part 19, the following is a description of the training required for all personnel who work with or in the vicinity of radioactive materials:

1. The nuclear medicine department will be staffed by individuals who will be classified as occupational employees. These individuals will perform their duties from the radiation safety viewpoint under the direction of the physician(s) named on the license application.

2. Every effort will be made to hire nuclear medicine technology registered or registry eligible personnel to work with radioactive material. Orientation of such personnel for a day or two by the physician(s) named on the license and/or by the supervising technologist will include the following:

   a. Indicate areas where radioactive materials are used or stored.
   b. Potential hazards associated with radioactive materials.
   c. Radiological safety procedures appropriate to their respective duties.
   d. Pertinent NRC regulations.
   e. The rules and regulations of the license.
   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.
   j. Location where the licensee has posted or made available notices, copies of pertinent regulations, and copies of pertinent licenses and license correspondence), as required by 10 CFR, Part 19.

Each technologist is encouraged to attend one regional or national meeting per year. Each technologist is encouraged to attend the local chapter meetins of the technology group. Each technologist will attend the monthly departmental staff meeting. Twice during the year, a radiation safety expert will present a lecture.

3. Our consulting physicists, Nuclear Medicine Associates, Inc., Cleveland, Ohio, will visit our facility quarterly to review all procedures, equipment and records. Personnel will receive refresher training relative to duties, regulations, or terms of the license during these visits or by the physician(s) named on this license application, or by supplementary training at least annually or more frequently, as needed.

4. Access into areas where radioactive material is stored or used will be restricted for nonoccupational personnel. When it is necessary for nonoccupational personnel to enter these areas, as in the case of certain patients who need special care, personnel so involved will be present under the direction of the nuclear medicine technologist, who will ensure that the exposure of these persons is held to the minimum required for the performance of the nuclear medicine procedure. Further, all nonoccupational personnel will receive instruction as to the location and potential hazards associated with radioactive material during their hospital orientation process and annually thereafter in the form of verbal instruction and/or hospital interdepartment memos.

PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. An authorized technologist or his/her designee 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. The receipt area identified in the Item #11 diagram is designed such that radiation levels in unrestricted areas do not exceed the limits specified in 10 CFR 20.105.

2. During normal working hours, carriers will be instructed to deliver radioactive packages directly to the appropriate department. If this is not practical, responsible personnel will sign for packages containing radioactive materials and immediately take them to this location. Alternatively, trained nuclear medicine personnel will sign for and transport packages to the appropriate department.

3. During off-duty hours, supervisory personnel will arrange to have delivery of radioactive packages in accordance with the procedures outlined in the attached directive:

RADIOACTIVE SHIPMENT RECEIPT REPORT

1. P.O.# _____ SURVEY DATE _____ TIME _____

   SURVEYOR _____

2. CONDITION OF PACKAGE:

   _____ O.K. _____ PUNCTURED _____ STATUS _____ WET

   _____ CRUSHED _____ OTHER _____

3. RADIATION UNITS OF LABEL: _____ UNITS (mR/hr)

4. MEMEASURED RADIATION LEVELS: a. Package surface _____ mR/hr

   b. 3' from surface _____ mR/hr

5. DO PACKING SLIP AND VIAL CONTENTS AGREE?

   a. Radionuclide _____ yes _____ no difference _____

   b. Amount _____ yes _____ no difference _____

   c. Chem Form _____ yes _____ no difference _____

6. WIPE RESULTS FROM: a. Outer _____ CPM = _____ DPM

   eff = ( )

   b. Final source container _____ CPM = _____ DPM

   eff=( )

8. SURVEY RESULTS OF PACKING MATERIAL AND CARTONS _____ mR/hr, CPM

9. DISPOSITION OF PACKAGE AFTER INSPECTION _____

10. IF NRC/CARRIER NOTIFICATION REQUIRED, GIVE TIME, DATE AND PERSONS NOTIFIED.

Date: _____

RADIOPHARMACEUTICAL STOCK

Manufacturer: Lot# Expiration Date: Assay Date

Radiopharmaceutical Patient Name	Date	Time	Assay (mCi/ml)	PATIENT DOSE				Balance Remaining(ml)	Administered by (initials)
				Pre dose Activity	Post dose Activity	Net dose Activity	ml		
Initial Assay									
1)									
2)									
3)									
4)									
5)									
6)									
7)									
8)									
9)									
10)									

VA FORM FEB 1957 7051 DATA SHEET

* GPO : 1968 O - 345-187 (68)

RADIOACTIVE SHIPMENT RECEIPT REPORT

1. Suitcase # or P.O.# _____ SURVEY DATE _____ TIME _____

   SURVEYOR _____

2. CONDITION OF PACKAGE:

   _____ O.K. _____ PUNCTURED _____ STATUS _____ WET

   _____ CRUSHED _____ OTHER _____

3. RADIATION UNITS OF LABEL: _____ UNITS (mR/hr)

4. MEMEASURED RADIATION LEVELS: a. Package surface _____ mR/hr

   b. 3' from surface _____ mR/hr

5. DO PACKING SLIP AND VIAL CONTENTS AGREE?

   a. Radionuclide _____ yes _____ no difference _____

   b. Amount _____ yes _____ no difference _____

   c. Chem Form _____ yes _____ no difference _____

6. WIPE RESULTS FROM: a. Outer _____ CPM = _____ DPM
   eff = ( )

   b. Final source container _____ CPM = _____ DPM
   eff=( )

8. SURVEY RESULTS OF PACKING MATERIAL AND CARTONS _____ mR/hr, CPM

9. DISPOSITION OF PACKAGE AFTER INSPECTION _____

10. IF NRC/CARRIER NOTIFICATION REQUIRED, GIVE TIME, DATE AND PERSONS NOTIFIED.

Date: _____

Suitcase #

RADIOPHARMACEUTICAL STOCK

Rx#	Raph.	Date	Calib. Time	Test		Date Returned	R/C			
Residue transferred to Syncor for storage and disposal.										

VA FORM FEB 1987 **7051**

DATA SHEET

☆U. S. Government Printing Office: 1980—311-645/1206

April 18, 1983

Chief, Nuclear Medicine Service (115)

Chief, Police Section (001B)
Chief, Medical Administration Service (136)

Receipt of Packages Containing Radioactive Material

1. Any packages containing radioactive material that arrive between 4:30 p.m. and 7:30 a.m., or on weekends, shall be signed for by personnel in Admissions.

2. Packages containing radioactive material will be taken by courier, accompanied by guard, who will open Nuclear Medicine Service, SW3. Packages not requiring refrigeration, including Technetium generator, are to be placed on the floor in Room 331. Packages requiring refrigeration (they will be labelled, Refrigerate) are to be placed in the refrigerator in either Room 331 or Room 330. Doors are to be relocked by the guards.

3. In event of emergency and guard is not available, small packages not needing refrigeration may also be placed in the lead-lined refrigerator.

4. If the package is wet from other than external causes (rain, snow, etc.) or appears to be damaged, immediately contact Radiation Safety personnel. Ask the carrier to remain at the hospital until it can be determined that he nor the vehicle is contaminated. Contact one of the following:

	Office Phone	Home Phone
Naomi F. Lindsay	268-6511, Ext. 466 or 328	277-3557
Khairoon M. Ally, M.D.	268-6511, Ext. 466 or 328	837-0790

KHAIROON M. ALLY, M.D.,

cc: Radiation Safety Officer (114)

APPENDIX F

PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIAL

1. Special requirements will be followed for packages containing quantities of radioactive material in excess of the Type A quantity limits as specified in paragraphs 20.205 (a)(1) and (c)(1) of 10 CFR Part 20 (more than 20 Ci for Mo-99 and Tc-99m). They will be monitored for surface contamination and external radiation levels within 3 hours after receipt if received during working hours or within 18 hours after receipt if received after working hours, in accordance with the requirements of paragraphs 20.205 (a) through (c). All shipments of liquids greater than exempt quantities will be tested for leakage. The NRC Regional Office will be notified in accordance with the regulations if removable contamination exceeds 0.01 uCi/100 cm^2 or if external radiation levels exceed 200 mR/hr at the package surface or 10 mR/hr at 3 feet (or 1 m).

2. For all packages, the following additional procedures for opening packages will be carried out:

   a. Put on gloves to prevent hand contamination.

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

   c. Measure exposure rate at 3 feet (or 1m) from package surface and record. If > 10 mR/hr, stop procedure and notify Radiation Safety Officer.

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

   e. Open the package with the following precautionary steps:

      (1) Open the outer package (following manufacturer's directions if supplied) and remove packing slip.

      (2) Open inner package and verify that contents agree with those on packing slip. Compare requisition*, packing slip, and label on bottle.

*In the case of special order (e.g., therapy doses) also compare with physician's written request.

(3) Check integrity of final source container (i.e., inspect for breakage of seals or vials, loss of liquid, and discoloration of packaging material).

(4) Check also that shipment does not exceed possession limits.

f. Wipe external surface of final source container shield and remove wipe to low background area. Check wipes with a thin-end window G-M survey meter, and take precaution against the spread of contamination as necessary.

g. Monitor the packing material and packages for contamination before discarding.

(1) If contaminated, treat as radioactive waste.

(2) If not contaminated, obliterate radiation labels before discarding in regular trash.

3. Maintain records of the results of checking each package.

APPENDIX G

GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL IN THE NUCLEAR MEDICINE DEPARTMENT

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. Always use syringe shields for routine preparation of patient doses and administration to patients, except in circumstances such as pediatric cases when their use would compromise the patient's well-being. In these exceptional cases, use other protective methods such as remote delivery of the dose (e.g., through use of a butterfly valve).

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

   b. Do not store food, drink, or personal effects with radioactive material.

6. a. 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 percent.

   b. For therapeutic doses, also check the patient's name, the radionuclide, the chemical form, and the activity vs. the order written by the physician who will perform the procedure.

7. Wear personnel monitoring devices (film badge or TLD) at all times while in areas where radioactive materials are used or stored. These devices should be worn at chest or waist level. Personnel monitoring devices when not being worn to monitor occupational exposures should be stored in a designated low background area.

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 and properly shielded 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 labeled with name of compound, radionuclide, date, activity, and radiation level, if applicable.

13. Always transport radioactive material in shielded containers.

APPENDIX H

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. Also insert into the plastic bag all other contaminated materials such as disposable gloves.

4. **SURVEY:** With a low-range, thin window G-M survey meter, check the area around the spill, 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 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:**

ALTERNATIVE NAMES AND TELEPHONE NUMBERS DESIGNATED BY RADIATION SAFETY OFFICER:

PATHOLOGY DEPARTMENT SURVEY PROCEDURES

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

B. Laboratory areas where only small quantities of radioactive material are used (less than 200 uCi) will be monitored monthly, via wipe test.

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 200 dpm.

E. A permanent record will be kept of the weekly or monthly 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 relevant 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 200 dpm/100cm^2, except in the case of some Tc-99m spill where less radiation exposure would be received by personnel if the area is secured and contamination is allowed to decay.

NU[illegible]AR MEDICINE DEPARTMENT SURVEY PROCEDURE

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

B. Laboratory areas where only small quantities of radioactive material are used (less than 200 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. Analysis of wipe tests will be performed using a low level G-M survey meter.

The procedure will be as follows:

a. Perform wipe tests.
b. Place smear(s) in a "baggy" or disposable glove.
c. Adjust response time to the longest time constant, if applicable.
d. Select most sensitive range.
e. Turn beta shield on probe to open position.
f. Wait until reading stabilizes.
g. Read and record background.
h. Place smear in contact with open position of probe.
i. Wait until the reading stabilizes.
j. Read and record wipe results.

Action levels for smear analysis using the G-M survey meter will be set at any response above background. If action levels of removable contamination are found, decontamination efforts will be initiated to provide for clean-up or to prevent spread. In order to avoid unnecessary personnel exposure, contamination strongly suspected as being caused by Tc-99m may be shielded and/or covered to prevent spread and be allowed to decay.

E. A permanent record will be kept of the weekly or monthly 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 relevant 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.

APPENDIX J

WASTE DISPOSAL

1. Liquid waste

   Liquid waste can be disposed in the sanitary sewer system in accordance with 20.303 of 10 CFR, Part 20.

   Alternatively, the activity may be 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.

2. Mo-99/Tc-99m generators or pharmaceuticals from a radiopharmacy will be:

   Returned to the supplier for disposal. Otherwise, they may be 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.

3. Other solid waste will be 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.

4. A commercial radioactive waste disposal service may be used that is authorized for this type of disposal by a Federal or State regulatory agency.

APPENDIX K

RADIATION SAFETY PROCEDURES FOR
THERAPEUTIC USE OF RADIOPHARMACEUTICALS

1. All patients treated with I-131 or Au-198 will be placed in a private room that has a toilet. The large surfaces in the room and toilet areas that are more likely to be contaminated will be covered with absorbent pads or protective material as appropriate to the amounts of contamination to be expected. Attention should be given to objects likely to be touched by the patient, e.g., telephones, doorknobs, and other items that would be difficult to decontaminate. Plastic bags or wrappings that are waterproof and easily disposable should be used on the smaller items.

2. The patient's room will be properly posted or attended in accordance with §§ 20.203 or 20.204 of 10 CFR Part 20.

3. Surveys of the patient's room and surrounding areas will be conducted as soon as practicable after administration of the treatment dose. Exposure rates will be measured at the patient's bedside and 3 feet (or 1 m) from the patient after administration and at the entrance to the room. The Radiation Safety Officer or his designee will then determine how long a person may remain at these positions and will post these times of the patient's chart and on his door. The results of daily surveys will be used to recalculate permitted times, which will be posted on the patient's chart and on his door.

4. The form, Nursing Instructions for Patients Treated with Phosphorus-32, Gold-198, or Iodine-131 (or a similar form containing all the requested information), will be completed immediately after administration of the treatment dose. A copy will be posted on the patient's chart.

5. Radiation levels in unrestricted areas will be maintained less than the limits specified in paragraph 20.105(b) of 10 CFR Part 20.

6. All linens will be surveyed for contamination before being removed from the patient's room and, if necessary, will be held for decay.

7. Disposable plates, cups, eating utensils, tissue, surgical dressings, and other similar waste items will be placed in a specially designated container. The material will be collected daily by the Radiation Safety Officer or his

designee, checked for contamination, and disposed of as normal or radioactive waste, as appropriate.

8. Nondisposable items used for these patients will be held in plastic bags in the patient's room and will be checked for contamination by the Radiation Safety Officer or his designee. Items may be returned for normal use, held for decay, or decontaminated, as appropriate.

9. If urine and vomitus from I-131 therapy patients are collected, they will be stored for decay in the radioactive waste storage area. Such stored wastes will be retained until they have reached background levels, as measured with a low-level survey meter. They will then be released to the sanitary sewer system.

10. Before a therapy patient's room is reassigned to another patient, the room will be surveyed for contamination and decontaminated if necessary, and all radioactive waste and waste containers will be removed.

11. Nursing Instructions

    a. Nurses should spend only that amount of time near the patient required for ordinary nursing care. Special restrictions may be noted on the precaution sheet on the patient's chart. Nurses should read these restrictions before administering to the patients. Call the Nuclear Medicine Department or the Radiation Safety Officer with any questions about the care of these patients. Nursing personnel who attend the patient will wear personnel monitoring devices as advised by the Radiation Safety Office.

    b. Visitors will be limited to those 18 years of age or over unless other instructions are noted on the precaution sheet on the patient's chart.

    c. Patients must remain in bed while visitors are in the room and visitors should remain at least 3 feet (or 1 m) from the patient.

    d. Patients containing radioactive materials are to be confined to their rooms except for special medical or nursing purposes approved by the Nuclear Medicine Department.

    e. No nurse, visitor, or attendant who is pregnant should be permitted in the room of a patient who has received a therapeutic amount of radioactivity until the patient no longer presents a radiation hazard. Female visitors should be asked whether they are pregnant.

f. Attending personnel should wear rubber or disposable plastic gloves when handling urinals, bedpans, emesis basins, or other containers having any material obtained from the body of the patient. Wash gloves before removing and then wash hands. The gloves should be left in the patient's room in the designated waste container. These gloves need not be sterile or surgical in type.

g. Disposable items should be used in the care of these patients, whenever possible. These items should be placed in the designated waste container. Contact the Radiation Safety Officer or his designee for proper disposal of the contents of the designated waste container.

h. All clothes and bed linens used by the patient should be placed in the laundry bag provided and should be left in the patient's room to be checked by the Radiation Safety Officer or his designee.

i. All nondisposable items should be placed in a plastic bag and should be left in the patient's room to be checked by the Radiation Safety Officer or his designee.

j. Surgical dressings should be changed only as directed by the physician. Au-198 leaking from a puncture wound may stain the dressings dark red or purple. Such dressings should not be discarded but should be collected in plastic bags and turned over to the Radiation Safety Officer or his designee. Handle these dressings only with tongs or tweezers. Wear disposable gloves.

k. For I-131 patients:

(1) To the degree possible with cooperative patients, urine will be collected in special containers provided by the Radiation Safety Officer or his designee. The patient should be encouraged to collect his own urine in the container. If the patient is bedridden, a separate urinal or bed pan should be provided. The urinal or bed pan should be flushed several times with hot soapy water after use.

(2) If the nurse helps to collect the excreta, disposable gloves should be worn. Afterward, hands should be washed with the gloves on and again after the gloves are removed. The gloves should be placed in the designated waste container for disposal by the Radiation Safety or his designee.

(3) Disposable plates, cups, and eating utensils will be used by patients who are treated with I-131.

(4) Vomiting within 24 hours after oral administration, urinary incontinence, or excessive sweating within the first 48 hours may results in contamination of linen and floor. In any situation where the patient's room may be contaminated or if radioactive urine and/or feces is spilled during collection, call the Radiation Safety Officer or his designee, Ext. (Posted). Meanwhile, handle all contaminated material with disposable gloves and avoid spreading contamination.

(5) Keep all contaminated wastes and vomitus in plastic bags in the patient's room for disposal by the Radiation Safety Officer or his designee. Feces need not be routinely saved unless ordered on the chart. The same toilet should be used by the patient at all times and it should be well flushed (3 times). The Radiation Safety Officer will establish procedures for disposal of wastes (see Item 12 below).

l. If a nurse, attendant, or anyone else knows or suspects that his or her skin or clothing, including shoes, is contaminated, notify the Radiation Safety Officer or his designee immediately. This person should remain in an area adjacent to the patient's room and should not walk about the hospital. If the hands become contaminated, wash them immediately with soap and water.

m. If a therapy patient should need emergency surgery or should die, notify the Radiation Safety Officer or the Nuclear Medicine Department immediately.

n. When the patient is discharged, call the Radiation Safety Officer or his designee or the Nuclear Medicine Department and request that the room be surveyed for contamination before remaking the room.

12. Waste Disposal

When contaminated wastes are transported to the Waste Storage/Disposal area, precautions will be taken to minimize external irradiation of personnel. Stored wastes will be shielded to maintain exposure to personnel in restricted and unrestricted areas ALARA.

NURSING INSTRUCTIONS FOR PATIENTS TREATED WITH
PHOSPHORUS-32,GOLD-198, OR IODINE-131

Patients's Name: _____

Room No: _____ Physician's Name: _____

Radioisotope Administered: _____

Date and Time of Administration: _____

Dose Received: _____ Method of Administration: _____

Exposure Rates in mR/hr

Date	3 feet from bed	10 feet from bed

(Comply with all checked items)

_____1. Visiting time permitted: _____
_____2. Visitors must remain _____ from patient.
_____3. Patient may not leave room.
_____4. Visitors under 18 are not permitted.
_____5. Pregnant visitors are not permitted.
_____6. Film or TLD badges must be worn.
_____7. Pocket chambers will be worn for supplementary personnel monitoring of individual tasks.
_____8. Tag the following objects and fill out the tag:

_____ door _____ chart
_____ bed _____ wrist

_____9. Disposable gloves must be worn while attending patient.
_____10. Patient must use disposable utensils.
_____11. All items must remain in room until approved for removal by the Radiation Safety Officer or his designee.
_____12. Smoking is not permitted.
_____13. Room is not to be released to Admitting Office until approved by the Radiation Safety Officer or his designee.
_____14. Other instructions.

In case of an emergency contact:

RSO

_____

Name On-duty/Off-duty Telephone Numbers

PROCEDURES AND PRECAUTIONS FOR THE USE OF RADIOACTIVE GASES

I. Quantities:

A. An average of 5 exams per week may be done.

B. Average activity per exam is 20mCi.

C. Possession limit of 500mCi is authorized.

II. Use and Storage:

A. Xenon-133 will be stored in the hot lab, Room 331. It will be stored in its original shipping container until used. The Xenon will be kept in the cement storage vault with 5" thick walls and 1" lead cover or in the lead castle with 2" thick lead walls. Accessory lead shielding will be used whenever survey measurements at the surface of the vault or lead castle are 2.0mR/hr or more.

The hot lab where Xenon is kept is under negative pressure. It is continuously exhausted at 1765 cfm by an 18" diameter window fan located near the ceiling. The fan is at least 10 feet away from any potential re-entry port to the hospital. There is no forced air supply to the hot lab room. Therefore, the room is under negative pressure at all times.

B. Room 330 is used to store the Xenon trap cartridges that are undergoing decay. The cartridges are supplied by the Atomic Development Corporation.

Room 330 is continuously exhausted at 1765 cfm by an 18" diameter window fan mounted near the ceiling. The fan is at least 10 feet away from any potential re-entry port to the hospital. There is no forced air supply to this room ensuring that it is under negative pressure at all times.

C. The Camera Room where Xenon will be used is Room 323. It is exhausted by an 18" diameter window fan which provides an exhaust rate of 1765 cfm. This fan is located no closer than 10 feet from any potential point of re-entry to the hospital. The maximum air supply to the camera room is 455 cfm through a window air conditioner. Therefore, it is ensured that the room is under negative pressure whenever the fan is on. This exhaust rate will be maintained for 3.5 hours for each Xenon study performed.

D. Room dimensions:

1) Room 331 (hot lab) 8' x 7' x 9'
2) Room 330 (trap storage) 8' x 7' x 9'
3) Room 323 (camera room) 13' x 13' x 9'

III. Procedure for Routine Use:

A. The camera room door will be opened to a six inch gap at the door jamb if patient's condition permits.

Prior to starting a Xenon study, the exhaust system will be turned on and remain on for a minimum of 3.5 hours for each Xenon study performed.

The patient will be fitted with the rebreathing and collection apparatus, and then instructed as to the procedure. Trial runs without Xenon will be conducted whenever patient condition permits.

The Xenon will be administered and appropriate number of views obtained. During the washout phase, the Xenon will be collected in the gas trap until practically no Xenon remains in the patient as evidenced by the camera persistence scope.

Whole body film badges and TLD finger badges will be worn by occupational personnel handling Xenon. Visitors will be excluded from the camera room during Xenon use unless their presence is required for patient care or desired for educational or observational purposes.

B. An activated charcoal gas trap will be used for patient studies. An Atomic Development Corporation delivery system with gas trap or equivalent is used. This system will be used in accordance with manufacurer's instructions.

Face masks that cover both mouth and nose or nose clamps for use with the mouthpiece delivery systems will be employed to reduce leakage of the Xenon into camera room.

C. On a semi-annual basis, the exhaust flow rates from the camera rooms and hot lab will be checked to assure that a change in exhaust rate has not occurred and a check of the air supply will be made to assure negative pressure in the rooms.

IV. Emergency Procedures:

A. In the event there is an accidental patient associated loss of Xenon into the hot lab, the exhaust system will clear the room to levels less than 1×10^{-5} uCi/ml in less than 2 minutes.

For room 331 (Hot Lab)

Activity per loss (A) = 20 mCi = 2×10^{4} uCi

Room volume (V) = 8' x 7' x 9'

= 504 $ft.^{3}$

= 1.4×10^{7} ml

Clearance rate (λ) = $\frac{1765 \text{ cfm}}{504 \text{ ft}^3}$

= 3.5 $min.^{-1}$

Initial concentration (C_o) = $\frac{2 \times 10^{4} \text{ uCi}}{1.4 \times 10^{7} \text{ ml}}$

= 1.4×10^{-3} uCi/ml

Evacuation time (t) = 2 minutes

Final concentration (C) = $C_o \, e^{-\lambda t}$

= $(1.4 \times 10^{-3}) \, e^{-3.5 \times 2}$

= 1.3×10^{-6} uCi/ml

This value is less than 1×10^{-5} uCi/ml.

All unnecessary personnel will evacuate the room. The hot lab door will be guarded against inadvertant entry during this time period.

A survey meter will be placed on the floor so it can be observed from the door. When background levels are reached, the room may be re-entered.

B. In the event there is an accidental patient associated loss of Xenon into the camera room, the exhaust system will clear the room to levels less than 1×10^{-5} uCi/ml in less than 5 minutes.

For room 323 (camera room)

Activity per loss (A) = 20 mCi = 2×10^{4} uCi

Room volume (V) = 13' x 13' x 9'

= 1521 ft.^{3}

= 4.3×10^{7} ml

Clearance rate (λ) = $\frac{1765 \text{ cfm}}{1521 \text{ ft}^3}$

= 1.16 min.$^{-1}$

Initial concentration (C_o) = $\frac{2 \times 10^{4} \text{ uCi}}{4.3 \times 10^{7} \text{ ml}}$

= 4.65×10^{-4} uCi/ml

Evacuation time (t) = 5 minutes

Final concentration (C) = $C_o \, e^{-\lambda t}$

= $(4.65 \times 10^{-4}) \, e^{-1.16 \times 5}$

= 1.4×10^{-6} uCi/ml

This value is less than 1×10^{-5} uCi/ml.

All unnecessary personnel will evacuate the room. The camera room door will be guarded against inadvertant entry during this time period.

A survey meter will be placed on the floor so it can be observed from the door. When background levels are reached, the room may be re-entered. Alternatively, the camera may be turned on periodically to collect counts for a present time. When no significant reduction in count rate is noted, the room may be re-entered.

C. For accidental release of Xenon in the room where the trap cartridges are stored (Room 330) the same calculations for the hot lab in paragraph A above would apply.

V. Air Concentration of Xenon-133 in Restricted Areas:

A. Camera Room (323):

It is estimated that 20 mCi will be used per study.

15% of the Xenon will be lost into the camera room due to patient associated losses and the inability of the gas to trap 100% of the Xenon.

An exhaust rate of 1765 cfm will be used in this calculation.

Exhaust fan will be on 3.5 hours per study.

Activity = 20 mCi x 0.15 x 10^3 uCi/mCi

= 3000 uCi

Volume = 1765 cfm x 210 min. x 2.832 x 10^4 ml/ft^3

= 1.05 x 10^{10} ml

$$\text{Concentration} = \frac{A}{V} = \frac{3 \times 10^3 \text{ uCi}}{1.05 \times 10^{10} \text{ ml}}$$

$$= 2.86 \times 10^{-7} \text{ uCi/ml}$$

This value is less than required for restricted areas

(1 x 10^{-5} uCi/ml).

B. Hot Lab (331):

Assume 5 studies per week at 20 mCi each for a total of 100 mCi/wk x 52 wks: 5200 mCi per year.

Assume 5% of the Xenon will be lost in storage.

An exhaust rate of 1765 cfm will be used.

Exhaust will be on continuously.

Volume = 1765 cfm x 1.484×10^{10} ml/yr/cfm

= 2.6×10^{13} ml/yr

$$\text{Concentration} = \frac{A}{V} = \frac{5200 \text{ mCi} \times 10^3 \text{ uCi/mCi} \times 0.05}{2.6 \times 10^{13} \text{ ml}}$$

= 1×10^{-8} uCi/ml

C. Trap Storage Room (330):

The same calculations can be used as for the hot lab.

IV. Methods of Xenon Disposal

A. All unused Xenon will be disposed of by decay in storage in the hot lab vault. Containers and apparatus will be surveyed unshielded with the low-level survey meter held on contact with the source containing device. If levels are the same as background, the containers will be disposed of after defacing labels.

All escaped Xenon will be vented through the exhaust system.

Xenon loss is assumed to be the following for each room:

Camera Room (323):	15%
Hot Lab (331):	5%
Trap Storage (330):	5%
Total Loss:	20%

B. Camera Room (323):

If the exhaust fan in the camera room remains on for 3.5 hrs/Xenon study, then the concentration in unrestricted areas will not exceed 3×10^{-7} uCi/ml as per 10 CFR 20.106.

Activity = 20 mCi x 0.15 x 10^3 uCi/mCi

= 3000 uCi

Volume = 1765 cfm x 210 min. x 2.832×10^4 ml/ft^3

= 1.04×10^{10} ml

$$\text{Concentration} = \frac{A}{V} = \frac{3 \times 10^{3} \text{ uCi}}{1.05 \times 10^{10} \text{ ml}}$$

$$= 2.86 \times 10^{-7} \text{ uCi/ml}$$

C. For Hot Lab (331):

Exhaust runs continuously at 1765 cfm.

It is assumed that 0.26 curies of Xenon will be vented to the atmosphere per year.

$$\text{Volume} = 1765 \text{ cfm} \times 1.484 \times 10^{10} \text{ ml/yr/cfm}$$

$$= 2.6 \times 10^{13} \text{ ml/yr}$$

$$\text{Concentration} = \frac{A}{V} = \frac{0.26 \text{ Ci} \times 10^{6} \text{ uCi/Ci}}{2.6 \times 10^{13} \text{ ml}}$$

$$= 1 \times 10^{-8} \text{ uCi/ml}$$

D. Calculation for the Trap Storage Room (330) are the same as for the Hot Lab.

E. After every 20 procedures, the trapping efficiency of the charcoal trap will be evaluated. A low-level G-M probe will be placed against the inlet tube of the trap during the equilibrium phase of the study and a reading taken. The probe will then be placed against the outlet from the trap at the initiation of the washout phase. The maximum reading during washout will be noted. If the maximum exhaust reading exceeds 10% of the inlet reading, taking background into consideration, the trap will be considered to be saturated and the cartridge will be replaced.

F. Saturated charcoal traps will be stored in the cabinet for decay. After decay a survey will be performed using a low level G-M on contact with the unshielded column. If the reading is equivalent to background, the column may be disposed.

Model Program for Maintaining Occupational Radiation Exposures at Medical Institutions ALARA

V.A. Medicine Center
(Licensee's Name)

March 8, 1984
(Date)

I. Management Commitment

a. We, the management of this (medical facility, hospital, etc.) 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 commitment, 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 will include a Radiation Safety Committee (RSC)[1] 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 with the radiation protection staff or 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.

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1 Private practice physician licenses do not include a RSC.

II. Radiation Safety Committee (RSC)[2]

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 byproduct material, the RSC will review the efforts of the applicant to maintain exposure ALARA. The user should have systematized procedures to ensure ALARA, and shall have incorporated the use of special equipment such as syringe 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 overruled, 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.

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[2] The RSO on private practive physician licenses will assume the responsibilities of the RSC under Section II.

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]

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 authorized 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 the RSO are committed to implementing the ALARA concept.

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[3]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 investigation.

c. Cooperative Efforts for Development of ALARA Procedures

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

2. The RSO will establish procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and encourage the 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 commitment to maintain exposures ALARA to all of those he surpervises.

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. 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.

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

This institution (or private practive) 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 1

		Investigational levels - (mrems per calendar quarter)	
		LEVEL I	LEVEL II
1.	Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads	125	375
2.	Hands and forearms; feet and ankles	1875	5625
3.	Skin of whole body*	750	2250

*Not normally applicable to nuclear medicine operations except those using significant quantities of beta emitting isotopes.

The Radiation Safety Officer will review and record on Form NRC-5, Current Occupational External Radiation Exposures, or an equivalent form (e.g. dosimeter processor's report), 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 1:

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 equaling 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 MRC-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.

d. Re-establishment of an individual occupational worker's Investigational Level II Above That Listed in Table I.

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 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.

VII. Signature of Certifying Official[4]

I hereby certify that his institution (or private practice), has implemented the ALARA Program set forth above.

Reeder Hurt
Signature

REEDES HURT
Name (print of type)

Acting Director
Title

Institution (or Private Practice) Name and Address:

VA Medical Center
4100 West Third Street
Dayton, OH 45428

[4]The individual who is authorized to make commitments for the administration of the institution (e.g., hospital administrator, etc.) or, in the case of private practice the licensed physician.