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

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

Marshfield Clinic, 1000 N. Oak Ave.
St. Joseph Hospital, 611 St. Joseph Ave.
Marshfield Medical Foundation, 510 N. St. Joseph Ave.
Marshfield, WI 54449

TELEPHONE NO.: AREA CODE (715) 387 5511

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

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Lois Rutz

TELEPHONE NO.: AREA CODE (715) 387 9022

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO. _____
c. ☒ RENEWAL OF LICENSE NO. 481096603

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

N/A - Broad Scope License

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.)*

Lois J. Rutz, MS

6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE See attached

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

ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM		
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.		

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
Any byproduct material with atomic numbers between 3 and 83 inclusive	Any	See attached (over)	

16218

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	
X	Names and Specialties Attached; and
	Duties as in Appendix B; or *(Check One)*
X	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
	Supplements A & B Attached for Each Individual User; and N/A
X	Supplement A Attached for RSO.
9. INSTRUMENTATION *(Check One)*	
	Appendix C Form Attached; or
X	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)*	
	Appendix F Procedures Followed; or
X	Equivalent Procedures Attached

15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL *(Check One)*	
	Appendix G Rules Followed; or
X	Equivalent Rules Attached
16. EMERGENCY PROCEDURES *(Check One)*	
	Appendix H Procedures Followed; or
X	Equivalent Procedures Attached
17. AREA SURVEY PROCEDURES *(Check One)*	
	Appendix I Procedures Followed; or
X	Equivalent Procedures Attached
18. WASTE DISPOSAL *(Check One)*	
	Appendix J Form Attached; or
X	Equivalent Information Attached
19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS *(Check One)*	
	Appendix K Procedures Followed; or
X	Equivalent Procedures Attached
20. THERAPEUTIC USE OF SEALED SOURCES	
	Detailed Information Attached; and
	Appendix L Procedures Followed; or *(Check One)*
X	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	
X	Detailed Information Attached

24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	RS Landauer	Monthly
	X	TLD	RS Landauer	Monthly
		OTHER (Specify)		
b. FINGER		FILM		
	X	TLD	RS Landauer	Monthly
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

3 Ion chamber pocket dosimeters used for special surveys or for temporary help

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
Byproduct material (10 CFR 170.31.3A)

(2) LICENSE FEE ENCLOSED $ 460.00

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*
Frederick J. Wenzel

(1) NAME *(Type or Print)*
Frederick J. Wenzel

(2) TITLE
Executive Director

c. DATE
11/15/83

FORM NRC-313M (8-78)

16228

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.

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
Lois Jo Rutz, MS, Radiation Safety Officer	N/A

3. CERTIFICATION

SPECIALTY BOARD A	CATEGORY B	MONTH AND YEAR CERTIFIED C

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	University of Colorado Health Science Center	200	
b. RADIATION PROTECTION	University of Colorado Health Science Center	30	
c. MATHEMATICS PERTAINING TO THE USE AND MEASUREMENT OF RADIOACTIVITY	See C.V.	>200	
d. RADIATION BIOLOGY	University of Colorado Health Science Center	30	
e. RADIOPHARMACEUTICAL CHEMISTRY	University of Colorado Health Science Center	5	

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

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

ITEM 5 - Addendum to Supplement A

Experience with radiation

Isotopes: All isotopes acquired by users at Marshfield Clinic, St. Joseph Hospital and Marshfield Medical Foundation as well as Co^{60} teletherapy source.

Maximum amount: Up to any amount named in Part 6 a and b of this current byproduct license.

Place where experience gained: University of Colorado Health Science Center, Marshfield Clinic/St. Joseph Hospital.

Duration of experience and type of use: Experience was ongoing as part of Medical Physics training program and continues through current employment as medical physicist and Radiation Safety Officer. Main uses of isotopes are as check sources for equipment calibration and performance, evaluation of room shielding, teaching, general handling of waste and low level contamination surveys and any other use necessary in order to fulfill obligations of this license.

ITEM 6 a and b

Radioactive Materials

Byproduct, source and/or special nuclear material	Chemical and/or physical form	Maximum amount that license may possess at any one time
1. Any byproduct material with atomic numbers between 3 and 83 inclusive	Any	200 mCi of each byproduct material with atomic numbers between 3 and 83 inclusive except as stated below
2. I-131	Any	1500 mCi
3. Au-198	Any	350 mCi
4. Xe-133	Any	3000 mCi
5. H-3	Any	30 mCi
6. H-3	Foil	150 mCi
7. Mo99/Tc99m	Generator	3000 mCi
8. Tc99m	Kit	3000 mCi
9. Cs-137	Needles, tubes	300 mCi
10. Ir-192	Seeds, Wires	3000 mCi
11. I-125	Seeds	500 mCi
12. Au-198	Seeds	200 mCi
13. U-235	Depleted uranium, cadmium plated, used as shielding for a medical accelerator	91 Kg

16218

ITEM 7

A. Radiation Safety Committee

The Radiation Safety Committee is the administrative body responsible for the safe use of radioisotopes in the Marshfield Clinic, St. Joseph Hospital and the Marshfield Medical Foundation. Membership will include a representative of each institution's management, a nuclear medicine physician, the Radiation Safety Officer, a senior scientist from the Marshfield Medical Foundation, a radiologist, an experienced radiological technologist and a physician specializing in hematology, pathology or internal medicine. The chairman of the committee will not be the chief of nuclear medicine and will be particularly knowledgeable in radiobiology and radiation safety.

The Radiation Safety Committee will meet as frequently as necessary and at least once every quarter. A quorum will consist of the chairman of the Radiation Safety Committee, the Radiation Safety Officer and two members. Minutes of the meetings will be distributed to the members and copies of the minutes as well as proposed isotope uses and comments will be maintained on file. The duties and responsibilities of the Committee will include:

1. Review of qualifications of applicants for byproduct use and subsequent approval or disapproval of applicant.

2. Evaluation, modification and subsequent approval or disapproval of individual isotope use including an evaluation of all new proposed uses and an annual review of ongoing user programs.

3. Determination of special conditions or precautions which may be required during a proposed use of radioactive materials, such as requirements for bioassay or special monitoring.

4. Setting of standards of training for byproduct users, staff and ancillary personnel.

5. Review of problems and infractions and recommendations of remedial action.

6. Maintenance of written records of all actions taken by the Radiation Safety Committee.

7. Informing the NRC of changes in membership.

The Radiation Safety Committee will annually review the entire radiation safety program to determine that all activities are being conducted 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 annual revision of all user proposals.

The Committee has the authority to suspend or terminate uses of radioisotopes within the institutions when it deems necessary.

B. Radiological Safety Officer

The Radiological Safety Officer is appointed by the Radiation Safety Committee and is responsible to the Committee and to the Executive Committee of the Clinic and administration of St. Joseph Hospital for the radiation protection program.

1. He will be cognizant of all uses of byproduct material within the complex and will periodically evaluate each safety program to include review of routine and special surveys of all areas in which byproduct material is used.

2. He will evaluate and insure compliance with rules and regulations, license conditions of project approval specified by the Radiation Safety Committee for each specific use.

3. He will monitor all uses, storage and disposals of byproduct materials, including evaluation and inspection of special venting systems and filters prescribed for each use.

4. He will serve as consultant to administrative, scientific and support personnel on all aspects of radiation protection.

5. He is responsible for supervising the receipt, delivery and opening procedures for all material arriving at the complex and for receiving, packaging and shipping all radioactive material leaving the complex.

6. He is responsible for the personnel monitoring system. He will determine the need for and evaluate all bioassays. He will maintain records of personnel exposure and bioassay reports.

7. He is responsible for conducting the training program for proper use of byproduct material, for maintaining cognizance of changes in procedures of individual users and changes in regulations and for informing users and support personnel of those changes which will affect each of them.

8. He is responsible for supervising and coordinating the radioactive waste program. He will be aware of all transfers to the central disposal area, maintain records of contents of this area, make arrangements for transfer when storage amounts indicate, maintain records of such transfers and supervise the transfer procedure. He will evaluate disposal to sewage under the guidelines established below and insure the limits established are not exceeded.

9. He is responsible for supervising and evaluating storage of all byproduct material not in current use, including wastes prior to transfer to the disposal agency.

10. He is responsible for performing leak tests on all sealed sources and maintaining records of such tests.

11. He is responsible for maintaining an inventory of all radioisotopes in the complex and will insure that total and specific possession limits are not exceeded.

12. He has the authority and the responsibility to terminate any procedure felt to be a threat to health or property, and to take necesary steps to insure safety. In the event he exercises such authority, he will immediately report to the Chairman of the Radiation Safety Committee (or the senior member in the chairman's absence) for Committee review of the problem.

13. He is responsible for maintaining all other records necessary for safe use of byproduct material being guided by paragraph 30.51 f 10 CFR Part 30 regarding time of retention.

C. The name of current members of the Radiation Safety Committee and their CV's are attached.

March, 1983

CURRICULUM VITAE

Robert Hiram Greenlaw, M.D., F.A.C.R.

POSITION:	Radiation Oncologist Marshfield Clinic Marshfield, Wisconsin 54449
BIRTH:	December 14, 1927 Norway, Maine
EDUCATION:	1948 B.S. (magna cum laude) Tufts College, Medford, Mass. Phi Beta Kappa 1952 M.D. University of Rochester, Rochester, New York Alpha Omega Alpha
INTERNSHIP:	Mary Imogene Bassett Hospital, Cooperstown, New York Rotating - 1952-54
RESIDENCY:	1954-58 Radiology - University of Rochester Medical Center
MILITARY SERVICE:	1955-57 Captain USAF (MC) Radiologist-in-charge 2500th USAF Hospital, Mitchell AFB, New York
BOARD CERTIFICATION:	1959 American Board of Radiology Diagnostic and Therapeutic Radiology Nuclear Medicine
SOCIETIES:	Wood County Medical Society Wisconsin State Medical Society Wisconsin Society of Radiation Oncologists American Medical Association American College of Radiology (fellow) American Society of Therapeutic Radiologists Association of Community Cancer Centers Board of Trustees American Society of Therapeutic Radiology Committee on Private Practice American Cancer Society, Wisconsin Division Director, At Large Department of Health and Social Service, State of Wisconsin Council on Radiation Protection
RESEARCH ACTIVITIES:	1948-52 (Part Time) University of Rochester Department of Radiology, with William H. Strain, Ph.D. 1) Development of new radiographic contrast materials. 2) Investigation of pancreas-gallbladder relationships.

1958-61

1) Investigation of methods for pancreatic tumor localization by scintillation scanning.
2) Evaluation of portal circulatory dynamics by splenic isotope injections.
3) Determination of biological half-life of thorotrast.
4) Evaluation of Yttrium-90 as an agent for control of malignant effusions.
5) Investigation of tumor localization by the use of labelled antibodies.
6) Localization of intravascular thrombi with labelled antibodies.
7) Development of a technique to determine carotid flow with intravenously administered isotopes.
8) Evaluation of the renogram in radiation therapy patients.
9) Evaluation of gastric effects from radiotherapy.

1961-70

1) Investigation of factors leading to production of radiation nephritis in dogs.
2) Investigation of methods to localize biliary tract stones with radioisotopes and ultrasound.
3) Evaluation of isotope brain scanning for identification of occult metastases in carcinoma of the lung.
4) Evaluation of combined radiotherapy and surgery management of extensive verrucal carcinoma of the oral mucous membranes.
5) Evaluation of radioiodinated macroaggregated albumin in pulmonary embolism.
6) Evaluation of factors which lead to radiation caries and osteonecrosis of the mandible.
7) Evaluation of radiopharmaceuticals for tumor localization.
8) Evaluation of mechanisms for activation of repair of radiation injury.

1971-To Present

1) Development of Community Oncology Programs
2) Evaluation of radiogallium as tumor localization agent.
3) Evaluation of CANSCREEN program in a rural setting.
4) Evaluation of local hyperthermia by microwave heating.
5) Evaluation of total body hyperthermia in cancer control.
6) Principal Investigator, Community Hospital Oncology Program.

POSITIONS:

1958-59 Picker Foundation in Radiological Research

1959-61 American Cancer Society
Advanced Clinical Fellow in Radiation Therapy

1958-60 Instructor in Radiology, University of Rochester
Assistant Radiologist, Strong Memorial Hospital

1960 - Senior Instructor in Radiology, University of Rochester
Assistant Radiologist, Strong Memorial Hospital

1961 - Assistant Professor of Radiology, University of Kentucky
Therapeutic Radiologist

1967 - Professor of Radiology, University of Kentucky
Chief of Radiation Therapy and Nuclear Medicine
University of Kentucky Medical Center

1969 - 1970 Chairman, Department of Therapeutic Radiology, University of Kentucky and Chief of Radiation Therapy and Nuclear Medicine, University of Kentucky Medical Center

Sept. 1970 - Radiation Oncologist, Marshfield Clinic, Marshfield, Wisconsin

PUBLICATIONS:

1) Iodinated Organic Compounds as Contrast Media for Radiographic Diagnosis X. Interrelationship of Gallbladder and Pancreas: M. Radakovich, R. H. Greenlaw, W. H. Strain: Proc. Soc. Exp. Biol. & Med. 77:156 (1951).

2) Iodinated Organic Compounds as Contrast Media for Radiographic Diagnosis XIV. The Influence of Pancreatic Function on Cholecystography: M. Radakovich, V. W. Logan, R. H. Greenlaw, D. H. Ramsey, C. E. Sherwood, W. H. Strain; New York State Journal of Medicine; 51:2880 (1951).

3) Evaluation of Portal Circulation by Percutaneous Splenic Isotope Injection: R. H. Greenlaw, S. I. Schwartz: Journal of Nuclear Medicine 2:85 (1961).

4) Evaluation of Portal Circulation by Percutaneous Splenic Isotope Injection: S. I. Schwartz, R. H. Greenlaw: Surgery 50, No. 5, (1961).

5) Experimental Studies for Scintillation Scanning of the Pancreas: R. H. Greenlaw, W. H. Strain, T. E. Callear, L. B. Dublier, S. E. Strain; Journal of Nuclear Medicine 3:47 (1962).

6) The Retention of Neohydrin Hg-203 as Determined with a Total Body Scintillation Counter: R. H. Greenlaw, M. A. Quaife: Radiology 78:970 (June, 1962).

7) Intestinal Intralymphatic Injection of Radiogold in Dogs: C. Rob, S. I. Schwartz, R. H. Greenlaw, P. Rubin: Cancer 15:623 (May-June 1962).

8) Radiographic Studies on Skeletal Parts of Zinc Deficient Pullets: T. R. Zeigler, M. L. Scott, R. K. McEvoy, R. H. Greenlaw, F. Heugin, W. H. Strain; Proc. Soc. Exp. Biol. & Med. 109:239 (1962).

9) Evaluation of Portal Circulation by Percutaneous Splenic Isotope Injection: R. H. Greenlaw, S. I. Schwartz: Radiology 79:441 (September 1962).

10) Localization of Biliary Tract Stones by Isotopic Labelling: J. Gallagher, R. H. Greenlaw, B. Eiseman; Surgical Forum (1962).

11) Significance of Vaginal Recurrence in Endometrial Carcinoma: P. Rubin, R. H. Greenlaw, R. D. Gerle, R. S. Quick; Amer. Jour. Roent, Rad. Ther. & Nucl. Med. 89:91 (1963).

12) Radiodiagnostic Agents: W. H. Strain, R. H. Greenlaw et al: Medical Radiography & Photography 40, Supplement (Nov., 1964).

13) Correlation of Renal Function Measurements in Dogs: R. H. Greenlaw, W. D. Hudgins; Journal of Nuclear Medicine 5:453 (1964).

14) Retention of Radioisotopes by Hair, Bone and Vascular Tissue: W. H. Strain, W. Berliner, C. Lankau, R. K. McEvoy, W. Pories, R. H. Greenlaw: Journal of Nuclear Medicine 5:664 (1964).

15) Measurement of Gastrointestinal Loss of Plasma Albumin: C. Mabry, R. H. Greenlaw, W. D. DeVore; Journal of Nuclear Medicine 6:93 (February, 1965).

16) Localization of Common Duct Stones by Ultrasound: B. Eiseman, R. H. Greenlaw, W. Malette; Archives of Surgery 9:195 (1965).

17) Portal Circulation: R. H. Greenlaw, S. I. Schwartz; Chapter 12 in Radioisotopes and Circulation, Gunnar Sevelius, Editor, Little Brown and Co. (1965).

18) The Value of Vaginal Cytology Following Radiation Therapy for Cervical Carcinoma: D. N. Tweeddale, R. H. Greenlaw et al: General Practice 33:113 (February, 1966).

19) Postoperative Changes in Regional Pulmonary Blood Flow: L. R. Bryant, F. C. Spencer, R. H. Greenlaw, P. Prathnadi, J. W. Bowlin; Journal of Thoracic and Cardiovascular Surgery 53:64 (1967).

20) An Evaluation of Cobalt-60 Rotational Teletherapy Equipment: W. D. DeVore, R. H. Greenlaw; Amer. Jour. Roent. Rad. Ther. & Nucl. Med. 99:600 (March, 1967).

21) Cancer Therapy by Integrated Radiation and Operation: Proceedings of symposium at the University of Kentucky; B. F. Rush, R. H. Greenlaw, Editors, Charles C. Thomas, Publishers (March, 1968).

22) Integrated Therapy in Cancer of the Larynx: R. H. Greenlaw, B. F. Rush; A chapter in the above monograph.

23) Integrated Irradiation and Operation in Treatment of Cancer of the Larynx and Hypopharynx: A Preliminary Report; B. F. Rush, G. Reymonds, R. H. Greenlaw; Amer. Jour. Roent. Rad. Ther. & Nucl. Med. 102:129 (January, 1968).

24) Scintillation Scanning for Localization of Occult Metastases in Brain and Liver from Carcinoma of the Lung: K. R. McCormack, R. H. Greenlaw, C. R. Hopkins; Journal of Nuclear Medicine 9:222 (1968).

25) Multiple Primary Cancers of the Oro-Respiratory Tract and the Cervix: S. A. Lewis, J. W. Roddick, R. H. Greenlaw, B. F. Rush, D. N. Tweeddale; Cancer 21:672 (April, 1968).

26) Distribution of Pulmonary Bloodflow in Chronic Airways Obstruction: Lung Scintiscanning and Pulmonary Arteriography. Current Research in Chronic Airways Obstruction (Ninth Aspen Emphysema Conference Proceedings). L. R. Bryant, J. E. Cohn, R. H. Greenlaw, R. P. O'Neill, J. W. Bowlin; Public Health Service Publication 1717:189 (May, 1968).

27) A Simple Treatment Planning Device for Use in Radiotherapy: J. R. Biggs, Jr., E. M. Higgins, R. H. Greenlaw; British Journal of Radiology 42:315 (April, 1969).

28) Verrucous Carcinoma of Oral Cavity: E. A. Fonts, R. H. Greenlaw et al; Cancer 23:152 (January, 1969).

29) "Hot Spots" in Lung Scans: D. F. Preston and R. H. Greenlaw; Journal of Nuclear Medicine, 11:422 (July, 1970).

30) Osteogenic Sarcoma Following Radiotherapy for Retinoblastoma: T. Yoneyama and R. H. Greenlaw; Radiology 93:1185 (Nov., 1969).

31) Experiences with Integrated Operative and Radiation Therapy for Cancer of the Hypopharynx and Larynx: B. F. Rush, Jr., and R. H. Greenlaw; Submitted to J.A.M.A., October, 1969.

32) The Value of "Pre-Load" Doses of Stable Mercury Prior to Radioactive Brain Scan Procedures: A Negative Report; J. B. Selby, K. R. McCormack, R. H. Greenlaw and S. E. Layne; J. Nuclear Medicine 11:440 (July, 1970).

33) Invasive Carcinoma of the Bladder: A Review of 52 Cases, D. W. Purcell and R. H. Greenlaw. Southern Medical Journal, 1971.

34) Treatment of Cervical Cancer: J. W. Roddick, Jr., M. D. and R. H. Greenlaw, M.D.; Amer. Jour. Obst. & Gyn., Vol. 109, #5, pg. 754-764, (March, 1971).

35) Formalized Immobilization and Localization in Radiotherapy: Edwin Van Arsdale, R.T., and Robert H. Greenlaw, M.D.; Radiology Vol. 99, #3, pg. 697-98, (June, 1971).

36) Activated Repair of Skin: A Damage-Induced Radiation Repair System: John Calkins, Ph.D. and R. H. Greenlaw, M.D.; Radiology, 100:398-395 (August, 1971).

37) ^{67}Ga-citrate Imaging in Untreated Malignant Lymphoma: Preliminary Report of Cooperative Group: R. H. Greenlaw et al; Journal of Nuclear Medicine, Vol. 15, 404-407, 1974.

38) Results of High Dose Radiation and Surgery in Treatment of Advanced Cancer of the Head & Neck: Carifi, Ohanion, David, Greenlaw and Rush; The American Journal of Surgery, Vol. 128 580-582, 1974.

39) Regulatory Role of Zinc in Gallbladder Function: William Strain, Thomas E. Callear, Robert H. Greenlaw and Michael Raines; Trace Substances in Environmental Health XIII, 1979. A Symposium. D. D. Hamphill, Editor, University of Missouri, Columbia.

40) Evaluation of the Patient with a Positive Hemoccult Test: Robert H. Greenlaw and Robert G. Norfleet, M.D., Wisconsin Medical Jouranl, Vol. 49, 17-18, (Jan, 1980).

41) Pulmonary Failure Association with Whole Body Hyperthermia: Robert H. Greenlaw, Pandy G. Swamy, David D. Loshek, C. Anne Doyle; Journal of National Cancer Institute, Monograph 61, 1982.

42) Radiation and Cancer: Robert H. Greenlaw, M.D.; Wisconsin State Medical Journal, Vol. 81, 14, November, 1982.

CURRICULUM VITAE

Kenneth J. Billings, M.D.
as of April 1983

GENERAL:

Born: Webster, Massachusetts - 14 July 1939
Marital Status: Married - Wife: Joyce
Children - Robin - age 12
Gabriel - age 8

EDUCATION:	Year	Degree
High School:		
Bartlett High School; Webster, Massachusetts	1953-1957	
Pre-Medical:		
Clark University; Worcester, Massachusetts Major: Biology	1957-1961	A.B.
Medical:		
Tufts University School of Medicine Boston, Massachusetts	1961-1965	M.D.
Internship:		
Naval Hospital #5 Philadelphia, Pennsylvania (rotating)	1965-1966	
Residency:		
Naval Hospital #5 Philadelphia, Pennsylvania (Radiology) (Chief: James E. Turner, M.D.)	1966-1969	
Fellowship:		
Naval Hospital #5 Philadelphia, Pennsylvania (Vascular Radiology)	1969-1970	

RESIDENCY ROTATIONS:	Year
1) Armed Forces Institute of Pathology Washington, D.C. (Radiologic Pathology) Elias G. Theros, M.D., Chief	1969
2) The Childrens Hospital of Philadelphia Philadelphia, Pennsylvania (Pediatric Radiology) John W. Hope, M.D., Chief	1968
3) National Naval Medical Center Bethsda, Maryland (Nuclear Medicine) Howard Dworkin, M.D., Director	1969
4) Hospital of the University of Pennsylvania Philadelphia, Pennsylvania (Therapeutic Radiology) Antolin Raventos, M.D., Chief	1969

PROFESSIONAL APPOINTMENTS:

		Year
1)	Staff: Radiology Department Naval Hospital #5 Philadelphia, Pennsylvania	1970-1973
	a) Head: Special Procedures Division	1970-1973
	b) Head: Nuclear Medicine Division	1970-1973
2)	Chairman: Department of Radiology Holzer Medical Center Gallipolis, Ohio	1973-1979
3)	Staff Radiologist Department of Radiology Marshfield Clinic Marshfield, Wisconsin	1979-1980
4)	Chairman: Department of Radiology St. Elizabeth Community Hospital Baker, Oregon	1980-1982
5)	Staff Radiologist Marshfield Clinic Marshfield, Wisconsin	1982 to present

MEMBERSHIPS - PROFESSIONAL:

American Medical Association
Wood County Medical Society
Wisconsin Radiological Society
American College of Radiology
Radiological Society of North America
American College of Nuclear Physicians
State Medical Society of Wisconsin

CERTIFICATION:

American Board of Radiology December 1970

LICENSURE:

Ohio, Wisconsin, Oregon	WI	22290
	OH	035733
	OR	12230

PUBLICATIONS:

1) Aneurysmal Bone Cyst of the First Lumbar Vertebrae: Billings, K.J. and Werner, L.G. - Radiology: Vol. 104, No.1, July 1972, pp. 19-20.
2) Cerebellar Heterotopia: A Case Report: Billings, K.J. and Danziger, F.S. Journal of Neurosurgery, Vol. 38, No.2, pp. 218-220.
3) Traumatic Arteriovenous Fistula with Spontaneous Closure: Billings, K.J., Nasca, R.J. and Griffin, H.W.: The Journal of Trauma: Vol. 13, No.8, 1973, pp. 741-743.

CURRICULUM VITAE

Name: Edward Philip Anthony Horvath, Jr.
Birthdate: August 9, 1946
Birthplace: Painesville, OH
Marital Status: Married Wendy Joy Swanson, June 28, 1975
Children: Diane Joy
Damien Edward
Office Address: Marshfield Clinic 1000 N. Oak Marshfield, WI 54449
(715/387-5523)
Home Address: 1000 Westview Drive Marshfield, WI 54449 (715/387-6660)

Education:

M.P.H., Environmental Health, University of Minnesota School of Public Health, 1975

M.D. (with honors), Ohio State University, College of Medicine, 1971.

B.A. (with honors), Biology, Western Reserve University, 1968.

Experience:

1978-Present: Section Chief, Occupational Medicine, Marshfield Clinic, Marshfield, WI.

1982-Present: Visiting Assistant Professor of Preventive Medicine/Biometrics, Uniformed Services University of the Health Sciences, Bethesda, MD.

1980-Present: Clinical Assistant Professor, Department of Preventive Medicine, University of Wisconsin, Madison, WI.

1976-1978: Assistant Clinical Professor of Environmental Health, University of Cincinnati.

Lieutenant Commander, Medical Corps (Occupational Medicine), Navy Environmental Health Center, Cincinnati, OH.

Medical Staff, Medical Health Services, Inc., Cincinnati, OH.

1975-1976: Postdoctoral Fellow, Preventive Medicine and Pulmonary Disease, University of Wisconsin.

1974-1975: Resident, Internal Medicine, University of Wisconsin.

1974: Emergency Room Staff Physician, Madison General Hospital, Madison, WI.

1973-1974: Resident, Internal Medicine, Postdoctoral Fellow, Pulmonary Disease, Veterans Administration Hospital, University of Wisconsin.

1972-1973: Resident, Occupational Medicine, University of Minnesota, School of Public Health.

1971-1972: Intern, Internal Medicine, University of Wisconsin

Licensure:

Ohio - 1971 (FLEX)

Minnesota - 1972 (Reciprocity)

Wisconsin - 1973 (Reciprocity)

Board Certification:

Diplomate, American Board of Preventive Medicine (Occupational Medicine), 1977.

Diplomate, American Board of Internal Medicine, 1975.

Membership/Fellowship in Professional, Honorary and Learned Societies:

Fellow, American Occupational Medical Association - 1982

Fellow, American College of Preventive Medicine - 1982

Fellow, American Academy of Occupational Medicine - 1981

Alpha Omega Alpha - 1971

Member, American Conference of Governmental Industrial Hygienists

Member, Wood County Medical Society

Member, State Medical Society of Wisconsin

Member, American Medical Association

Member, American Public Health Association

Professional Activities:

Member, Governors Health Policy Council, State of Wisconsin, 1980-Present.

Member, Committee on Environmental and Occupational Health, State Medical Society of Wisconsin, 1980-Present.

Program Director, Weyerhaeuser Company Corporate Asbestos Control Program, 1978-Present.

Medical Director, Employee Health Service, St. Joseph's Hospital, Marshfield, WI, 1979-Present.

Medical Director, Weyerhaeuser Company, Marshfield Facility, 1978-Present.

Medical Director, Toro Company, Tomah Facility, Tomah, WI 1979-Present.

Director, Executive Examination Program, Marshfield Clinic, 1982-Present.

Staff, Policy Advisory Council, Marshfield Medical Foundation, 1982-Present.

Board of Directors, Marshfield Medical Foundation, 1981-Present.

Board of Governors, Central States Occupational Medical Association 1980-1983.

Executive Committee, Marshfield Medical Foundation, 1981-1982.

Member, Occupational Health Committee, American Group Practice Association, 1979-Present.

Member, Emergency Government Committee, Marshfield, WI, 1980-1982.

Chairman, National Farm Medicine Center Feasibility Study Committee, Marshfield Medical Foundation, 1980-1981.

Member, North Central Area Health Planning Association, Occupational Health and Safety Task Force, 1978-1979.

Observer, Ad Hoc Committee to Study Pulmonary Function Testing and Training Procedures in Industry, 1977-1978.

Program Manager, Navy Asbestos Medical Surveillance Program (AMSP), Navy Environmental Health Center, 1978.

Faculty, Spirometry Course, University of Cincinnati, February 13-15, 1978.

Faculty, Navy Asbestos Medical Surveillance Program Training Courses, San Francisco, CA August 21-25, 1978; Virginia Beach, VA September 25-29, 1978.

Member, American Conference of Governmental Industrial Hygienists Ad Hoc Committee to review NIOSH Criteria for a Recommended Standard. . . Decomposition Products of Fluorocarbon Polymers, 1977.

Workshop Participant, Development of Clinic-Based Occupational Safety and Health Programs for Small Businesses, National Institute for Occupational Safety and Health, Cincinnati, OH, May 1-3, 1977.

Workshop Participant, Labor-Management Seminar on Occupational Respiratory Diseases, Appalachian Laboratory for Occupational Safety and Health, Morgantown, WV, June 29-July 1, 1977.

Workshop Participant, Group Practice Innovations in Health Services for Industry, American Group Practice Association/National Institute for Occupational Safety and Health, Las Vegas, NV, February 9-11, 1978.

Course Director, Spirometry Training Course: U.S. Navy, Seattle, WA November 5-7, 1977; Weyerhaeuser Company, Marshfield, WI October 16-20, 1978; Open Enrollment, Marshfield, WI November 12-14, 1979; Wausau Insurance Company, Wausau, WI June 5-7, 1980; Open Enrollment, Marshfield, WI July 14-16, 1980; Allied Chemical Corporation, Morristown, NJ August 20-22, 1980; Open Enrollment, Marshfield, WI March 11-13, 1981; Allied Chemical Corporation, Secaucus, NJ September 14-16, 1981; Open Enrollment, Marshfield, WI March 15-17, 1982.

Bibliography

Horvath, E.P.: Medical Surveillance (in press).

Horvath, E.P.: Agent Orange Controversy - A Physician's Dilemma. Wis Med J 80:16-18, 1981.

Horvath, E.P., Ilka, R.A., Boyd, J., Markham, T.N.: Neurophysiologic Effects of 1, 2-Propylene Glycol Dinitrate as Evaluated by Quantitative Ataxia and Eye Tracking Tests. Amer J Ind Med 2:365-378, 1981.

Dodson, V.N., Lindesmith, L.A., Horvath, E.P., Zenz, C., Blumenthal, M.S.: Diagnosing Occupationally-Induced Diseases. Wis Med J 80:18-20, 1981.

Horvath, E.P. (editor): Manual of Spirometry in Occupational Medicine, U.S. Department of Health and Social Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Cincinnati, OH, November 1981.

Frostman, T.O., Horvath, E.P.: NIOSH Spirometry Workbook - Instructor's Guidebook, U.S. Department of Health and Social Services, Center for Disease Control, National Institute for Occupational Safety and Health, Cincinnati, OH, April 1981.

Horvath, E.P., Frostman, T.O.: NIOSH Spirometry Workbook, U.S. Department of Health and Social Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety and Health, Cincinnati, OH May 1980.

Braun, S. doPico, G.A., Tsiatias, A., Horvath, E.P., Dickie, H., Rankin, J.: Farmers Lung Disease: Long-Term Clinical and Physiologic Outcome Amer Rev Resp Dis 119:185, 1979.

Horvath, E.P.: Proper Training, Technique Vital to Pulmonary Testing. Int J Occp Health and Safety 46:20-31, 1977.

Horvath, E.P., doPico, G.A., Barbee, R.A., Dickie, H.A.: Nitrogen Dioxide-Induced Pulmonary Disease - Five New Cases and a Review of the Literature. JOM 20:103-110, 1978.

Presentations

Horvath, E.P.: Acute and Chronic Health Effects of Arsenic. Cabot Corporation, Pampa, TX September 21, 1982.

Horvath, E.P.: Employee Health Service Programs in Hospitals - Are They Cost Effective? - infections. American Occupational Health Conference, Toronto, Canada April 29, 1982.

Horvath, E.P.: Employee Health Service Programs - Infections. Milwaukee Area Industrial Safety Council, Milwaukee, WI March 1, 1982.

Horvath, E.P.: Occupational Hazards of a Dental Practice. 4th Annual Dental Seminar, Stevens Point, WI January 28, 1982.

Horvath, E.P.: Worker's Compensation and Disability Determination - A Physician's View. Milwaukee Insurance Adjusters Association, Milwaukee, WI May 8, 1981; Helath Hazards Seminar, Mid-State Technical Insititute, Wisconsin Rapids, WI December 9, 1981.

Horvath, E.P.: Medical Evaluation for Users of Respiratory Protective Equipment. 39th Wisconsin Safety Congress and Exposition, Milwaukee, WI April 15, 1981.

Horvath, E.P. Occupational Health in Agriculture. University of Wisconsin Extension Service, Marshfield, WI March 10, 1981.

Horvath, E.P. Testimony on Formaldehyde in Indoor Air of New Mobile Homes. Wisconsin Department of Industry, Labor and Human Relations and Department of Justice, Wausau, WI February 10, 1980; Madison, WI February 23, 1982.

Horvath, E.P.: Health and Wellness - Individual Responsibility. Teacher's Annual In-Service Program, Marshfield, WI February 1, 1980.

Horvath, E.P.: Community Occupational Health Resources. Safety and Health Conference for Community Union Leaders, University of Wisconsin, Madison, WI December 6, 1979.

Horvath, E.P.: Asbestos-Induced Diseases. Scientific Exchange with Gunderson Clinic, LaCrosse, WI September 19, 1979.

Horvath, E.P.: Health Effects of Otto Fuel II. Canadian Forces Naval Facility, Halifax, Nova Scotia August 27, 1979.

Horvath, E.P.: Occupational Pulmonary Disease - Occupational Safety and Health for Nurse Educators - NIOSH Course. Texas A & M University, College Station, TX June 15, 1979; Wausau Insurance Company, Wausau, WI June 10, 1980.

Horvath, E.P.: Asbestos-Induced Disease - Their Control Through Medical Surveillance. Second Annual Medical-Surgical Update, Marshfield Clinic, Marshfield, WI June 8, 1979; Wisconsin Council of Safety Annual Meeting, Milwaukee, WI April 9, 1980.

Horvath, E.P. Update on Occupational Medicine. Annual District Nurses Association Meeting, Wisconsin Rapids, WI May 15, 1979.

Horvath, E.P: New Standards in Screening Spirometry. State Medical Society of Wisconsin Annual Meeting, Milwaukee, WI May 12, 1979.

Horvath, E.P.: Occupational Lung Disease. Medico-Legal Update, Marshfield Clinic, Marshfield, WI April 28, 1979; Wisconsin River Valley Safety Conference, Wisconsin Rapids, WI August 14, 1980; Marathon County Council of Safety, Wausau, WI February 11, 1981; 39th Wisconsin Safety Congress and Exposition, Milwaukee, WI April 16, 1981.

Horvath, E.P.: Occupational Health - An Opportunity for Community Health. Conference by Wisconsin Division of Health, Stevens Point, WI April 21, 1981.

Horvath, E.P.: Occupational Medicine - An Overview. Marshfield Rotary Club, January 15, 1979; Staff of Riverview Hospital, Wisconsin Rapids, WI March 23, 1979; Wisconsin Economic Development Association, Oshkosh, WI May 2, 1979; Medical College of Wisconsin, Milwaukee WI November 3, 1980; Second Annual Safety and Health Conference for Community Union Leaders, Madison, WI March 19, 1981; School for Workers, Wisconsin Rapids, WI April 13, 1981.

Horvath, E.P.: Pulmonary Hazards in Industry. Working at Staying Well: Staying Well at Work. National Seminar on Occupational Health, Milwaukee, WI October 10, 1978; State Medical Society of Wisconsin Annual Meeting, Milwaukee, WI March 29, 1980.

Horvath, E.P.: Asbestos-Induced Disease. American Occupational Health Conference - Occupational Lung Disease Session, New Orleans, LA April 10 and April 14, 1978.

Horvath, E.P.: History, Physical Examination and Respiratory Surveillance. American Occupational Health Conference - Occupational Lung Disease Session, New Orleans, LA April 10 and April 14, 1978.

Horvath, E.P.: Quantitative Eye Tracking Tests and Otto Fuel II. 20th Navy Occupaitonal Health Workshop, Seattle, WA November 9, 1977.

Horvath, E.P. Asbestos-Induced Disease - An Overview with Emphasis on Spirometry. Course on Radiographic Interpretation of Occupational Lung Disease, Naval Regional Medical Center, Portsmouth, VA August 29, 1977.

Horvath, E.P.: Valid Screening Spirometry. 19th Navy Occupational Health Workshop, Charleston, SC September 29, 1976.

Horvath, E.P.: Nitrogen Dioxide-Induced Pulmonary Disease. 57th Annual Session American College of Physicians, Philadelphia, PA April 6, 1976; 19th Navy Occupational Health Workshop, Charleston, SC September 29, 1976.

Reports, Abstracts

Braun, S., doPico, G.A., Reddan, W., Nichols, D., Horvath, E.P., Dickie, H., Rankin, J.: Long Term Follow-Up of Farmers Lung with and without Recurrent Exposures. Amer Rev Resp Dis 115:47, 1977.

Health Evaluation for Otto Fuel II Workers, Otto Fuel II - Health Precaution, Bureau of Medicine and Surgery Instruction 6270.7A, Department of the Navy September 18, 1978.

Occupational Health Standards Control and Medical Surveillance Requirements - Control of Asbestos Exposure to Naval Personnel and Environs, Naval Operations Instruction 6260.1A, Department of the Navy August 8, 1978.

Occupational and Preventive Medicine - Isocyanates; Measures for Control of Health Hazards Related To. Bureau of Medicine and Surgery Instruction 6260.16A, Department of the Navy May 27, 1977.

Horvath, E.P.: Low Back Pain in Industry - Masters Thesis, University of Minnesota, School of Public Health April 1974.

Horvath, E.P.: Organic Mercurialism - Masters Thesis, University of Minnesota, School of Public Health April 1973.

CURRICULUM VITAE

NAME:	Miller, Richard W.
SOCIAL SECURITY NO.	207-28-6686
ADDRESS:	Work: Marshfield Clinic 1000 N. Oak Avenue Marshfield, WI 54449 Phone No. 715-387-5493
	Home: 606 Cypress Avenue Marshfield, WI 54449 Phone No. 715-387-3296
DATE OF BIRTH:	December 4, 1935
MARITAL STATUS	Married
EDUCATION:	Amherst College: Amherst, Massachusetts 1953-1957 University of Pennsylvania School of Medicine 1957-1961
MILITARY SERVICE:	United States Army 1965-1968
POSTGRADUATE EDUCATION:	Straight Medical Internship - The New York Hospital 1961-1962 Medical Residency - The New York Hospital 1962-1965
OTHER EDUCATION:	Traineeship, Endocrinology & Nuclear Medicine, University of Michigan - 1968-1970
BOARD CERTIFICATION:	American Board of Internal Medicine - 1968 --Recertification - 1974 American Board of Nuclear Medicine - 1972 Endocrinology and Metabolism - 1975
HOSPITAL APPOINTMENTS:	St. Joseph's Hospital Marshfield, WI 54449 1970 - present
NARCOTICS REGISTRATION:	AM4059982
STATE MEDICAL LICENSE:	17065
AWARDS:	American Medical Association Physician's Recognition 1980
HONORS:	AOA
PROFESSIONAL SOCIETIES:	Society of Nuclear Medicine - 1970 - present.
COMMITTEES:	None
BIBLIOGRAPHY:	None

16218

CURRICULUM VITAE

Lee L. Schloesser, M. D.

1. Personal

   a. Birth: March 14, 1925 - Fredonia, Kansas

   b. Marital Status: Married

   c. Social Security No.: 510-12-5286

2. Education

   a. A.B. - University of Kansas - 1948

   b. M.D. - University of Kansas - 1951

3. Postgraduate Training

   a. Internship - University of Kansas Medical Center - 1951-1952

   b. Resident in Medicine - University of Wisconsin Hospitals - 1952-1955

   c. Research Fellow in Medicine - University of Wisconsin Hospitals - 1955-1956

   d. Physician - Department of Student Health, University of Wisconsin Hospitals July 1956-September 1957

   e. Instructor and research in Department of Medicine - University of Wisconsin Medical School - July 1956-September 1957

   f. Current position - hematologist and internist at Marshfield Clinic and St. Joseph's Hospital, Marshfield

4. Academic and Research Experience

   a. Research and clinical work with Dr. E. C. Albright and Dr. Frank Larson (Radioisotope Laboratory, University of Wisconsin Medical School) in thyroid physiology - January 1955-July 1955

   b. Research Fellow in Medicine and Trainee of the National Cancer Institute under Dr. R. F. Schilling working full time in Hematology Research Laboratory and also instructing classes (September 1955-June 1956) in physical diagnosis - July 1955-July 1956

   c. See Bibliography

   d. Clinical Associate Professor of Medicine - University of Wisconsin Medical School (Teaching rounds in hematology at the University of Wisconsin on a monthly basis)

5. Certification

a. American Board of Internal Medicine - October 1958

b. Fellow of the American College of Physicians - November 1964

c. Member of the American Federation for Clinical Research

d. American Board of Hematology - 1972

6. Licensure

a. Kansas - 1951

b. Wisconsin (by reciprocity) - 1952

BIBLIOGRAPHY

1. Schloesser, Lee L., and Schilling, Robert F.; Biologic Half-Life of Hepatic Radioactivity from Vitamin B_{12} Co^{60}, 6th Congress, Int. Soc. of Hemat., 245, 1956.

2. Schilling, Robert F., Bunge, Mary Bartlett, and Schloesser, Lee L.; Preferential Binding and Absorption of Cyanocobalamin in the Presence of Excess Pseudo-Vitamin B_{12}, J. Lab. & Clin. Med., 48, 939, 1956.

3. Bunge, Mary Bartlett, Schloesser, Lee L,, and Schilling, Robert F.; Intrinsic Factor Studies IV. Selective Absorption and Binding of Cyanocobalamin by Gastric Juice in the Presence of Excess Pseudo-Vitamin B_{12} of 5, 6 Dimethylbensimidazole, J. Lab. & Clin. Med., 48, 5 735, 1956.

4. Morris, Frances K., Loy, Virginia E., Strutz, Kay M., Schloesser, Lee L., and Schilling, Robert F.; Hemoglobin Concentrations as Determined by a Methemoglobin Method, Studies on 1,000 College Students, AM J. Clin. Path., 26, 1450, 1956.

5. Schilling, Robert F., and Schloesser, Lee L.; Intrinsic Factor Studies V. Some Aspects of the Quantitative Relationship between Vitamin B_{12}, Intrinsic Factor, Binding, and the Absorption of Vitamin B_{12}, in "Vitamin B_{12} and Intrinsic Factor I. Europaisches Symposion", Hamburg, 23-26 May, 1956, Ferdinand Enke Verlag, Stuttgart, 1957.

6. Schloesser, Lee L., Korst, Donald R., Clatanoff, Dallas V., and Schilling, Robert F.; Radioactivity over the Spleen and Liver Following the Transfusion of $Chromium^{51}$ - Labelled Erythrocytes in Hemolytic Anemia, J. Clin. Invest., 36, 10, 1470, 1957.

7. Schloesser, Lee L., Deshpande, Pandurang, and Schilling, Robert F.; Biologic Turnover Rate of Cyanocobalamin (Vitamin B_{12}) in Human Liver, A.M.A. Arch. Int. Med., 101, 306, 1958.

8. Schloesser, Lee L.; Kipp, Mary Ann; and Wenzel, Frederick J.; Thrombocytosis in Iron Deficiency Anemia, J. Lab. & Clin. Med., 66, 107, 1965.

9. Schloesser, Lee L.; Diagnostic Significance of Splenomegaly, A.J. Med. Sciences, Jan. 1963.

10. River, George L., Schloesser, Lee L., Roberts, Ronald, and Winemiller, Robert; Plasma Cell Intranuclear Inclusions and the Nephrotic Syndrome.

11. River, George L., Hardacre, Jerry M., and Schloesser, Lee L.; Generous Splenomegaly from Benign Cysts; Scientific Review of Marshfield Clinic, Vol. 2, pg. 19-27, Jan. 1970.

12. Korst, Donald R., Raich, P. C., Crowell, E. B., Jr., and Schloesser, Lee L.; The Need for Data Basis in Therapy in Acute Leukemia and Lymphoma; Wis. Medical Journal, Vol. 70, pg. 140-142, May 1971.

Curriculum Vitae

David D. Loshek, Ph.D.

1969 B.S. University of Wisconsin, Madison, Wisconsin
1972 M.S. University of Wisconsin, Madison, Wisconsin
1976 Ph.D. University of Glasgow, Glasgow, Scotland

September 1969-September 1972 Employed as a research assistant in the Department of Nuclear Physics, University of Wisconsin, Madison. During this period a 16 week theoretical/practical course concerning the medical uses of radioisotopes was undertaken at the University of Wisconsin.

December 1972-August 1976 Employed by the Department of Clinical Physics and Bio-Engineering of the West of Scotland Health Boards. Primarily engaged in medical radiation physics.

August 1974-August 1976 Seconded to the Glasgow Institute of Radiotherapeutics. Responsible for the coordination of various aspects of radiation dosimetry.

Isotope Experience

Year	Isotope	Form	Purpose	# Hours	Instructor	Institution
9-70	^{3}H	Gas	Target material	5	Dr. J. Davis	Univ. of Wisc.
971	^{210}Po	Salt	α Source	10	Dr. J. Davis	Univ. of Wisc.
972	^{32}P	Sodium Phosphate	Plant uptake			
	^{51}Cr	Sodium Chromate	Red cell volume			
	^{125}I	Serum Albumen	Plasma volume			
	^{131}I	T_3, T_4	In vitro uptake	96 Total	Dr. J. Sorensen	Univ. of Wisc.
	^{99m}Tc	Sulfur colloid	Liver imaging			
	^{99m}Tc	Pertechnate	Brain scanning			
3-76	^{3}H	Amino acids	Cell metabolism	50	Dr. J. S. Orr	Univ. of Glasgow
	^{14}C	Amino acids	Cell metabolism	50	Dr. J. S. Orr	Univ. of Glasgow
	^{131}I	Sodium Iodide	Therapy	2	Dr. J. S. Orr	Univ. of Glasgow
	^{226}Ra	Sealed Tubes	Therapy	20	Dr. J. S. Orr	Univ. of Glasgow
	^{137}Cs	Sealed Tubes	Therapy	10	Dr. J. S. Orr	Univ. of Glasgow
	^{198}Au	Seeds	Therapy	5	Dr. J. S. Orr	Univ. of Glasgow
	^{133}Xe	Gas in Saline	Blood flow	5	Dr. J. S. Orr	Univ. of Glasgow
977	^{125}I	Seeds	Therapy	5	Dr. R.H. Greenlaw	Marshfield Clinic

CURRICULUM VITAE

NAME: Edward D. Plotka, Ph.D.

ADDRESS:

Office: 510 North St. Joseph Avenue
Marshfield, WI 54449
Telephone: 715-387-5241

Residence: 11713 West Lane
Marshfield, WI 54449
Telephone: 715-387-2793

DATE & PLACE OF BIRTH: October 10, 1938 Utica, NY

EDUCATION:

1960 - B.S. Animal husbandry
Delaware Valley College, Doylestown, PA

1963 - M.S. Genetics
Oregon State University, Corvallis, OR

1966 - Ph.D. Physiology
Purdue University, Lafayette, IN

HONORS: 1963-1966 Purdue Research Foundation Fellowship

MAJOR RESEARCH INTEREST: Endocrinology and physiology of female reproduction

EXPERIENCE:

1969-date Senior Scientist
Marshfield Medical Foundation, Marshfield, WI
1967-1969 Assistant Research Professor
University of Georgia, Athens, GA
1966-1967 Assistant Professor
Purdue University, Lafayette, IN
1963-1966 Research Assistant
Purdue University, Lafayette, IN (parttime)
1961-1963 Research Assistant
Oregon State University, Corvallis, OR (parttime)

SOCIETIES:

Society for the Study of Fertility
Society for Experimental Biology and Medicine
Society for the Study of Reproduction
American Physiological Society
New York Academy of Sciences
American Society of Animal Sciences
The Endocrine Society

Published Articles

1. Plotka, E. D., E. G. Stant, Jr., F. A. Waltz, V. A. Garwood, and R. E. Erb: A computer program for double radionuclide assay data. Int. J. Appl. Rad. Isotopes 17:637-641, 1966.

2. Plotka, E. D., R. E. Erb, C. J. Callahan, and W. R. Gomes: Levels of progesterone in peripheral blood plasma of the cycling cow. J. Dairy Sci. 50:1158-1160, 1967.

3. Hodgen, G. D., R. E. Erb, and E. D. Plotka: Estimating creatinine excretion in sheep. J. Anim. Sci. 26:586-589, 1967.

4. Plotka, E. D. and R. E. Erb: Levels of progesterone in peripheral blood plasma of the cycling ewe. J. Anim. Sci. 26:1363-1365, 1967.

5. Erb, R. C., V. L. Estergreen, Jr., W. R. Gomes, E. D. Plotka, and O. L. Frost: Progestin levels in corpora lutea and progesterone in ovarian venous and jugular vein blood plasma of the pregnant bovine. J. Dairy Sci. 51:401-410, 1968.

6. Erb, R. E., V. L. Estergreen, Jr., W. R. Gomes, E. D. Plotka, and O. L. Frost: Progestin content of ovaries and the effect on assessment of luteal activity in the bovine. J. Dairy Sci. 51:411-415, 1968.

7. Plotka, E. D. and R. E. Erb: Identification and excretion of estrogen in urine during the estrous cycle of the ewe. J. Anim. Sci. 29:934-939, 1969.

8. Callahan, C. J., J. F. Fessler, R. E. Erb, E. D. Plotka, and R. D. Randel: Prolonged gestation in a Holstein-Friesian cow. Clinical and reproductive steroid studies. Cornell Vet. 59:370-387, 1969.

9. Plotka, E. D., R. E. Erb, and R. B. Harrington: Female sex steroid relationships during the estrous cycle of the ewe. J. Anim. Sci. 30:412-419, 1970.

10. Erb, R. E., S. A. Tillson, G. D. Hodgen, and E. D. Plotka: Urinary creatinine as an index compound for estimating rate of excretion of steroids in the domestic sow. J. Anim. Sci. 30:79-85, 1970.

11. Plotka, E. D. and W. L. Williams: Hormones and sperm capacitation in rabbits. Proc. Soc. Exp. Biol. Med. 136:934-936, 1971.

12. Plotka, E. D. and W. L. Williams: The effect of sodium pentobarbital on capacitation in the rabbit. Proc. Soc. Exp. Biol. Med. 136:937-939, 1971.

13. Plotka, E. D., D. M. Witherspoon, and C. W. Foley: Luteal function in the mare as reflected by progesterone concentrations in peripheral blood plasma. Am. J. Vet. Res. 33:917-920, 1972.

14. Foley, C. W., C. C. Engle, E. D. Plotka, R. C. Roberts, and A. D. Johnson: Influence of early pregnancy on proteins and amino acids of uterine tubal fluids in rabbits. Am. J. Vet. Res. 33:2059-2065, 1972.

15. Poole, H. R., C. W. Foley, and E. D. Plotka: Swine semen buffering systems. Am. J. Vet. Res. 34:901-902, 1973.

16. Plotka, E. D., T. F. Nikolai, and S. S. Hague: The interaction between estradiol and human platelets. Clin. Chim. Acta 49:287-293, 1973.

17. Schorr, W. F., E. Keran, and E. D. Plotka: Formaldehyde allergy. Arch. Dermatol. 110:73-76, 1974.

18. Plotka, E. D., U. S. Seal, E. E. Schobert, and G. C. Schmoller: Serum progesterone and estrogens in elephants. Endocrinology 97:485-487, 1975.

19. Plotka, E. D., C. W. Foley, D. M. Witherspoon, G. C. Schmoller, and D. D. Goetsch: Periovulatory changes in peripheral plasma progesterone and estrogen concentrations in the mare. Am. J. Vet. Res. 36:1359-1362, 1975.

20. Seal, U. S., R. Barton, L. Mather, K. Olberding, E. D. Plotka, and C. W. Gray: Hormonal contraception in captive female lions (Panthera leo). J. Zool. Anim. Med. 7:12-15, 1976.

21. Stevens, M. L. and E. D. Plotka: Functional lutein cyst: A rare cause of estrogenization in a postmenopausal woman. Obstet. Gynecol. 50:27s-29s, 1977.

22. Plotka, E. D., U. S. Seal, G. C. Schmoller, P. Karns, and K. D. Keenlyne: Reproductive steroids in the white-tailed deer (Odocoileus virginianus borealis). I. Seasonal changes in the female. Biol. Reprod. 16:340-343, 1977.

23. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: Reproductive steroids in the white-tailed deer (Odocoileus virginianus borealis). II. Progesterone and estrogen levels in peripheral plasma during the breeding season and pregnancy. Biol. Reprod. 17:78-83, 1977.

24. Elizondo, G., P. B. Addis, E. D. Plotka, D. N. Marple, D. B. Anderson, W. E. Rempel, and C. Madero: Physiological parameters and muscle characteristics of purebred pietrain and two specific pietrain crosses. J. Anim. Sci. 46:102-112, 1978.

25. Friedenberg, W. F., W. O. Myers, E. D. Plotka, J. N. Beathard, D. J. Kummer, P. F. Gatlin, J. F. Ray, III, and R. D. Sautter: Platelet dysfunction associated with cardopulmonary bypass. Ann. Thorac. Surg. 25:298-305, 1978.

26. Letellier, M. A., E. D. Plotka, U. S. Seal, L. J. Verme, and J. J. Ozoga: A technique for pinealectomy in deer, with notes on the neuroanatomy. Am. J. Vet. Res. 39:1617-1620, 1978.

27. Seal, U. S., E. D. Plotka, and C. W. Gray: Baseline hematology, serum chemistry and hormone data for captive tigers (Panthera tigris ssp) and lions (P. leo). In: International Tiger Studbook (1st International Symposium on the Management and Breeding of the Tiger, October 11-12, 1978, Leipzig, Germany), pp. 174-192.

28. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: Endocrine and morphological effects of pinealectomy in white-tailed deer. In: Animal Models for Research on Contraception and Fertility, N. J. Alexander (ed), Harper and Row, Hagerstown, MD, pp. 452-466, 1979.

29. Sautter, R. D., D. E. Larson, S. K. Bhattacharyya, H.-M. Chen, P. S. Treuhaft, J. P. Milbauer, J. J. Mazza, D. A. Emanuel, E. L. Koch, D. M. Lolley, W. O. Myers, J. F. Ray, III, E. D. Plotka, G. R. Nycz, and F. J. Wenzel: The limited utility of fibrinogen I 125 leg scanning. Arch. Int. Med. 139:148-153, 1979.

30. Hoehn, J. L., E. D. Plotka, and K. B. Dickson: Comparison of estrogen receptor levels in primary and regional metastatic carcinoma of the breast. Ann. Surg. 190:69-71, 1979.

31. Seal, U. S., E. D. Plotka, J. M. Packard, and L. D. Mech: Endocrine correlates with reproduction in the wolf. I. Serum progesterone, estradiol, and LH during the estrous cycle. Biol. Reprod. 21:1057-1066, 1979.

32. Black, D., U. S. Seal, E. D. Plotka, and H. Kitchen: Uterine biopsy of a lioness and a tigress after melengestrol implant. J. Zoo An. Med. 10:53-56, 1979.

33. Schulte, B. A., J. A. Parsons, U. S. Seal, E. D. Plotka, L. J. Verme, and J. J. Ozoga: Heterologous radioimmunoassay for deer prolactin. Gen. Comp. Endocrinol. 40:59-68, 1980.

34. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: Reproductive steroids in deer. III. Luteinizing hormone, estradiol and progesterone around estrus. Biol. Reprod. 22:576-581, 1980.

35. Gunther, J. D., C. W. Foley, H. A. Garverick, and E. D. Plotka: Comparison of milk and plasma progesterone levels in the cycling and pregnant mare. J. Anim. Sci. 51:1131-1138, 1980.

36. Schulte, B. A., U. S. Seal, E. D. Plotka, L. J. Verme, J. J. Ozoga, and J. A. Parsons: Seasonal changes in prolactin and growth hormone cells in the hypophyses of white-tailed deer (Odocoileus virginianus borealis) studied by light microscopic immunocytochemistry and radioimmunoassay. Am. J. Anat. 159:369-377, 1980.

37. Schulte, B. A., U. S. Seal, E. D. Plotka, M. A. Letellier, L. J. Verme, J. J. Ozoga, and J. A. Parsons: The effect of pinealectomy on seasonal changes in prolactin secretion in the white-tailed deer (Odocoileus virginianus borealis). Endocrinology 108:173-178, 1981.

38. Schulte, B. A., U. S. Seal, E. D. Plotka, L. J. Verme, J. J. Ozoga, and J. A. Parsons: Characterization of seasonal changes in prolactin and growth hormone cells in the hypophyses of white-tailed deer (Odocoileus virginianus borealis) by ultrastructural and immunocytochemical techniques. Am. J. Anat. 160:277-284, 1981.

39. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: The effect of pinealectomy on seasonal phenotypic changes in white-tailed deer (Odocoileus virginianus borealis). In: Matthews, C. D. and R. F. Seamark (eds): Pineal Function, Chap. 7, Elsevier/North-Holland, Amsterdam, pp. 45-56, 1981.

40. Plotka, E. D., U. S. Seal, and L. J. Verme: Morphologic and metabolic consequences of pinealectomy in deer. In: The Pineal Gland, Extra-Reproductive Effects, Vol. III, CRC Press, Boca Raton, FL, pp. 153-169.

41. Peterson, E. K., M. A. Letellier, J. A. Parsons, E. D. Plotka, L. D. Mech, and U. S. Seal: Olfactory pedunculotomy induced anosmia in the wolf (Canis lupus). Physiol. Behav. 27:543-546, 1981.

42. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: Reproductive steroids in white-tailed deer. IV. Origin of progesterone during pregnancy. Biol. Reprod. 26:258-262, 1982.

43. Seal, U. S., L. J. Verme, J. J. Ozoga, and E. D. Plotka: Metabolic and endocrine responses of deer to increasing population density. J. Wildl. Manage., in press.

44. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: The adrenal gland in white-tailed deer - A significant source of progesterone. J. Wildl. Manage. 47:38-44, 1983.

45. Seal, U. S. and E. D. Plotka: Age specific pregnancy rates in feral horses. J. Wildl. Manage., in press.

46. Morley, J. E., A. S. Levine, E. D. Plotka, and U. S. Seal: The effect of naloxone on feeding and spontaneous locomotion in the wolf. Physiol. Behav., in press.

Abstracts and Papers Presented at Meetings

1. Plotka, E. D. and R. Bogart: Gonadotropic and thyrotropic hormone content of sheep pituitaries as related to sex, age, and breed. Proc. West. Sect. Am. Soc. An. Sci. 14:XLVIII, 1963.

2. Plotka, E. D., R. E. Erb, C. J. Callahan, and W. R. Gomes: Levels of progesterone in peripheral blood plasma of the cycling cow. Presented at the 61st Annual Meeting of the American Dairy Science Association, Corvallis, OR, 1966.

3. Witters, W. L., E. D. Plotka, R. E. Erb, R. B. Harrington, and C. W. Foley: Comparative metabolic behavior of boar semen under aerobic and anaerobic conditions. Presented at the Midwestern Section meeting of the American Society of Animal Science, Chicago, IL, Nov. 26-27, 1966.

4. Plotka, E. D., V. L. Estergreen, and O. L. Frost: Relationships between progesterone levels in peripheral and ovarian venous blood plasma, corpora lutea, and ovaries during pregnancy. Presented at the 62nd Annual American Dairy Science Association Meeting, Ithaca, NY, 1967.

5. Callahan, C. J., E. D. Plotka, and J. L. Albright: A prolonged gestation: Estrogen and progesterone relationships and physiological and anatomical observations. Presented at the 62nd Annual American Dairy Science Association Meeting, Ithaca, NY, 1967.

6. Clem, D. R., E. D. Plotka, V. A. Garwood, and C. W. Foley: Heritabilities and correlations among boar semen traits. Presented at the Midwestern Section meeting of the American Society of Animal Science, Chicago, IL, Nov. 27-28, 1967.

7. Plotka, E. D., W. L. Williams, and C. W. Foley: Hormonal relationships with sperm capacitation. Fed. Proc. 28:705, 1969.

8. Plotka, E. D. and W. L. Williams: The effect of pentobarbital on capacitation in the rabbit. J. Reprod. Fert. 18:175, 1969.

9. Plotka, E. D., D. M. Witherspoon, and D. D. Goetsch: Peripheral plasma progesterone levels during the estrous cycle of the mare. Fed. Proc. 30:419, 1971.

10. Plotka, E. D., S. S. Hague, and D. D. Hupe: The interaction between steroids and human blood platelets. Fed. Proc. 31:245, 1972.

11. Plotka, E. D., S. S. Hague, and D. D. Hupe: The interaction between steroids and human blood platelets. II. Partial characterization of estrogen binding. Abstracts III Congress, the International Society on Thrombosis and Haemostasis, Aug. 22-26, 1972, p. 236.

12. Plotka, E. D., T. F. Nikolai, and L. J. McCann: The <u>in vitro</u> binding of estradiol to human platelets before and during oral contraceptive treatment. Acta Endocrinol. Suppl. 177:140, 1973.

13. Plotka, E. D., L. J. McCann, and S. S. Hague: The interaction of cholesterol with human platelet membrane. Abstracts of the 9th International Congress of Biochemistry, Stockholm, 1973.

14. Anand, A. S., B. C. Wentworth, E. D. Plotka, J. C. Sullivan and N. L. First: Blood LH and progesterone level changes during the estrous cycle of the mare. J. Anim. Sci. 37:299, 1973.

15. Seal, U. S., D. G. Makey, N. Flesness, L. Murtfeldt, C. W. Gray, R. Barton, L. Mather, K. Olberding, and E. D. Plotka: The Noah's ark problem. Multigeneration management of wild species in captivity as a means of their conservation. Presented at the annual meeting of Am. Assoc. Zoo Parks Aquar., 1975.

16. Seal, U. S., R. Barton, L. Mather, C. W. Gray, and E. D. Plotka: Long-term control of reproduction in female lions (Panthera leo) with implanted contraceptives. Presented at the AAZV annual meeting, San Diego, CA, November, 1975.

17. Plotka, E. D., U. S. Seal, L. J. Verme, J. J. Ozoga, and G. C. Schmoller: Reproductive steroids in white-tailed deer during the estrous cycle and pregnancy. Presented at the Fifth International Congress of Endocrinology, Hamburg, July 18-24, 1976.

18. Plotka, E. D., U. S. Seal, P. Karns, K. D. Keenlyne, and G. C. Schmoller: Circannian rhythms in reproductive steroids in white-tailed deer (Odocoileus virginianus borealis). Presented at the 58th annual meeting of the Endocrine Society, June 23-25, 1976, p. 270.

19. Seal, U. S., E. D. Plotka, J. M. McMillin, C. W. Gray, R. Barton, L. Mather, and S. Seager: Some hormonal correlates of reproduction and contraception in lions. Presented at the 4th International Conference on the World's Cats and Sociobiology of Carnivores, Seattle, WA, Mar. 17-19, 1977.

20. Plotka, E. D.: Estrogen assays - including breast carcinoma receptors. Presented at the fall meeting of the Central Chapter of the Society for Nuclear Medicine, Marshfield, WI, Oct. 1-2, 1977.

21. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: Endocrine and morphological effects of pinealectomy in white-tailed deer. Presented at the Symposium of Animal Models for Contraception and Research, Washington, DC, May 8-10, 1978.

22. Schulte, B. A., J. A. Parsons, U. S. Seal, E. D. Plotka, L. J. Verme, and J. J. Ozoga: Seasonal variation of prolactin secretion in the white-tailed deer (Odocoileus virginianus borealis) evaluated by heterologous radioimmunoassay and immunocytochemistry. Presented at the Endocrine Society meeting, Anaheim, CA, June 1979.

23. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: The effect of pinealectomy on seasonal changes in luteinizing hormone secretion in the white-tailed deer (Odocoileus virginianus borealis). Presented at the Society for the Study of Reproduction meeting, Quebec City, Canada, August 1979.

24. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: Reproductive steroids in white-tailed deer (Odocoileus virginianus borealis). IV. Origin of progesterone during pregnancy. Presented at the Sixth International Congress of Endocrinology, Melbourne, Australia, Feb. 10-16, 1980.

25. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: The effect of pinealectomy on seasonal phenotypic changes in white-tailed deer (Odocoileus virginianus borealis). Presented at the Symposium on Pineal Function, Thredbo, Australia, Feb. 17-20, 1980.

26. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: Reproductive steroids in white-tailed deer. V. Progesterone levels in a population of changing density and social status. Presented at the Society for the Study of Reproduction meeting, Ann Arbor, MI, Aug. 11-14, 1980.

27. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: Pinealectomy induced alterations in seasonal patterns of adrenal progestin and corticoid secretion in white-tailed deer. Presented at the Endocrine Society meeting, Cincinnati, OH, June 17-19, 1981.

28. Seal, U. S. and E. D. Plotka: Hematology and blood chemistry: Seasonal norms in captive wolves. Presented at the First International Captive Wolf Research Conference, University of Michigan, Flint, MI, Oct. 9-11, 1981.

29. Plotka, E. D.: The pineal and seasonal rhythms. Presented at the Veterinarian and the Physician on Common Ground - The Farm, Marshfield, WI, Oct. 21, 1982.

Articles Submitted or in Preparation

1. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: Pinealectomy induced changes in patterns of luteinizing hormone and testosterone secretion in white-tailed deer. Endocrinology, submitted (9/30/81).

2. Sautter, R. D., E. L. Koch, W. O. Myers, J. F. Ray, III, D. E. Larson, H.-M. Chen, J. P. Milbauer, P. S. Treuhaft, E. D. Plotka, F. J. Wenzel, G. Nycz, and W. E. Pierce: Combination of aspirin and sulfinpyrazone in the prophylaxis of deep vein thrombosis in total hip replacement. N. Engl. J. Med., submitted (11/1/82).

3. Kastin, A. J., J. E. Morley, A. S. Levine, E. D. Plotka, U. S. Seal, M. A. Letellier, and L. J. Verme: Circannual rhythm and the effects of pinealectomy and castration on circulating MIF-1/TYR-MIF-like material in the white-tailed deer (Odocoileus virginianus borealis). Science, submitted (11/1/82).

4. Engle, C. C., C. W. Foley, and E. D. Plotka: Free amino acids and total protein in reproductive tract fluids of the mare. J. Theriogenol., submitted.

5. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: The effect of ovariectomy on the LH response to LHRH in white-tailed deer. In preparation.

6. Plotka, E. D., U. S. Seal, M. A. Letellier, L. J. Verme, and J. J. Ozoga: Pinealectomy induced changes in growth rate and coat molt in deer. In preparation.

7. Plotka, E. D., U. S. Seal, L. J. Verme, and J. J. Ozoga: Reproductive steroids in white-tailed deer. V. Progesterone levels in a population of changing density and social status. In preparation.

8. Plotka, E. D., U. S. Seal, R. Barton, L. Mather, and C. W. Gray: Endocrine correlates of reproduction and contraception in lions. In preparation.

9. Packard, J. M., U. S. Seal, L. D. Mech, and E. D. Plotka: Causes of reproductive failure in two family groups of wolves (Canis lupus). In preparation.

CURRICULUM VITAE

NAME: Richard J. Carlson
Senior Vice-President
ST. JOSEPH'S HOSPITAL
Marshfield, Wisconsin 54449

EDUCATION:

Civilian

Attended Heron Lake (Minnesota) Catholic Grade School, 1948-1956.

Attended Heron Lake (Minnesota) Public School, 1956-1960. Graduated Heron Lake (Minnesota) High School, May, 1960.

Attended St. John's University, Collegeville, Minnesota, 1960-1961.

Attended University of Minnesota, Minneapolis, Minnesota, 1961-1963 and 1968-1969.

Graduated from University of Minnesota with Distinction, July, 1969. Degree: Bachelor of Science in Business Administration.

Attended Course in Hospital Administration, University of Minnesota, September, 1969 through July, 1970. Administrative Residency requirements for graduation taken at Methodist Hospital, St. Louis Park, Minnesota, July, 1970 through June, 1971. Graduated from the University of Minnesota in June, 1971. Degree: Masters in Hospital Administration.

Accomplishments: Honor graduate, University of Minnesota, 1969.

Elected member of Beta Bamma Sigma, National Honor Fraternity in Business Administration, 1970.

Recipient of American Surgical Trades Association Award, 1970.

Completion of Masters Thesis Entitled, "A Study of Selected Variables and Physician Characteristics and the Association of These Variables and Characteristics to Physician Attitudes Toward Intern and Resident Training in Community Hospitals."

Military

Attended and graduated from U. S. Air Force Security Police Technical Training School, June, 1964.

EDUCATION:
(con't)

Military

Attended and graduated from Air Force Combat Preparedness School, November, 1966.

MILITARY SERVICE: United States Air Force, March, 1964 to January, 1968. The majority of active duty was spent at Vandenberg Air Force Base, California as a Security Police Investigator. The remainder of tour was spent at Cam Ranh Bay, Vietnam as a Security Policy Desk Sergeant.

Related Awards:
Air Force Commendation Medal
Air Force Good Conduct Medal
Vietnamese Service Medal
Vietnamese Campaign Medal

Discharge Rank: Staff Sergeant - Honorable Discharge January 13, 1968.

EXPERIENCE:

Administrative Clerkship, St. Paul Ramsey Hospital, January to March, 1970.

Administrative Resident at 400 bed Methodist Hospital, St. Louis Park, Minnesota, July, 1970 to June, 1971.

Assistant Vice-President, Rhode Island Hospital, Providence, Rhode Island, July, 1971 to September, 1975.

Vice-President, Clinical Services, St. Joseph's Hospital, September, 1975 to February, 1979.

Senior Vice-President, St. Joseph's Hospital, Marshfield, Wisconsin, February, 1979 to present.

PROFESSIONAL ORGANIZATIONS:

Fellow, American College of Hospital Administrators

Personal Member, American Hospital Association

Personal Member, Wisconsin Hospital Association

Personal Member, Catholic Health Association of Wisconsin

Member, Marshfield Medical Foundation Board of Directors and Executive Committee

Member, Wisconsin Crime Victims Compensation Panel

Secretary/Treasurer, Marshfield Chamber of Commerce

Cirriculum Vitae
of
David R. Fetterolf

Mailing Address: 611 St. Joseph's Avenue, Marshfield, WI 54449

Telephone: (715) 387-7787

Education:

Level	Institution	Field of Study	Degree	Year
High School	Wauwatosa East High School	General	Diploma	1971
Undergraduate	University of WI, LaCrosse	Nuclear Medical Technology & Chemistry	B.S.	1976
Graduate	University of WI, Milwaukee	Business	None - working for M.B.A.	
Clinical Internship	St. Luke's Hospital Milwaukee, WI	Nuclear Medical Technology	N.A.	1975-76

Registration: American Society of Clinical Pathologists
NM(ASCP) #000917 August, 1976

American Registry of Radiologic Technologists
RT(AART) #131787 November, 1976

Employment History:

Institution	Dates	Position
St. Joseph's Hospital Marshfield, WI	October, 1981 to present	Director of Nuclear Medicine Educational Coordinator of Nuclear Medicine Technology Program
Stan A. Huber Consultants, Inc. New Lenox, IL	February, 1981 to September, 1981	Nuclear Medicine Consultant
St. Francis Hospital Milwaukee, WI	May, 1979 to February, 1981	Senior Nuclear Medical Technologist
St. Luke's Hospital Milwaukee, WI	August, 1976 to April, 1979	Staff Nuclear Medical Technologist

Professional Affiliations: Society of Nuclear Medicine
Society of Nuclear Medicine - Tech ologist Section

Sigma Zeta Honorary Science Fraternity
American Chemical Society

Teaching Experience: Chemistry Tutor - UW, LaCrosse
Physics Instructor - St. Lukes Hospital, Milwaukee, WI

CURRICULUM VITAE

NAME: Reidun Juvkam Daeffler

ADDRESS: 1500 North Hume Avenue
Marshfield, Wisconsin 54449

TELEPHONE:
(715)384-3546

EMPLOYMENT: Oncology Clinical Nurse Specialist
St. Joseph's Hospital
Marshfield, Wisconsin 54449

(715)387-7869 or 387-1713

SOCIAL SECURITY NUMBER: 527-15-3955

EDUCATION:

University of Oslo Oslo, Norway	Undergraduate degrees: Philosophy Education Psychology	 1954 1965 1967
Aker School of Nursing (Aker Sykepleieskole Oslo 5, Norway)	Diploma	1955-1958
Norges Sykepleiehoyskole Nordraaksgt, 12, Oslo 2	Graduate program Nursing Education with Administration	 8/59-12/60
University of Arizona College of Nursing Tucson, Arizona	Special program to prepare for nursing research	9/68-5/69
Arizona State University College of Nursing Tempe, Arizona	Master of Science Medical-Surgical Nursing	1972-1974
Texas Woman's University Houston, Texas	Ph.D. Program in Nursing (discontinued program and transferred students to Denton at the end of 1977)	6 credits Fall 1977

LICENSED AS REGISTERED NURSE:

Norway since 1958
Arizona since 1972 (R.N. - 026039 - 005)
Texas since 1977 (R.N. - 438371)
Wisconsin since 1978 (R.N. - 69770)

POSITIONS IN CLINICAL NURSING:

St. Joseph's Hospital Marshfield, Wisconsin	Oncology Clinical Nurse Specialist	1/78 to Present
University of Texas Cancer Center and Tumor Institute M.D. Anderson Hospital Houston, Texas	Clinical Supervisor	9/76-12/77
Veterans Administration Hospital Phoenix, Arizona	Clinical Nurse Specialist (Oncology, Diabetes)	7/74-8/76
Dora L. Convalescent Center 2645 East Thomas Phoenix, Arizona	Part-time - Relief nurse for all RN positions in the institution	3/73-7/74
Good Samaritan Hospital 1033 East McDowell Phoenix, Arizona	Staff Nurse (RN Team Leader), Oncology/ Hematology Unit	11/71-3/73
Baatsfjord Red Cross Health Center Baatsfjord, Finnmark, Norway	Charge Nurse (Administrator of 12 bed inpatient unit and outpatient services in addition to RN duties)	8/58-7/59
Aker Hospital Oslo 5, Norway	Staff Nurse (Psychiatric and Medical Units)	1/58-8/58

POSITIONS IN NURSING EDUCATION:

Aker School of Nursing Oslo 5, Norway	Assistant Director (3 year diploma program, 200 students)	3/63-8/71 (Leave of Absence 9/70-3/71)
Aker School of Nursing Oslo 5, Norway	Instructor	1/63-8/71
Finnmark School of Nursing Hammerfest, Norway	Instructor	Summer of 1960 1/61-12/62

POSITION IN NURSING RESEARCH:

Norwegian Association of Nurses Boks 3649 Gamlebyen, Oslo 1, Norway	Researcher for project on education and functions of the professional nurse	9/70-3/71

MEMBERSHIP AND PARTICIPATION IN PROFESSIONAL ORGANIZATIONS:

Sigma Theta Tau Honor Society (since 1975)
Oncology Nursing Society (Charter member since 1975)
American Nurses Association (1971-1977)
Continuing Education Committee, Texas Nurses Association District 9 (1977)
Oncology Nursing Group, Marshfield, Wisconsin (Chair from initiation in 1978 until present)
Wisconsin Oncology Nursing Group (Charter member since 1980)
Clinical Nurse Specialist Group, Phoenix, Arizona (1974-1976)
Norwegian Association of Nurses (since 1958)
Active membership including:
- numerous committees, such as the Education Committee, the Editorial Committee for the journal "Sykepleien", the Editorial Committee for textbooks in Nursing, the Nursing Research Committee.
- elected representative from Oslo to the General Assembly in 1965.
- president of a local chapter (1962, Vest-Finnmark Krets).
- member of the Board for the Oslo Chapter of nursing educators.
- representative to the ICN Convention in Mexico City in 1973, where the group from Norway presented a panel on Nursing Research.

PUBLICATIONS:

Articles in American Journals:

"Oral Hygiene Measures for Patients with Cancer I". Cancer Nursing, October 1980, 347-356.

"Oral Hygiene Measrues for Patients with Cancer II". Cancer Nursing, December 1980 427-432.

"Oral Hygiene Measures for Patients with Cancer III". Cancer Nursing, February 198 29-35.

"Outcomes of Primary Nursing for the Patient". Military Medicine, March 1977, 204-208.

"Patients' Preception of Care Under Team and Primary Nursing". Nursing Digest, Summer 1976, 47-49.

"Patients' Preception of Care Under Team and Primary Nursing". JONA, March-April 1975, 20-26. (This article is also incorporated in Primary Nursing: A Contemporary Nursing Resource Book, 1977)

Patient Education Materials:

Editor of a "Handbook for the Diabetic" to be used in a teaching program for the diabetic patient and his family at the Phoenix V.A. Hospital (1974-1975). Participation in developing a slide-tape presentation about this patient education program.

Other Publications:

One of three members of the Nursing Research Committee at M.D. Anderson Hospital who initiated and published a monthly Nursing Research Newsletter.

Books in Norwegian:

Sykepleie - Individuelt Ansvar-Gruppeansvar? Oslo: Norsk Sykepleier-forbund, 1975 (94 pages).
Translation of Master of Science thesis on team and primary nursing, Arizona State University, 1974.

PUBLICATIONS: (continued)

Books in Norwegian:

Sykepleierfunksjon og Profesjonell Utdanning. Oslo: Universitetsforlagt, 1971 (288 pages).
A research report on a study done for the Norwegian Association of Nurses in 1969-1971 on the education and functions of the professional nurse in Norway.

Kobro, M. and Juvkam, R. Farmakologi, Laerebok for Sykepleieskoler IX. Oslo: Fabritius, 1969.
Textbook in Pharmacology for student nurses co-authored with Dr. Kobro.

Other Publications in Norwegian:

Among several articles and other publications is an article on the Clinical Nurse Specialist in a supervisor role, published in Posdkorb (March 1977) and reprinted in Sykepleien (64: 738-740, August 1977).

Report from a government appointed committee to revise the curriculum for the 30 general nursing programs in Norway, 1970 (Helsedirektoratet, Wolan-Komiteens Instilling).

MAJOR ACTIVITIES IN PRESENT POSITION:

I. Staff Education, Oncology Nursing

Entered newly established position as Oncology Clinical Nurse Specialist January 3, 1978. An Oncology Unit had been opened November, 1977 for an estimated 15 beds with another 14 beds for Medical overflow. At that time no RN on the unit had received Oncology nursing training or experience. By 1980 the Oncology Unit was expanded to 46 beds, Medical Oncology/Hematology.

1. Role - modeling in clinical nursing.
2. Inservice for Oncology nursing staff at all levels.
   - A 12 hour basic oncology course established and taught to provide a systematic program for the staff.
   - A continuing inservice program based on needs and the rapid development of unit activities.
3. Establishing a thorough orientation program for new nursing staff. This program developed into a six week (systematic and flexible) clinical and classroom orientation for RN's.
4. Inservices for staff outside of the Oncology Unit as part of serving as a consultant on Oncology nursing. This includes other departments as well as nursing units.
5. Education to new methods, techniques, programs and systems.

II. Clinical Nursing

1. Consultant to all staff.
2. Counseling of patient and family during hospitalization and after discharge as needed.
3. Patient and family education.

MAJOR ACTIVITIES IN PRESENT POSITION: (continued)

III. Coordination of Cancer Care
1. Member of Cancer Center Committee.
2. Member of Radiation Safety Committee.
3. Supervisor for Oncology Unit.
4. Chairing an Ad Hoc Committee on Financial Counseling of the Cancer Patient.
5. Representative for inpatient nursing in Oncology Department Medical Staff Meeting.
6. Attend Wisconsin Oncology Meetings and cooperate with the Wisconsin Clinical Cancer Center, University of Wisconsin, Madison.

IV. Research Activities and Special Projects
1. Terminal Care
a. Data gathering
- Literature review on Hospice.
- Visited Hill Haven Hospice, Tucson, March 1978.
- Attended National Hospice Organization Annual Meeting, Washington, D.C., October 4-7, 1978.
- Attended regional Hospice Conference in Bloomington, Minnesota, March 1-4, 1979.
- Attended Wisconsin Hospice Meeting, American Cancer Society, Madison, November 5, 1980.

b. Proposed the establishment of and chaired the interdisciplinary Thanatology Committee.
Performed four surveys to determine need for Hospice type services.
Developed Standards of Care for the Terminally Ill.
Presented educational programs.
Presented written reports to the Hospital Administration.
Position as Hospice Care Facilitator established 1980.

c. Terminal Care Research Proposal presented to NCI for grant application 1979, after approval by institutional Human Experimentation Committee and the Marshfield Medical Foundation, funding from NCI denied. On initiative by the Thanatology Committee the institutions from 1981 participate in the National Hospice Study that will answer some of the questions raised in the Terminal Care Study.

2. Community Hospital Oncology Program, Chairperson of Nursing Committee (CHOP Contract NCI 1980, Committee established February 1981).
Development of a Nursing Model as a basis for standards, policies and procedures developed by seven subcommittees.

3. Laminar Air Flow Isolation - established 1980.
- preparation of equipment and unit
- education of staff
- developing and writing manual
- nursing aspect of Bone Marrow Transplantation Programs

4. Development of a Patient Education Center and a staff Learning Resource Center on the Oncology Unit.

5. Establishment of a Nursing Research Committee within the Eastern Cooperative Oncology Group (ECOG is the source of protocols for much of the cancer treatment at the Cancer Center in Marshfield).

6. Development of proposal for a one week Oncology Nursing Residency at the Medical Complex in Marshfield to start February, 1982.

MAJOR ACTIVITIES IN PRESENT POSITION: (continued)

V. Joint Position as an Instructor in the St. Joseph's Hospital School of Nursing

VI. General Nursing Service Activities
1. Member of the Policy/Procedure Committee.
2. Member of the Standards Committee.
3. Member of the Nursing Service Administrative Committee.
4. Weekend supervisor of Nursing Service (rotation among Nursing Service Executives)

VII. Facilitation of Research Activities (e.g. Pain Study WCCC, Nausea-study City of Hope Cancer Center) as participating institution.

DIRECTION OF WORKSHOPS AND COURSES:

"Fourth Annual Oncology Nursing Conference: Chemotherapy: Nursing Aspects", Marshfield 9/23/81.
"Third Annual Oncology Nursing Conference: Community Nursing: Patient/Family Education", Marshfield 9/10/80.
"Second Annual Oncology Nursing Conference", Marshfield 9/7/79.
"Supportive Family Care in Cancer", one day workshop sponsored by the St. Joseph's Hospital, the American Cancer Society and the Marshfield Clinic, 10/18/78.
"I Can Cope", Trainers Seminar, A.C.S. Wisconsin Division, Stevens Point, 8/13-14/80.
"Basic Oncology Course", a 12 hour course over 8 weeks offered to health care providers in Marshfield 2-4 times a year since 1978.
"Care of the Diabetic Patient", Veterans Administration Center, Phoenix, Arizona, 1974.
"Nursing Research", A one week workshop sponsored by the Norwegian Association of Nurses, Oslo, 1970.

PRESENTATION OF PAPERS LAST THREE YEARS:

Oncology Nursing for R.N.'s

"Management of Pain in the Cancer Patient", Wausau Visiting Nurse Association, 1/15/79.
"Problems Secondary to Therapy", University of Wisconsin, Spring Cancer Conference, 4/16/81.
"Care of the Patient Receiving Chemotherapy", Taylor County Public Health Nurses, 4/9/81.
"Diagnostic Procedures - Therapy", Cancer Again, 19th Annual Spring Cancer Conference, A.C.S. Wisconsin Division, 4/21/80, 9/10/80 and 11/12/80.
"Patient Education - News in Cancer Care", Third Annual Oncology Nursing Conference, Marshfield, 9/10/80.
"Chemotherapy and Radiation Therapy", Inservice Medford Hospital, 8/29/80.
"Approaches to Counseling Patients with Breast Cancer", Sexuality and Disability, Marshfield, 5/20/80.
"Oral Care in Cancer" and "Drug Control of Chronic Pain in Cancer", Second Annual Oncology Nursing Conference, Marshfield, 9/7/79.
"Cancer Care: An Overview", Supportive Home Care for the Cancer Patient, A.C.S., Chippewa, Dunn and Eau Claire Units, Menomonie, Wisconsin, 8/10/79.
"Management of Pain in the Cancer Patient", Wausau Visiting Nurse Association, 1/15/79.
"The Nursing Challenge of Supportive Family Care" and "What is a Hospice", Supportive Family Care in Cancer, Marshfield, 10/18/78.

PRESENTATION OF PAPERS LAST THREE YEARS (EXAMPLES): (continued)

University and Community Lectures

"Body Image", Marshfield Ostomy Club, 6/24/81.
"Grieving", Seminar: You Deserve A Break, University of Wisconsin, Marshfield - Wood County, 3/31/80 and 3/16/81.
"Dealing with Emotions; Helping the Dying Patient and His Family", Staff inservice, Marshfield Convalescent Center, 2/26/81 and 3/19/81.
"Cancer", Sunburst Home for Mentally Disturbed Children, 3/6/81.
"Nursing Research - Personal Involvement", Guest speaker at Milton College, Nursing Research Course, 2/26/81.
"Death, Dying, Grieving and Wellness", Course: Wellness, University of Wisconsin, Marshfield - Wood County, 2/24/81.
"Care Options and Resources for the Terminally Ill", North-Central Technical Institute, Senior Citizen Day, Stratford, 11/12/80.
"Reactions to Loss", "NAME" - Organization for persons who have lost their spouses, Marshfield, 7/16/80.
"Patients Rights", Living With Cancer - group, Stevens Point, 5/27/80.
"The Hospice Movement", Unitarian Universalist Association, Marshfield, 3/2/80.
"Loss and Grief", United Methodist Church, Adult Class, Marshfield, 2/17/80.
"Cancer", Rosary Altar Committee, St. John's Church, Marshfield, 6/11/79.
"Life and Death", Faith Lutheran Church, Family Summer School, 6/4/79.
"Oncology", Marshfield Ostomy Club, 5/30/79.
"Psychological Aspects", Life and Death Issues for Ward Clerks, Mid-State Technical Institute, Marshfield, 4/7/79.
"Cancer", Lady Knights, Marshfield, 3/20/79.
"Cancer and Our Emotions", Course: Cancer: Facts, Fiction and Your Future, University of Wisconsin, Marshfield - Wood County, 10/18/78.

COMMUNITY INVOLVEMENT LAST THREE YEARS:

Board Member, Wood Unit of the American Cancer Society, 1979 to present.

Member of the Nursing Subcommittee of the Wisconsin Division, American Cancer Society Professional Education Committee, 1979 to present.

"I Can Cope" coordinator, Wood Unit of the American Cancer Society.
Instructor of "I Can Cope" trainers, American Cancer Society, Wisconsin Division.

Member of Social Concerns Committee, Faith Lutheran Church, Marshfield, (Also Secretary of the Church Council).

Teaching Norwegian at Mid-State Technical Institute, Marshfield Campus.

CURRICULUM VITAE

LOIS JO RUTZ
Route 4
Marshfield, WI 54449

Born: Oak Park, Illinois
April 19, 1946

Education:

University of Illinois, Urbana, IL 1964-1965
University of Illinois, Chicago Circle, IL, B.S. Physics, December 1967
Northern Illinois University, DeKalb, IL, M.S. Physics, January, 1972
University of Colorado Medical Center, Denver, CO, M.S. Medical Physics, August, 1978

Work Experience:

Currently: Medical Physicist and Radiation Safety Officer, Marshfield Clinic and St. Joseph's Hospital beginning September, 1978

Honorarium lecturer in Freshman physics at the University of Colorado, Colorado Springs, CO, 1973 and 1974

AUA-ANL Summer Engineering Practice School, Argonne National Laboratory, (on a fellowship from the AEC), 1969

Physics Laboratory assistantship, Northern Illinois University, 1968-69

Librarian, Oak Park Public Libraries, Maze Branch, 1965-66

Book Processing for Suburban Library System, Summer 1964

Languages Spoken:

German

Unpublished Papers:

Schilmoeller, Neil; Benn, E.; Rutz, L.; Orechwa, Y.; & Semenza, L.: Thermal Properties of Vibratory Packed Spherical Particles, ANL Metallurgy Department, August 1969

Herve, A.; Purcell, J.; Keltner, M.; Rutz, L.; & Smith, Jr., J.; Effect of Low Temperature and High Magnetic Fields on Resistivity of High Purity Aluminum, ANL High Energy Physics Department, August, 1969

Rutz, L., Determination of Radiated Power from a Plasma by the Lagrange Expansion Method, Master's Thesis, Northern Illinois University, 1971.

Rutz, L., Effects of Spectral Shaping of Diagnostic X-ray Beams by K Absorption Filters, Master's Thesis, University of Colorado Medical Center, August, 1978

Presentations:

"Dose Reduction and Contrast Enhancement Using Ho, Yb, and Gd filtration in Iodine Contrast x-ray Exams."

Meeting of the North Central Chapter AAPM October, 1978, Marshfield Clinic, Marshfield, WI

"Biological Effects of Low Level Radiation"

Meeting of the Midwest Area Life Insurance Medical Directors, May 9, 1979 and Medical Surgical Conference, Marshfield Clinic, June 26, 1980

"Digital Radiography"

Central Wisconsin Biomedical Electronics Technicians Association, Marshfield, WI, December 18, 1982

"NMR Imaging"

Cancer Educational Conference, Sponsored by Midwest Cancer Society and Holy Cross Hospital, April 6, 1983

"NMR Imaging"

Meeting of District IV Wisconsin Society of Radiologic Technologists, April 27, 1983

Workshops Attended:

AAPM Special Workshop on Electron Linear Accelerators in Radiation Therapy, Denver, CO, March 27-29, 1978

AAPM Summer School, U.W. LaCrosse, Tissue Imaging and Characterization with Computerized Tomography and Ultrasound, July 20-25, 1980

Tutorial Workshop on Math, Physics, and Engineering of NMR Imaging, University of WI Medical Physics Department, Madison, WI, January 5, 1983

AAPM Summer School, Fairleigh Dickenson University, Madison, NJ, July 24-July 30, 1983, Update in Nuclear Medicine Physics

Memberships:

American Association of Physicists in Medicine, 1978, Full Member, 1982

Society of Photo-Optical Instrumentation Engineers, 1980-1981

North Central Chapter AAPM, 1978- ? , Secretary Treasurer 1982-1983

AAPM Task Group on Digital Radiography, 1981- ?

16218

CURRICULUM VITAE

January,1977

NAME: Wilfred R. Schroeder BIRTHDATE: November 13, 1927

OFFICE ADDRESS: 611 St. Joseph's Avenue TELEPHONE: 715-387-7184
Marshfield, Wisconsin 54449

HOME ADDRESS: 1604 West 5th Street TELEPHONE: 715-387-6211
Marshfield, Wisconsin 54449

EDUCATION: Graduate Elgin High School, Elgin, Minnesota
Technical Graduate, Mayo Clinic, Rochester, Minnesota
Received ARRT certification 1956

POSITIONS HELD:

1957-1966: Assistant Chief Technologist-Radiology
St. Joseph's Hospital, Marshfield, Wisconsin

1966-Present: Department Head or Chief Technologist-Radiology
St. Joseph's Hospital, Marshfield, Wisconsin

MEMBERSHIP PROFESSIONAL:
American Society of Radiologic Technologists (ASRT)
Wisconsin Society of Radiologic Technologists (WSRT)

Mr. Schroeder has been an active member of the American Society of Radiologic Technologists since 1959. He held the office of Counselor Western Section of Wisconsin 1975-1976. This was by appointment of the National Society.

He has been active on the state and local levels since 1960. He has served as president and Board of Directors of the WSRT. He has held numerous committee appointments on state and district levels during this period.

Currently, he is chairman of the Vote by Mail Committee of the Wisconsin Society of Radiologic Technologists; Member of the Radiologic Technology Advisor Committee-District I Technical Institute, Eau Claire, Wisconsin; Member of the Advisory Board for Medical Stenography-Mid-State Technical Institute, Marshfield, Wisconsin.

CURRICULUM VITAE

John R. Pohlman, R.T.

Birthdate: October 19, 1923
Cassville, Wisconsin

Home Address:
Route 1, Box 102
Pittsville, Wisconsin

Telephone: (715) 884-2497

Office Address:
1000 North Oak Ave.
Marshfield, Wisconsin

Telephone: (715) 387-5261

Education: Grades, Racine, Wisconsin
East High, Green Bay, Wisconsin
University of Wisconsin Medical School
Short Course--X-ray Technician 1948
American Registry of Radiologic Technologists
Certification in 1950

Military Service: February 1942 - December 1945
USNR Hospital Corpsman
May 1951 - November 1952
USNR Hospital Corpsman

Societies: American Society of Radiologic Technologists 1950
Wisconsin Society of Radiologic Technologists 1953

Experience: Christie Clinic, Champaign, Illinois
1949-1951 Senior Technologist

Korea-Medical Battalion-Fleet Marine Force
1951-1952 Senior Technologist

Marshfield Clinic, Marshfield, Wisconsin
1953 Senior Technologist
presently Manager-Department of Radiology

ITEM 8 - Training and Experience

Training and experience of all isotope users will be evaluated by the Radiation Safety Committee as per ITEM 7 of this license.

Each applicant for isotope use will be considered individually. He will submit a complete description of his proposed uses, his CV and documentation of training in the safe use and handling of radioactive materials.

If the proposed user is a physician and the use is in vivo, appropriate criteria based on Regulatory Guide 10.8 Rev. 1, Appendix A as well as 10 CFR.35 will be used as a basis for the evaluation of the physician's qualifications.

Users requesting in vitro use of radioisotopes will be evaluated on the basis of formal training and experience considered necessary for the particular uses specified. Since each user must request each new use separately, training requirements are open to a review on each new request. See ITEM 15A for details.

ITEM 9 - Instrumentation

Name	Make	Serial #	Location	Sensitivity and Range	Type of Radiation Detected
Rad Gun	AGB-10 KG SR	2314	RT-Nurses Station	5-10-83 K = 1.0 on all scales	alpha-gamma-beta
Cutie Pie Victoreen Meter	740-F	206	RT-Nurses Station	alpha over 3.5 Mev; beta 40 kev (approx); gamma & x-ray 7 kev to 2 Mev	alpha-beta gamma
Nuclear Chicago	1185	28572	JVL/Radioisotope Counting Room	5-4000 kev	gamma
Nuclear Chicago	1185	30706	JVL/Radioisotope Counting Room	5-4000 kev	gamma
Searle	1285	33602	JVL/Radioisotope Counting Room	15-200 kev	gamma
Isodata	20/20	N/A	JVL/Radioisotope Counting Room	15-255 kev	gamma
Micromedic	4600	530	JVL/Radioisotope Counting Room	Preset to $I\text{-}125$, Co^{57}	gamma
Victoreen Survey Meter	491	1309	JVL	gamma above 12 kev & beta above 200 kev saturates above 4 R/hr with Model 491	beta-gamma G-M probe
Victoreen	491-GM with 489-35 probe thin end window	1772-GM 8021 probe	RS	0-4.7 R/hr with range of .1 mR/hr full scale to 100 mR/hr full scale	α >4 Mev β >70 kev γ >6 kev
Tri-Carb Liquid Scintillation Spectrometer	Packard	B3320-04-09313	MMF-Marx	Background 25 cpm	beta emission
Geiger Counter	Victoreen 493	412	MMF-Tewksbury	Cesium probe	gamma above 40 kev

500C Gamma Counter	Packard	A500C00-31650	MMF Main Lab	Sens = 322 pCi Range 15-2000 kev	gamma
Scintillation Counter	Searle	33724	MMF Main Lab	Sens = 36 pCi Range 0-1700 kev	beta
Gamma Counter	Nuclear Chicago Model 4216	224	MMF Main Lab	Sens = 32 pCi Range 15-100 kev	gamma

RT = Radiation Therapy
JVL = Joint Venture Laboratory
RS = Radiation Safety
MMF = Marshfield Medical Foundation

Instrumentation (Cont)

Location: Nuclear Medicine

1. Survey Meters

1 Victoreen Model 491
Minimum range: 0 mR/hr to 0.1 mR/hr
Maximum range: 0 mR/hr to 100 mR/hr

2. Dose Calibrators

1 Squibb CRC-6A
1 Nuclear-Chicago Mediac

3. Instruments used for Diagnostic Procedures

Type of Instrument	Manufacturer	Model Number
1 Scintillation Camera	General Electric	Maxicamera
2 Scintillation Cameras (portable)	Technicare	Sigma 420
1 Tomographic Imager	Siemans	Pho-Con 192
1 Computer	Digital Equipment Corp	PDP 11/34
1 Thyroid Uptake System	General Electric	INS-115
1 Deep Vein Thrombosis (DVT) System	Technicare Associates	FS-8M-SCAT
1 MCA/NaI probe	Nuclear Data	ND62T

4. Other

1 Picker Nuclear Model #642081 Area Monitor

ITEM 10A - Calibration of Survey Instruments

Survey instruments will be calibrated annually and after each repair.

A. Calibration of primary energy will be by any combination of the following:

1. By outside calibration firm whose services and procedures have been filed with the NRC

2. Against 3M Company Cs-137 therapeutic needle sources

3. Against a suitable NBS traceable reference source in our possession.

Each instrument will be calibrated at primary energy at two points, approximately 1/3 and 2/3 full scale for each scale less than 1 R/hr. Use of instruments with scales 1 R/hr or greater which remain uncalibrated will be according to the manufacturer's data concerning instrument response. Uncalibrated scales will be noted on the instrument. Calibration at secondary energy will be as follows:

1. Calibration will be at least annually and after major repairs

2. A low energy isotope will be used

3. If a NBS traceable source is not available, an energy independent instrument will be used to determine exposure rate and other instruments will be calibrated against it.

An instrument will be considered calibrated if its reading varies by less than $\pm$ 10% of the expected exposure rate. If an instrument reading is not within $\pm$ 10% but is within $\pm$ 20%, a calibration factor will be assigned to the instrument. If an instrument reading is not within $\pm$ 20%, it will not be used until it has been adjusted to within $\pm$ 20%.

B. Quarterly checks

All instruments will be checked quarterly at primary energy. Calibration factors will be updated if necessary. Failure of an instrument to read within $\pm$ 20% of the calibrated value will result in a full calibration of that instrument as outlined in section A.

C. Internal check sources will be checked and this reading recorded during annual calibration

This value shall be periodically checked by the user to verify that it is within $\pm$ 30%.

D. Instruments will be labelled with calibration factors for all scales which vary more than $\pm$ 10% but less than $\pm$ 20% at either primary or secondary energy.

Check source values will be noted on the instrument.

ITEM 10B - Calibration of Instruments: Dose Calibrators

A. Annual tests

1. The source will be used in all dose calibrators to check accuracy of the calibrator. The source will be contained in a vial identical to those used for daily 99mTc preparation. The activity measured as the average of three successive determinations should be within ± 5% of the activity of the reference 99mTc after decay correction. If not within such tolerance, the dose calibrator will be repaired or adjusted if possible. If impossible, a calibration factor will be calculated and used for routine assays.

2. Activity of the source is also determined at 6, 24 and 48 hr after the above measurement. These readings are plotted on a decay graph constructed for 99mTc from the initial assay. Measured activity should be within ± 5% of predicted activity. If errors greater than ± 5% are noted, repair or adjustment of the instrument will be performed. If it is not possible to bring predicted activity within the error range, calibration factors for the correction of observed activity will be calculated, posted with the instrument and used for routine assays.

B. Initial evaluation

1. New dose calibrators and dose calibrators which have undergone repair will be checked as listed under 'Annual tests' (paragraph A above).

2. Additionally, a vial identical to that used for daily 99mTc preparation containing approximately 10 mC 99mTc in 5 cc will be assayed. Successively 5 cc containing approximately 10 mC 99mTC will be added to the vial to a total of 30 cc. Activity will be assayed after each addition.

   The activity measured at the volume of the commercially obtained source used for linearity testing will be designated the true activity. True activity for all other volumes will be calculated. Correction factors for observed activity at all other volumes will be calculated, graphed and used in routine assays.

3. Appropriate tests of the dose calibrator response to volume and geometry variations will be made. Necessary correction factors will be established and placed near or on the instruments.

C. Quarterly evaluation

1. At the time of the annual check and quarterly, a 137 Cs therapeutic source (3M needle) will be assayed on all radionuclide settings of each calibrator. Subsequent readings will be compared to those obtained at the annual accuracy determination and changes of greater than ± 5% will dictate need for adjustment or repair.

2. The calibrators will be inspected quarterly for mechanical condition, electrical cord fraying, instrument zero setting and to ascertain that the measurement chamber liner is in place.

3. All dose calibrators will be tested quarterly for linearity of response with varying activity.

D. Daily evaluation

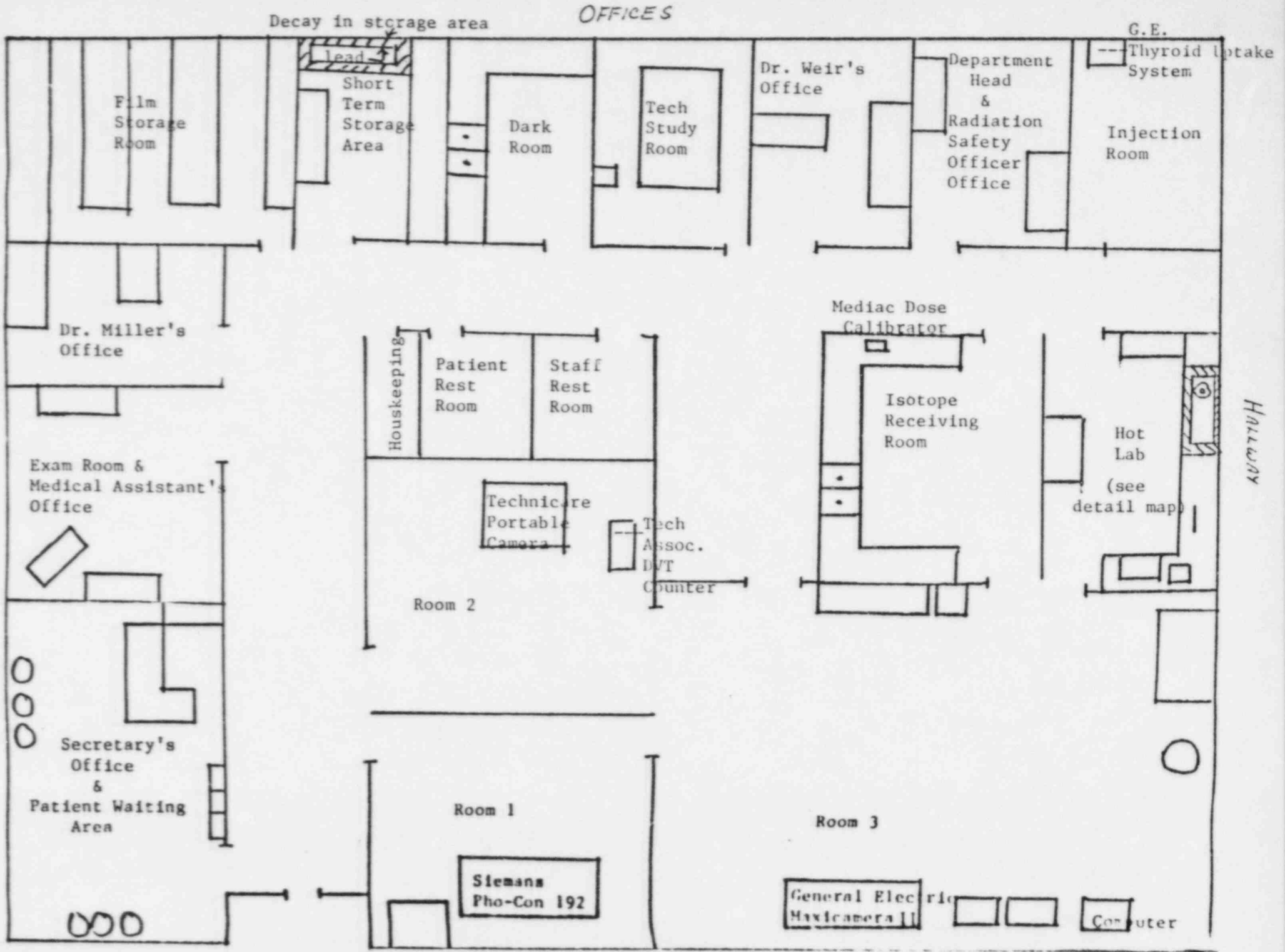
1. Dose calibrators will be checked daily with a 137 Cs source (New England Nuclear NES-356) on 137 Cs and 99mTc channels. Results will be compared to results on the day of the annual check. Changes of greater than $\pm$ 5% will indicate need for repair or adjustment of the instrument prior to use.

ITEM 11 - Facilities and Equipment

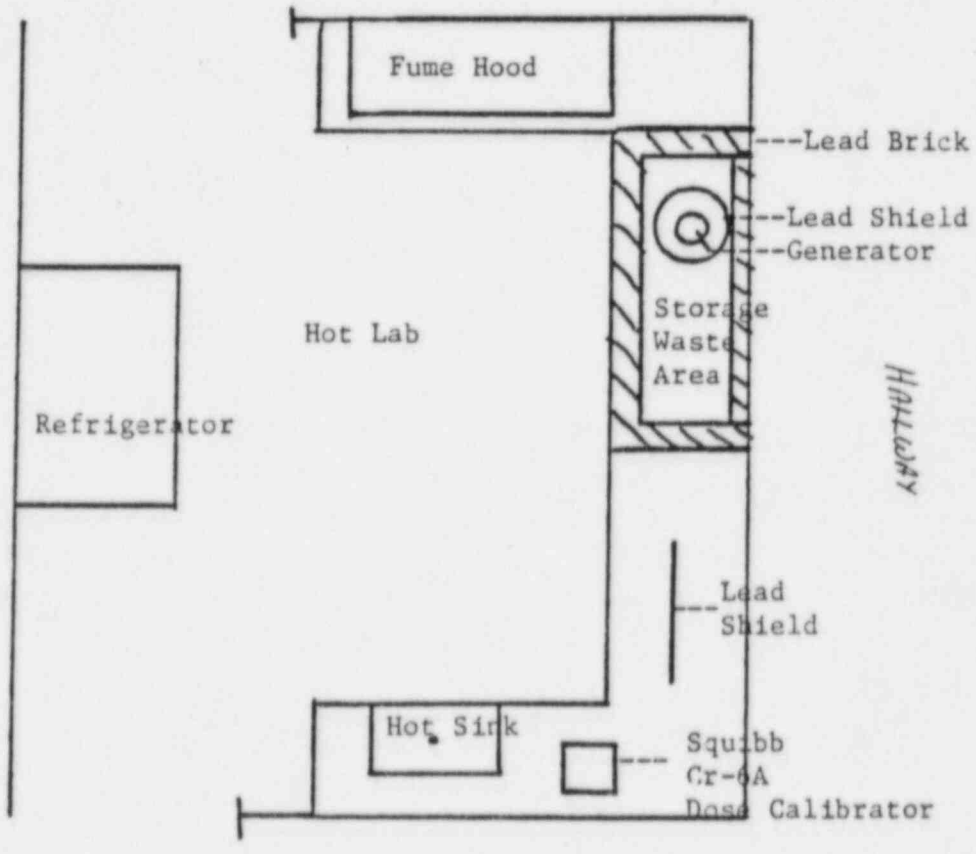
Radioactive materials are used by the Nuclear Medicine Department and Radiation Therapy Department of St. Joseph Hospital, Marshfield Medical Foundation and the Joint Venture Laboratory (Radioisotope Lab and Microbiology Lab). All users submit a description of receipt, storage, use areas and disposal with their user applications. The current facilities for each area are attached. Changes in facilities and equipment will be approved by the Radiation Safety Committee and the NRC will be notified of these changes.

Xe-133 will be used in the Nuclear Medicine Department, St. Joseph Hospital for lung ventilation studies. A complete description of the facility and procedure is given in ITEM 21 of this license.

Nuclear Medicine (Scanning)



NUCLEAR MEDICINE DEPARTMENT



ITEM 12 - Personnel Training Program

All personnel using byproduct material and ancillary personnel whose duties may require them to work in the vicinity of radioactive materials will receive appropriate instruction in radiation safety.

Isotope users will submit evidence of training in their initial application to the Radiation Safety Committee. Users are responsible for the training of their technicians and this training will be documented in their request for use of radioisotopes.

All personnel will receive instruction prior to assuming duties with or in the vicinity of radioactive materials and annually, or appropriately as specified by the department. Instruction will be by one of the following methods: distribution of printed information bulletins, audiovisual self teaching materials, inservice and on the job instruction.

Instruction will include (where appropriate) terms of the license, radioactive materials storage areas, review of radiation effects and potential hazards, safety procedures, pertinent NRC regulations, obligations and rights of radiation workers, emergency procedures, location of posted copy of 10 CFR 19 and copies of the license. The Radiation Safety Officer oversees this program.

ITEM 13 - Procedures for Receipt and Opening of Packages Containing Radioactive Materials

During normal working hours all orders for radioactive materials will be received by the central isotope receiving office. No individual users are authorized to receive direct shipments of radioactive materials. Each user will notify the central isotope receiving office of all material ordered.

After working hours shipments will be accepted by the emergency room admitting office personnel and will be immediately locked up in safe isolation until no later than the next working day at which time they will be transported by authorized personnel to the central isotope receiving office where their receipt will be logged and the packages opened.

ITEM 14 - Opening of Radioactive Material Shipments

Opening of radioactive material shipments will be as follows: For quantities and transport groups exempted by 10 CFR 20.205 special opening instructions from the manufacturer will be noted and followed. All packages will be visually inspected for damage, as will the contents of the package after opening. If damage is noted, the contents of the package will be surveyed and decontaminated if necessary. Any contaminated material will be treated as radioactive waste and the area cleaned before other packages are received.

For non-exempt quantities and transport groups the following procedure will be used:

1. 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) will be monitored for surface contamination and external radiation levels within 3 hr after receipt if received during working hours or within 18 hr 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 0.02 $\mu Ci/100\ cm^2$ or if external radiation levels exceed 200 mR/hr at the package surface or 10 mR/hr at 3 ft (or 1 m).

2. In addition, receipt office personnel will:

   a) Put on gloves to prevent hand contamination

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

   c) Measure exposure rate at 3 ft (or 1 m) 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 Office

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

f) Wipe external surface of final source container and remove wipe to low background area. Assay the wipe and record amount of removable radioactivity (e.g., μCi/100 cm^2, etc). Check wipes with a suitable survey instrument or counter and take precautions 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 using "Radioactive Shipment Receipt Record" (see next page) or a form containing the same information.

In all cases the package contents will be verified against the packing slip and order, the shipment will be logged into the appropriate records and transferred by central isotope personnel or picked up by the user. Transport will be in the original container and packaging whenever possible. Otherwise transfer will be in adequate containment and when liquids are involved with sufficient absorbent material.

The user will be responsible for maintaining records of his receipt from the central isotope office, the use of the materials and their ultimate disposal.

RADIOACTIVE SHIPMENT RECEIPT REPORT

1. P.O. No.: _____ Survey Date _____ Time _____

   Surveyor _____

2. CONDITION OF PACKAGE:

   _____ O.K. _____ Punctured _____ Status _____ Wet

   _____ Crushed _____ Other

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

4. MEASURED RADIATION LEVELS:

   a. Package surface _____ mR/hr

   b. 3 feet or 1 meter 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.

_____

Signature Date

ITEM 15 - General Rules for Safe Use of Radioactive Material

A. All personnel within the complex who wish to use byproduct material will submit their proposed use to the Radiation Safety Committee for evaluation. No use is permitted until approval is obtained from the Committee. A copy of the following will periodically be distributed to all potential users in the complex and specifically to any personnel known to be preparing an application.

Instructions for Application for Use of Radioactive Material

All users of radioactive material within St. Joseph Hospital, the Marshfield Clinic, the Marshfield Medical Foundation, and the Joint Venture Laboratory must be approved by the Radiation Safety Committee. The Committee will ask the Radiological Safety Officer to review your proposed use, and will then contact you indicating approval or disapproval of your request and noting any necessary additional safety procedures. You are not authorized to procure or use material until you are notified of such approval. Your application must include proposed procurement of radioisotopic material, amounts of material required, proposed handling methods (i.e., storage) after receipt from the Central Isotope Office and methods of handling radioactive wastes. Survey procedures of areas in which material will be stored and handled and personnel monitoring required must be included. A statement should be included that records of surveys, including negative results, will be kept by the user. If your proposal involves administration to humans, it must include an estimation of dose received with details of the calculation. Whole body and critical organ doses are to be included.

Evidence that the expected benefits justify the radiation exposure will be required. If exposure data are not well documented in the literature, you should include measurements to re-evaluate dose in your procedure and report such results to the Radiation Safety Committee. Appropriate literature references of dose received are required.

Evidence of satisfactory training in radiation safety procedures establishing your ability to handle the material and administer the program will be required. If you have any questions regarding survey requirements, personnel monitoring, waste disposal, storage or any other aspects, contact the Radiological Safety Officer and review the Byproduct Material License.

After review of a proposed use by the Radiological Safety Committee, the Radiological Safety Officer will inform the applicant of the decision of the Committee. If the application is approved, he will review the program with the applicant, including appropriate review and spot checking of surveys by the Radiological Safety Officer. Each approved user will receive the following:

Notification of Approval for Use of Radioactive Material

Your application for use of radioactive material has been approved. The statements in it become in effect an extension of our byproduct material license granted by the Nuclear Regulatory Commission and have the effect of Federal law.

You must:

Follow the safety program you outlined
Cooperate with the Radiological Safety Officer in monitoring your program
Have all orders of byproduct material delivered to the central isotope office
Transfer material to other users only with the approval of the Radiological Safety Officer
Handle wastes as outlined in your application, transferring wastes at periodic intervals to minimize personnel exposure and keep area restrictions at a minimum
Maintain a record of all receipts to include: isotope, chemical form, total activity, specific activity or activity per unit volume, manufacturer or distributor, lot number, use and ultimate disposal

You must not:

Order byproduct material without informing the central isotope office
Receive byproduct material directly
Dispose of material except as authorized in the application

In case of question or emergency contact:

The Radiological Safety Officer, the Chairman of the Radiation Safety Committee, or another Committee member

B. Appropriate laboratory equipment and apparel will be specified in the user proposals. All areas in which radioactive material is used will be clearly designated. Permanent surfaces will be covered with bench paper or trays will be used to prevent inadvertent contamination of the surface. Gloves and laboratory coats will be worn when contact with free nuclides or nuclides in solution is possible.

C. Uses involving labelling of materials with I-125, I-131, or I-123 will be conducted in a fume hood with a minimum flow of 100 cubic feet of air per minute. Labelling with activities in excess of 5 mCi will not be authorized without review of special procedures for handling possible volitalization of iodine.

D. Lead bricks, lead lined storage cabinets, lead lined refrigerators, syringe holders, syringe shields, and other protective equipment will be used as required to maintain personnel exposure as low as practicable. Such devices will be obtained only from recognized suppliers or manufacturers. Where such devices are used, the user is responsible for maintenance in accordance with manufacturer's instructions. Periodic surveys will include survey of areas specifically designed to check the continued integrity of such materials. Annual evaluations of approved users by the Radiological Safety Officer

will include evaluation of all safety devices and recommendations regarding replacement.

Syringe holders will be used for holding all syringes of radioisotopic material while awaiting injection. Syringe shields will be used routinely for the preparation of doses and administration to patients except in circumstances, such as pediatric cases, where their use would compromise the patient's well being.

E. All patient doses will be assayed in the dose calibrator prior to patient injection. Technologists are instructed to check all therapeutic doses against the physicians request. No therapeutic dose varying by greater than ± 10% of the requested dose will be administered.

Material received in the admitting office at other than normal working hours will be transported to the central office for inspection and opening in the original container unless the container shows evidence of physical damage and/or moisture.

All transfers will be accomplished with "double containment" of the material. The container of all liquids will include sufficient absorbent material to absorb the liquid. Transfers will be accomplished only by personnel properly trained in contamination control and authorized to perform transfers by the Radiation Safety Officer. Users wishing to transfer material will contact the central isotope office for help.

G. All materials will be stored such that the dose rate on contact with the exterior of the integral shielding (exterior walls in the case of material in an unoccupied room) will be such that a major part of the body of designated personnel in a controlled area may not receive in any one hour a dose in excess of 5 mRem or in any five consecutive days a dose in excess of 100 mRem or such that a major part of the body of anyone in a noncontrolled area may not receive a dose in excess of 1/10 of the above.

H. Personnel required to wear film badges, ring film badges, pocket dosimeters and other personnel monitoring devices will be determined by the Radiological Safety Officer and will include all personnel likely to receive an exposure in one year greater than 25% MPD.

The Radiological Safety Officer will arrange for exchange of film badges and other devices periodically and will maintain all records of personnel exposure. He will notify via their supervisor all personnel who receive more than 400 mRem exposure on their film badge measuring whole body dose in any one calendar month.

Should monitors be lost, contact the Radiological Safety Officer.

Monitoring devices will be stored in an area not exposed to radiation when not being worn and will be protected from heat, sunlight, and pressure at all times.

I. Waste will be segregated into long and short half-life and disposed of as described in ITEM 18 of this license. Each user will also maintain records of quantities, form and ultimate disposal of his own materials.

Interim storage areas and receptacles will be shielded such that the exposure rate at the surface will not exceed 2 mR/hr.

Interim storage areas will be designated as restricted areas.

J. Eating, drinking, smoking, application of cosmetics will be prohibited in all areas where radionuclides are prepared and administered. In large laboratories and work areas, the restricted sections will be designated clearly.

Refrigerators and storage areas for radioactive material may not be used to store personal effects or foods.

Personnel preparing radiopharmaceuticals will be instructed to monitor their hands periodically throughout the day. A continuous area monitor is provided in the Nuclear Medicine hot lab and may be used for this purpose.

ITEM 16 - Emergency Procedures

Each area will maintain and post emergency procedures to be used in conjunction with the institution's emergency plans. Each plan, although specific to the facility, will include the following general guidelines with the understanding that all steps be taken within the limits of personal safety.

1. Clear area of personnel not involved in spill
2. Secure ventilation systems and prevent spread of contamination
3. Attempt to minimize or localize use of water to control spread of contamination
4. Survey personnel and clothing of anyone likely to have been in the area
5. Secure the area to prevent unauthorized entry
6. Notify Radiation Safety Officer and/or members of the Radiation Safety Committee
7. The time and method of reentry into the area will be determined by qualified personnel and will depend on the condition of the area and available monitoring devices

Simple spills will be handled by the following (or comparable) procedure:

Decontamination Procedure

It is assumed that the person responsible for the spill will also be responsible for initiating the decontamination procedure. The following steps should be taken in the event of a spill:

1. Assess the extent of the contamination
2. Prevent access to the area
3. If possible, enlist the help of an uncontaminated person in the handling of the survey meter until the extent of your own contamination is determined. Wear gloves and take care to keep the survey instrument free of any radioactivity. Use protective coverings in spill kit (shoe covers, gloves, etc)
4. Notify the department supervisor and the Radiation Safety Office, extension 9022
5. Prevent the spread of contamination by turning off vents and putting down absorbent paper. Mark the area using radioactive tape and warning signs
6. Monitor personnel in the immediate area

Cleanup

Usual good housekeeping methods apply also to cleanup of radioactive materials. Use detergents provided in spill kit and appropriate cleaning materials (sponges, cloth wipes, paper towelling).

Start cleaning at the outer perimeter of the area and work in toward the center. Take care to avoid cutting through surface of skin on sharp objects or broken glass.

Discard all materials in bags provided, marking them at the end of the cleanup.

After cleaning, re-survey the area with G.M. survey meter. Avoid surveying the waste bag. If meter indicates contamination levels greater than background, more washings will be necessary until the level of activity is reduced to background.

Wipe test representative areas using materials provided in spill kit. Wipes should include an area 10 cm x 10 cm only. If activity is greater than 200 cpm above background, more cleaning will be necessary[2].

After area activity is reduced to background, warning tape and signs must be removed. All contaminated gloves and shoe covers should be discarded as radioactive waste.

Personnel Decontamination

After cleanup, each person involved should survey clothing and skin for contamination. Contaminated clothing should be removed and stored until decayed to background or discarded.

Hands and skin should be rinsed thoroughly with water and washed with a mild soap. Particular attention should be given to cleaning of fingernails. After washing, re-monitoring is required. This process should be repeated until the level of contamination is reduced to background or condition of the skin makes further cleaning impossible. Care should be taken to avoid abrading the skin through the use of harsh detergents or abrasives. A good method of hand decontamination is to tape a surgical glove at the wrist and allow the hands to perspire in the glove, thus washing off the contamination. Care should be taken to contain the moisture in the glove when removing it.

[1] In case of a spill of Xe131, vents should remain on. The pathway of the air flow should be monitored after clean up has taken place.

[2] In some cases it may be possible to simply isolate an area until the residual contamination decays to background. This possibility will be considered and approved by the Radiation Safety Officer or his designate.

Spill Report

Date: _____ Location: _____

Isotope Form: _____

Estimated Activity: _____

Floor Plan: Label areas contaminated and cleaned.
(On Back)

Area #	Activity Before Decontamination	Activity After Decontamination	Comment

Personnel Monitoring

Name	Clothing	Hands	Action Taken

Instrumentation Used: _____

_____ Signature

_____ Supervisor's Signature

4/79

ITEM 17 - Area Survey Procedures

Each user will be responsible for the appropriate surveys of his own area. Users will specify the frequency and type of survey necessary for their particular uses. The frequency will be at least monthly unless it can be shown that no isotopes were used for a period of 30 days or more. In this case, a baseline survey will be made before use of radioactive materials is reinitiated and surveys will continue throughout their use.

Surveys will consist of area surveys with appropriate survey instruments and/or wipe tests to determine contamination levels.

Results of surveys will be considered negative if the external exposure rate is at background (usually 0.05 mR/hr) or the wipe test reveals activity levels at or below 200 cpm above background for any 100 cm^2 wiped. Positive survey results will require decontamination of the area and resurvey to document absence of contamination.

Records of all surveys including negative results will be kept by the user and reviewed by the Radiation Safety Officer or designated staff. Records will include date, area surveyed, results of survey and any corrective action taken.

ITEM 18 - Waste Disposal

Radioactive materials will be disposed of by one of the following methods:

A. Return to vendor

B. Discharge to sewer

The minimum daily quantity of sewage is 6×10^6 ml/day from the laboratory, 10^8 ml/day from the hospital, and 6×10^6 ml/day from the Foundation. As calculated from 10 CFR, part 20, paragraph 20.303, disposal as follows is permitted.

Disposal into sewage will be as specified in 10 CFR 20.303 unless otherwise stated in this license.

All disposals into sewage will be recorded. Disposals of specimens (blood, urine, feces, etc) containing radioactive materials will be recorded. The isotope, chemical form quantity, activity and signature of person making disposal will be included in the log.

Amounts disposed will be totalled. Any unit reaching 250 mCi total disposal in any calendar year will notify the Radiological Safety Officer to insure the yearly disposal limit of 1 C is not exceeded.

Excreta from patients treated with radioactive material can be disposed of in the sewage without specific record and need not be included in the restrictions of this paragraph.

Each user will designate receptacles (liquid, solid or both as appropriate) for waste. Where appropriate, separate receptacles for long-lived (T 1/2 >2 days) and short lived materials will be used. These receptacles and contents will be subject to the same regulations regarding storage, survey and handling as all other types of byproduct material presented earlier. When full and before accumulation results in increase in area background as determined by periodic surveys, the material will be transferred.

C. Incineration

Whenever possible, the isotopes C-14, H-3, I-125 in low specific activity form will be disposed of by incineration in the hospital incinerator. H-3 will be primarily in the form of liquid scintillation wastes and C-14 primarily in the form of labelled sugar substrates used for blood bacterial analysis (BACTEC vials). I-125 would be in the form of LSA wastes such as paper counter covers, pipettes, test tubes, gloves, etc. On some occasions we may also wish to dispose of absorbed liquids, particularly if they contain chemical or biological materials which would prevent their release into the sewer, but which would be destroyed during incineration.

Gaseous effluents from the incinerator will not exceed the limits as specified for air in Appendix B, Table II, 10 CFR 20. All residues will be disposed of as ordinary waste provided appropriate surveys pursuant to Section 20.201 are made to

determine that concentrations of license materials appearing in the residues do not exceed the concentrations (in terms of microcuries per gram) as specified in Appendix B Table II 10 CFR 20.

Pertinent calculations are attached as Appendix A of this application.

Carcasses of animals to which radioisotope material has been administered and wastes from these animals will be treated as solid radioactive waste until it can be demonstrated that the administered activity has been excreted or has decayed.

D. Decay in storage

A storage area remote to traffic and used infrequently will be designated as the isotope waste disposal area.

Radioactive material with a physical half-life of less than 65 days will be held for decay-in-storage before disposal in ordinary trash. In addition, the following criteria will be met:

Radioactive waste to be disposed of in this manner shall be held for decay a minimum of ten (10) half-lives or until monitoring determines that its radioactivity cannot be distinguished from background with typical low-level laboratory survey instruments. All radiation labels will be removed or obliterated. Generator columns shall be segregated so that they may be monitored separately to insure decay to background levels prior to disposal.

In addition, we reserve the alternative to transfer waste to a commercial disposal site when necessary and/or to use disposal to trash of low level, low specific activity substances, liquid scintillation vials and BACTEC type vials provided that the specific activity of the nuclide does not exceed the limits of incineration residues as per part C of this application or 0.05 µCi/gm medium used for liquid scintillation or substrate as specified by 10 CFR 20.306.

The Radiological Safety Officer is responsible for records of receipts and current contents and transfer from this area. Transfer will be made before spaces adjacent to the area evidence a background level requiring designation as control areas. Access to the area will be restricted and the area will be locked at all times. All personnel with keys will be appropriately trained in handling of byproduct material and radiation safety. The building will be designated as a "controlled radioactive material" area unless surveys indicated a need for a more restrictive designation.

ITEM 19 - Therapeutic Use of Radiopharmaceuticals

Therapeutic use of I-131 and P-32 will be by the Nuclear Medicine physicians, currently Dr. G. J. Weir and Dr. R. W. Miller.

Therapy will be according to the attached protocol. Therapeutic use of radiopharmaceuticals by the radiation therapists will be according to procedures as outlined in ITEM 20 of this license.

Therapeutic Uses

I-131 and soluble sodium phosphate P-32 are given frequently for hyperthyroidism and polycythemia Rubra Vera, respectively. These procedures are performed as outpatients. The dose of pharmaceutical to be administered is determined by the physician interpreting studies at the time of administration in consultation with the referring physician and is administered by the Nuclear Medicine physician in the Nuclear Medicine suite. Therapy doses of radioactive iodine will be given in the fume hood with the hood suction running. The Nuclear Medicine assistant who calibrates these doses, and physicians administering these doses are monitored monthly by thyroidal counts in accordance with the license (ITEM 14, page 42, paragraph 10). Instructions are given to each 131-I therapy patient (copy enclosed). Doses of 131-I are limited to 30 mC on an outpatient basis.

Thyroid carcinoma is treated with up to 200 mCi radioactive iodine. Patients are isolated. Stay times for nursing personnel are calculated and posted (see forms attached). Release of the patient and instructions to the patient follow the guidelines of NCRP report number 37, "Precautions in the Management of Patients Who Have Received Therapeutic Amounts of Radionuclides".

All trash and materials leaving the room during the patient's occupancy is segregated, surveyed for presence of activity and handled as radioactive waste if activity is present. This material will be stored in Nuclear Medicine spaces and transferred to the waste disposal area in accordance with ITEM 15 of the Byproduct Material License. After the patient is discharged, the room is not cleaned or occupied by other personnel or patients until surveyed for radioactive contamination.

Therapy with colloidial phosphate, colloidial gold or other materials is not routinely performed. Should the occasion arise when it proved appropriate to use these materials by Nuclear Medicine personnel, individual procedures would be developed and reviewed with the Radiation Safety Officer. Many of these are done routinely in the Radiation Therapy Department of the hospital.

I-131 Oral Therapy Protocol
(Less than 30 mCi dose)

I-131 oral therapy is ordered for hyperthyroidism. Consultation for therapy is initiated usually by an endocrinologist (Drs. Nikolai, Coombs, McKenzie) in conjunction with Drs. Miller or Weir.

Requests will be in writing. Phone requests will be accepted only under unusual circumstances and confirmed by Drs. Weir or Miller.

The dose will be ordered by the technician in the isotope receipt/ordering slot for the week and the Nuclear Medicine assistant working in conjunction. When the patient reports the Nuclear Medicine assistant will check the dose in the dose calibrator, instruct the patient, determine that the patient is not pregnant if female, prepare the dose for administration and prepare the chart. The physician reading Nuclear Medicine studies that week will administer the dose.

Instructions for I-131 Therapy

Your physician has ordered radioactive iodine to be administered for treatment of your thyroid disease. This is a colorless, tasteless liquid you will drink through a straw. There are no side effects such as nausea or drowziness.

The amount of radioactivity is minimal and will not affect your family or your body except for your thyroid gland if you follow the simple instructions below. You can be active with your family. You can sleep in the same room and same bed with your husband or wife without fear of exposing them to a dangerous amount of radiation. Because of the radioactivity, you are asked to follow these instructions after your treatment.

1. Avoid close contact with children. You may feed, bathe and dress them but you should limit these activities to about 15 minutes at a time.

2. The radioactive iodine is excreted in the urine. Therefore, you should flush the toilet twice after each use.

3. Keep your personal items (toothbrush, water glass, etc) separate.

4. These rules should be followed for 48 hr after you receive the medication.

131-Iodine Thyroid Carcinoma Therapy

A. Patients receiving less than 30 mCi 131-iodine will be treated as an outpatient. Patients receiving more than 30 mCi 131-iodine will be admitted into the hospital for treatment.

B. The ordering, receiving and administering of the 131-iodine therapy doses will follow Nuclear Medicine Department guidelines.

C. Nursing instructions will be issued to the floor. They are:

1. The patient is restricted to the assigned room until radiation precautions are removed.

2. Gloves are worn when handling the patient, bed clothing, linen and urine.

3. Pregnant personnel should not attend the patient.

4. Disposable food trays are used.

5. The room is not cleaned during therapy. Housekeeping personnel will not be allowed access to the room unless cleared by the Radiation Safety Officer.

6. Biological specimens remain in the room until approval to remove them is given by the Radiation Safety Officer.

7. Solid rubbish (trays, linen, gloves, dressings, etc) are collected in large plastic bags and picked up daily by the Radiation Safety Officer or authorized personnel.

8. Visitors are not permitted for the first 24 hr. When visitors are allowed, they must remain behind the tape marking in restriction zone.

9. Permissable time in the restricted zone is posted on the Nursing Instruction Sheet attached to the patient's door.

D. Patient monitoring

1. With the patient lying in bed or standing in a designated place, a tape marker is placed on the floor 6-8 ft from the patient. A reading of the patient is obtained at 30-60 minutes after the dose and this reading (T_o) is related to the initial activity administered. Subsequently, daily patient readings are obtained and the retained activity calculated according to the formula:

$$\text{Retained activity} = \frac{\text{reading at T1,2,3, etc}}{\text{reading at } T_o} \times \text{mCi administered}$$

A daily record of retained activity is kept on the Nurses Instruction Sheet. Radiation precautions are lifted when retained activity has fallen below 30 mCi.

2. With the patient lying in bed, a bedside reading is obtained (approximately one meter distance). Permissable time in the restricted area is calculated on the basis of 20 mr per day maximum exposure. Daily recordings are made on the Nurses Instruction Sheet.

E. Posting of signs

1. A written instruction sheet is attached to both the chart in patient's room and to the front of the patient's chart. This sheet contains the following:

   a) Nursing instructions
   b) Permissable time in restricted area
   c) 131-iodine retained activity

F. Post discharge room monitoring

1. The room must be cleared by monitoring before it can be cleaned.

2. The Radiation Safety Officer or personnel assigned by the Radiation Safety Officer monitors the room for residual contamination.

3. Readings higher than 0.5 mr/hr on objects, floors, etc must be cleaned or allowed to decay to acceptable levels before the room can be used for other patients.

ST. JOSEPH'S HOSPITAL/MARSHFIELD CLINIC
COMBINED MEDICAL RECORD

NUCLEAR MEDICINE

RADIOACTIVE I-131 THERAPY

CAUTION: _____ mCi of radioactive Iodine-131 was administered on

_____ at _____ a.m./p.m.

IN CASE OF EMERGENCY NOTIFY: Dr. _____, phone (home) _____

(hosp) _____

NURSING INSTRUCTIONS:

The following instructions are to be followed throughout the therapy:

1. Pregnant personnel are not to attend to the patient.
2. Gloves are worn when handling the patient, bedclothing, linen. They are disposed of in the solid rubbish container.
3. The patient is restricted to the therapy room until radiation precautions are removed.
4. Disposable food trays are used.
5. Solid rubbish (trays, linen, gloves, dressings, etc.) are collected in large plastic bags and picked up daily by a Nuclear Medicine technician.
6. The room is not to be cleaned during the radionuclide therapy. No biological specimens are removed from the room or patient without the approval of the Nuclear Medicine physician in charge.
7. Visitors are not permitted for the first 24 hours. When visitors are allowed, they must remain behind the tape marking the restricted zone. No visits by pregnant women or by children are allowed.
8. Permissible time in the restricted zone is posted below.

A "restricted zone" is marked on the floor of the patient's room. The permissible time for working in this area on a given date is listed below. Do not exceed the permissible time. Avoid all unnecessary time within the area.

Date	Time	Exposure Rate at Bedside (mr/hr.)	Permissible Time in Restricted Zone/Day.

Iodine-131 body burden was less than 30 mCi on _____. The patient left room # _____ on _____.

Result of contamination survey: _____

_____

131-Iodine retained activity:

Date	Time	mr/hr at _____ feet	Activity remaining (mCi)

ITEM 20 - Therapeutic Use of Sealed Source

Sealed sources of radiation will be used as therapeutic sources by the radiation oncologists, currently Dr. H. H. Russ and Dr. R. H. Greenlaw. Procedures for procurement, use and disposal of sources is outlined below.

By-Product Materials Proposed for Use in Humans (see attached table)

Group IV

Phosphorus-32 as ionic phosphate. Infrequently, this agent has been used for oral/intravenous administration in treatment of bone metastases. Indications for use appear only rarely.

Phosphorus-32 as radiocolloid, chromic phosphate. Since the radiocolloid of gold-198 has been unavailable, this agent has had exclusive use for treatment of malignancy involving serosal surfaces.

Group V

At present this nuclide/form (gold-198 as radiocolloid) is not available. Should it reappear on the market, it may be used in place of phosphorus-32 as chromic phosphate colloid in control of malignant disease on serosal surfaces.

Group VI

Cesium-137 current inventory of sealed sources is approximately 175 mCi in 14 tubes.

Gold-198 as seeds. Largely, this nuclide has been replaced, clinically, by the use of iodine-125 seeds due to the sharply improved situation of radiation safety. Should there be supply problems for iodine-125, gold-198 seeds would be a fall-back resource. Gold-198 seeds, like iodine-125 seeds, are sources left in humans permanently.

Iridium-192 as seeds. Used in removable interstitial implants. The frequency of this type of treatment and usage is increasing which requires increase in limit of possession.

Group	Nuclide Form	Supplier	Limit of Possession	Storage	Disposal	Survey Instrument
Group IV	Phosphorus-32 for bone metastases	Abbott or other NRC approved supplier	15 mCi	Shipping container in locked room*	Secured to decay to background	Geiger-Mueller
	Phosphorus-32 as chromic phosphate	Abbott or other NRC approved supplier	20 mCi	Shipping container in locked room*	Secured to decay to background	Geiger-Mueller
Group V	Gold-198 radiocolloid	None at present	300 mCi	Shipping container in locked room*	Secured to decay to background	Jordan Rad Gun Cutie Pie
Group VI	Cesium-137 tubes/needles	3M	300 mCi	Lead safe-locked in locked room*	Long-life sources repeat use	Jordan Rad Gun Cutie Pie
	Gold-198 seeds	Amersham Searle	200 mCi	Shipping container in locked room*	Secured to decay to background	Jordan Rad Gu Cutie Pie
	Iridium-192 Seeds, hairpins	Alpha-Omega Rad-Irid Amersham Searle	3,000 mCi	Shipping container in locked room*	Returned to supplier	Jordan Rad Gun Cutie Pie
	Iodine-125 seeds	3M	500 mCi	Shipping container in locked room*	Secured to decay to background	Geiger-Mueller

* Storage room in Radiation Therapy Department

Receipt and Handling

A. Radioisotope central receiving is notified of all orders placed to suppliers for the above by-product material.

B. Upon receipt of shipment, the material is logged by the office, inspected for leak, surveyed for level of surface activity and notification is made to me of arrival.

C. The material is transferred to the source storage room in Radiation Therapy Department. This location is noted on the attached floor plans. The Radiation Therapy Department is locked when not occupied. The designated room for storage is locked when not occupied. The door is posted with sign indicating: CAUTION - RADIOACTIVE MATERIALS. Within this room, which is 15' x 20', is a smaller room, 4' x 4'. This is the storage area. The door is posted with sign indicating: DANGER - RADIATION AREA - AUTHORIZED PERSONNEL ONLY. Here is situated the lead safe for long-life cesium sources. A work table with L-block and other shielding is present for preparing short-life sources for use, as well as long-life sources. Short-life sources are stored here in shipping containers. The door of this room is locked when department is not occupied.

D. All sources are logged in upon arrival, logged out when used with appropriate dates, names and other pertinent information, and logged in when returned. If disposed of or returned, as appropriate, this too is entered in log.

E. Surveillance and monitoring is done regularly by users and routinely by Radiation Safety Officer. Inventory control of long-life sources is responsibility of each authorized user.

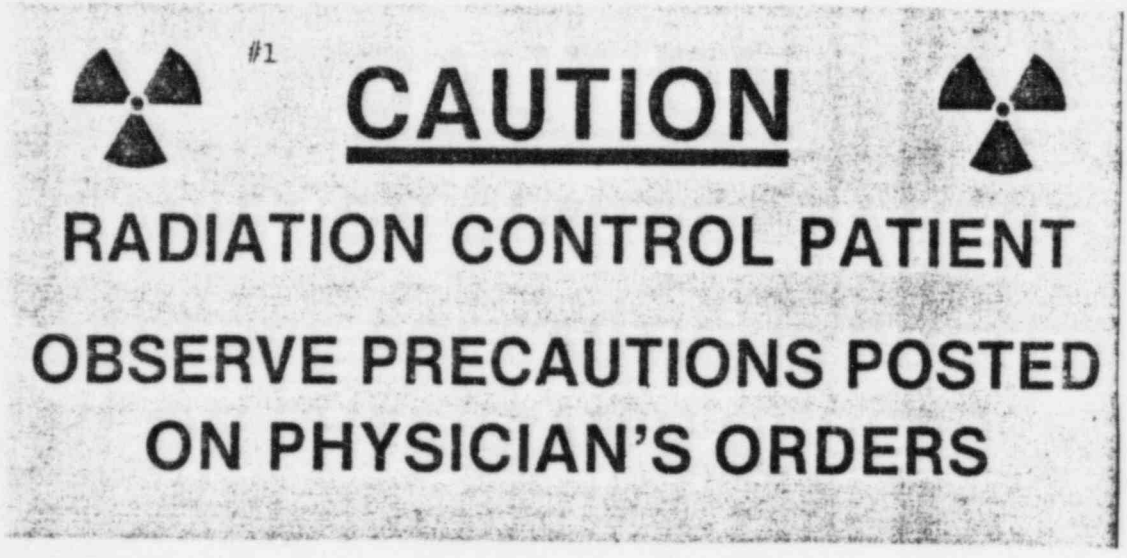
F. Personnel exposure is minimized by routine use of shielding materials and long handled instruments. Personnel monitoring is done with film badges.

During periods of introduction/removal of radioactive sources, the authorized user moves swiftly, following careful rehearsal and practice, using distance when shielding is not possible for protection. Assistants who are essential are properly monitored. The area of work is surveyed at conclusion and review of inventory is done for assuring all sources are accounted for.

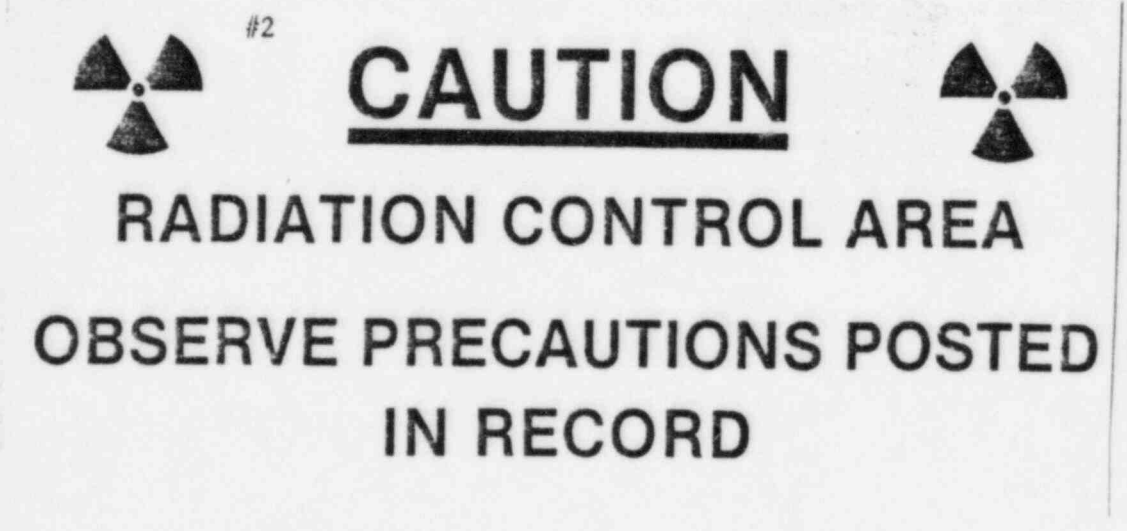
G. Personnel hazard. While the patient is a personnel hazard, orders are written by the responsible user to guide nursing and other attendants in care so as to minimize exposure of their person and to comply with Federal (NRC) and state codes. Attached are the standard materials used for this program.

H. Patients undergoing therapeutic radionuclide treatment will usually be confined to rooms specially situated on the oncology floor of St. Joseph Hospital. In the event that no room is available on that floor, arrangements for confinement of the patient on a general surgical floor will be made by first notifying Reidun Daeffler or the Radiation Safety Officer. Arrangements will then be made to provide a room remote from other patients and inservice general nursing staff in proper handling of the patient.

1. Adhesive label to be attached to front cover of the inhospital medical record which, in turn, is kept in a yellow notebook.



2. Caution sign which is placed in holder at patient's doorway.



3. Label inserted in wristband on patient.

4. Physician's order sheet to instruct personnel in aspects of care to minimize exposure. All patients who are a hazard to personnel are in especially isolated rooms. A bed-side shield is used to reduce truncal dose while providing care.

ST. JOSEPH'S HOSPITAL

MARSHFIELD, WISCONSIN

#4

PHYSICIAN'S ORDERS

Room No. _____

Date	Time	ORDERS	Physician	Nurs
		RADIATION PRECAUTIONS		
		RADIATION SOURCE _____ FORM _____ QUANTITY _____		
		DATE INTRODUCED _____ TIME _____		
		DATE TO BE REMOVED _____ TIME _____		
		WRIST BAND _____ SIGN ON DOOR _____ STICKER ON CHART _____		
		PRECAUTIONS WITH: MEAL TRAY _____		
		LINEN _____ EXCRETA _____		
		LABORATORY SPECIMENS _____		
		PERMISSABLE RADIATION EXPOSURE WILL NOT BE EXCEEDED BY PERSONNEL		
		WORKING:		
		1) AT BEDSIDE FOR _____ PER DAY, OR		
		2) _____ FEET FROM BEDSIDE FOR _____ PER DAY, OR		
		3) _____ FEET FROM BEDSIDE FOR _____ PER DAY.		
		PREGNANT PERSONNEL OR VISITORS **MAY NOT** ATTEND PATIENT.		
		PATIENT **MAY NOT** BE REMOVED FROM ROOM.		
		VISITORS MAY BE PRESENT _____ HR. PER DAY AT _____ FEET FROM BEDSIDE.		
		FOR OTHER DETAILS, CONTACT LOIS RUTZ, M.S., RADIATION SAFETY OFFICER OR MYSELF.		
		_____ M. D.		

5. Physician's progress note to incorporate specific details related to radiation hazard.

ST. JOSEPH'S HOSPITAL/MASHFIELD CLINIC
COMBINED MEDICAL RECORD

HISTORY — PHYSICAL EXAMINATION
PROGRESS NOTES

#5

INTRODUCTION OF RADIATION SOURCES

Date : Hour

SOURCE MATERIAL _____ QUANTITY _____

FORM _____ LOCATION OF SOURCES _____

APPLICATOR _____ NUMBER OF DESCRETE SOURCES _____

DAY AND TIME INTRODUCED _____

DAY AND TIME FOR REMOVAL _____

RADIATION MONITORING:

_____ R/HR _____ meters from _____

_____ R/HR _____ meters from _____

RADIATION PRECAUTION ORDERS WRITTEN _____

SPECIAL RADIATION PRECAUTIONS:

Should there occur an emergency with patient, or death, during time Radiation Sources are in place contact Lois Rutz, M. S., Radiation Safety Officer, or myself.

_____ M. D.

6. Patient identification card is issued to patients leaving hospital who could be a hazard to others if the radionuclide volume is entered; such as laparotomy on a person with radiocolloid of phosphorus-32.

#6

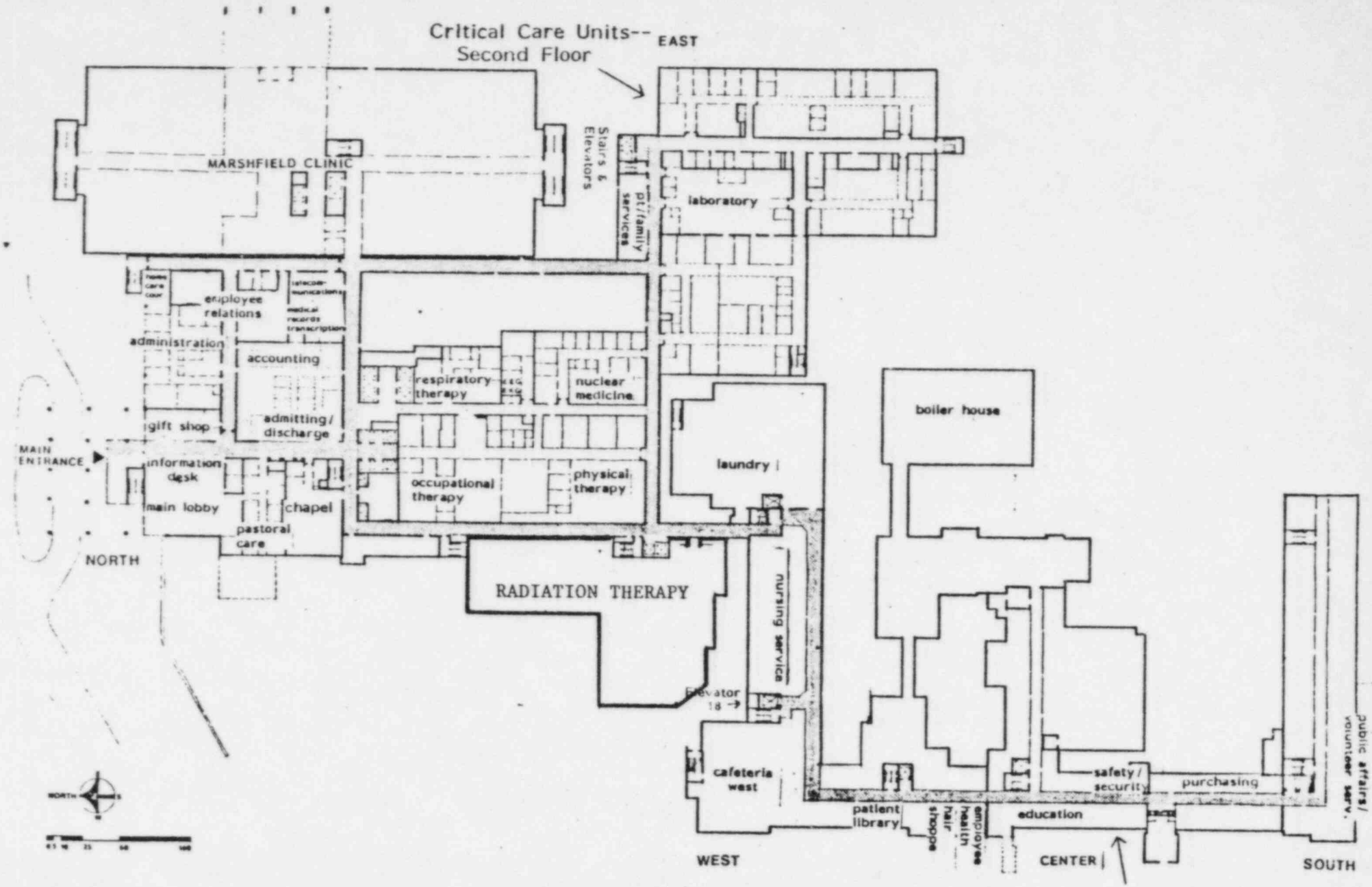
ST. JOSEPH'S HOSPITAL/MARSHFIELD CLINIC

ADVICE CONCERNING RADIATION SOURCES

_____, has been treated with internal radiation sources on _____. There are no radiation
date
hazards to others unless intervention is required, such as an operation. In case of emergency, operation or death, consult for clearance before intervening.

_____ M. D.
Responsible Physician 715/387-5511

Lois Rutz M. S.
Radiation Safety Officer 715/387-7787

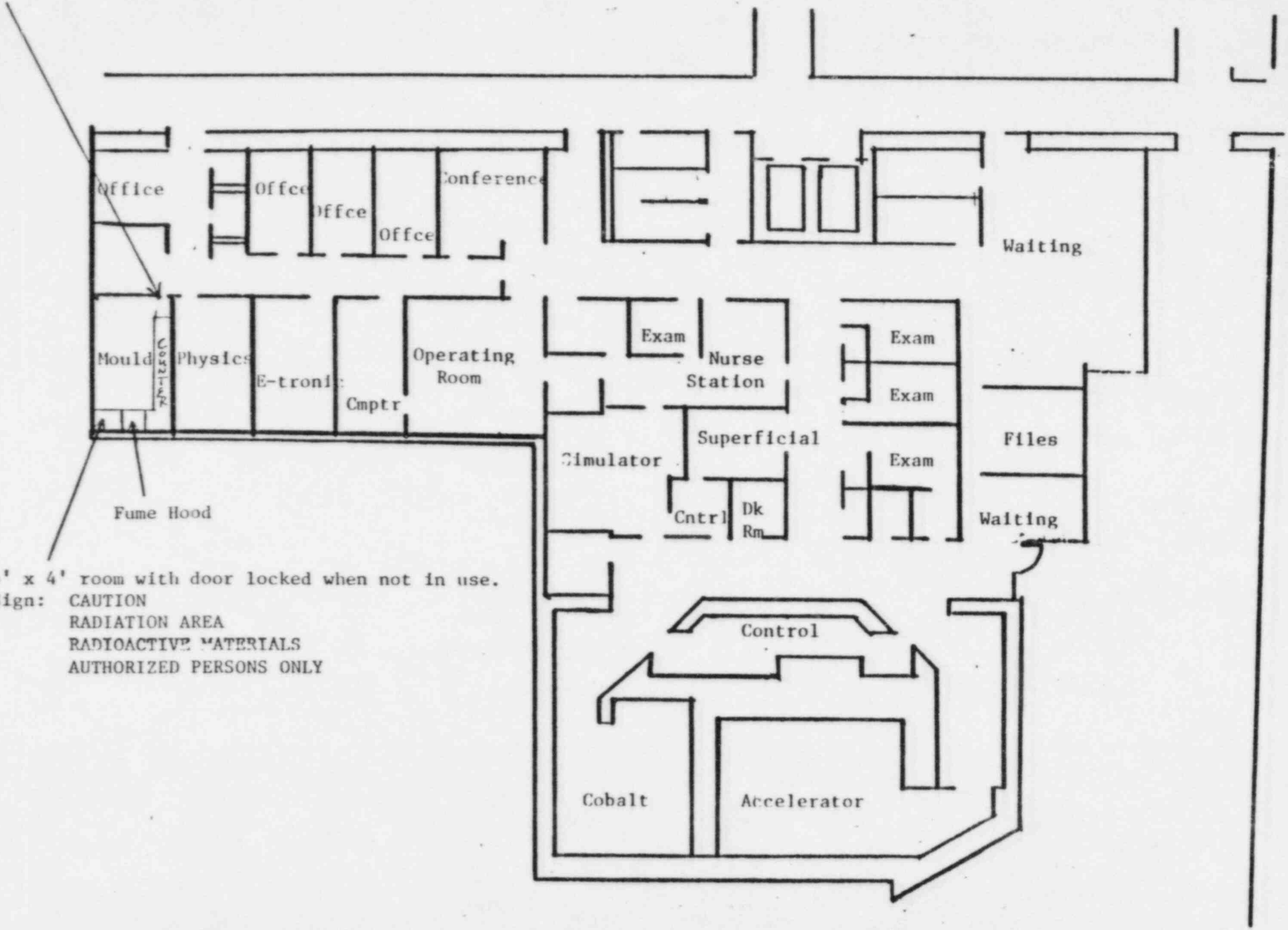


FIRST FLOOR

ST JOSEPHS HOSPITAL MARSHFIELD WI

berners schober & kilp — architects green bay wi

Room locked when department not occupied.
Sign on door: CAUTION RADIOACTIVE MATERIALS



4' x 4' room with door locked when not in use.
Sign: CAUTION
RADIATION AREA
RADIOACTIVE MATERIALS
AUTHORIZED PERSONS ONLY

ITEM 21 - Xe-133

Lung function ventilation studies will be done by inhalation and injection methods of Xe-133. An estimated 8 studies per week will be done with expected maximum dosage to be 15.0 mCi/study inhalation, 25 mCi/study I.V. Expected patient dose as per PDR 1978/79 is 3 mR whole body, 150 mR lung. Maximum possession will be 3 Ci with predicted usage of 2 Ci/2 weeks. This will be stored in the fume hood in the hot lab. Dose will be drawn in hood with exhaust fan on.

Study will be performed in the camera lab using a commercially available controlled gas delivery system. The system chosen will have the following: Activated charcoal filter trapping system with gas trap exhaust port monitor to alarm when exhaust exceeds 1×10^{-2} mCi/ml. Charcoal filters will be stored with radioactive wastes in the primary storage area and then removed to the waste disposal area.

The studies will be run with the backup ventilation system running, creating a negative pressure in the camera lab. Ventilation rate is 1100 CFM through vent A (see floor plan). Attached calculations show a maximum effluent concentration at the exhaust into the atmosphere to be 2.8×10^{-7} µCi/ml worst case. In addition, the vent system is equipped with a HEPA and activated charcoal filter with 95% efficiency. Nose clamps or full face mask inhalation system will be used to increase efficiency and reduce leakage.

In the event of unintentional release of radioactive gasses in either the imaging or drawing room, the room will be isolated and personnel evacuated (ventilation system will already be activated). A survey meter will be used to determine the release to the atmosphere through the vent system. Further survey will be done in the adjacent area to insure no residual contamination before returning the rooms to normal use. Wipe test of relevant areas in air flow path will be done. Decontamination procedures will be undertaken if activity is more than 100 cpm above background. Negative pressure will be maintained until room activity in main vent stream is less than 0.05 mR/hr.

Calculation of concentration of Xe-133 in µCi due to leakage of gas:

$$A = \frac{6 \text{ patients}}{\text{week}} \times \frac{15 \text{ mCi}}{\text{patient}} \times \frac{52 \text{ weeks}}{\text{year}} = 4.68 \times 10^{6} \text{ µCi/year}$$

(A = Annual activity assuming 100% leakage in µCi)

$$V = \frac{1100 \text{ ft}^3}{\text{minutes}} \times \frac{1.7 \times 10^{6} \text{ ml/hr}}{\text{ft}^3\text{/minute}} \times \frac{168 \text{ hr}}{\text{week}} \times \frac{52 \text{ weeks}}{\text{year}} = 1.64 \times 10^{13} \text{ ml/year}$$

(V = Volume of air for nonrecirculating negative pressure ventilation system in ml/year)

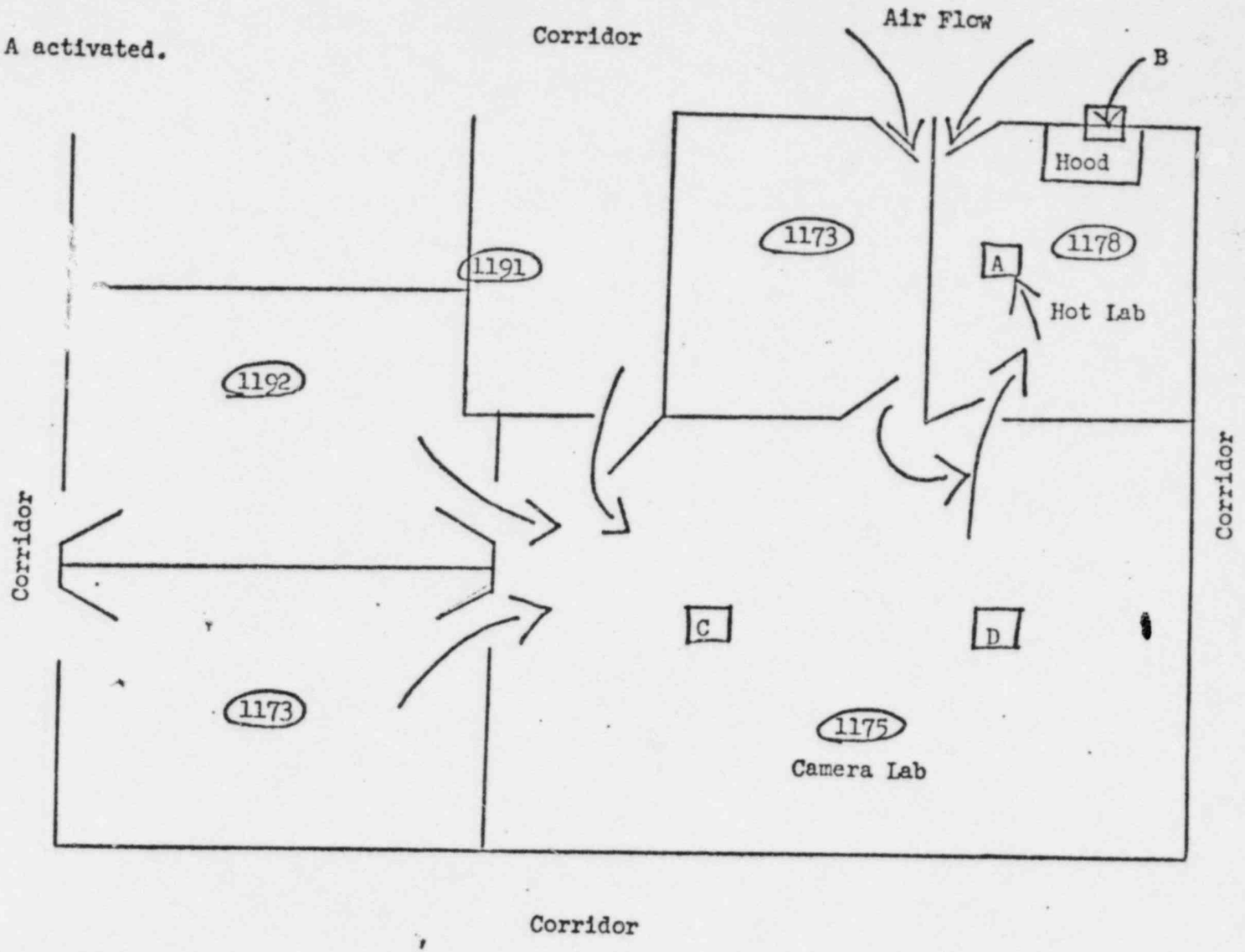
$$C = \frac{A}{V} = 2.8 \times 10^{-7} \text{ µCi/ml}$$

NOTES: Conservative estimates were made in both expected activity in gaseous form and percent leakage (100%). Further, the calculation is done without consideration of the filter system present, which reduces the activity released to the atmosphere by nearly a factor of 100 in an attempt to maintain a level of activity as low as possible.

Vents A, B - 1100 CFM

Vents C, D - 880 CFM

Air flow with Vent A activated.



ITEM 23 - Bioassay

Bioassay will be in the form of monthly thyroid counts for all personnel involved in I-131 therapy.

Urine samples will be counted and records of results kept by users involved in iodination (I-125) procedures using 10 mCi I-125 or greater per three month period of bound I-125 and procedures using 1.0 mCi or greater of volatile or dispersible I-125 per three month period. All iodinations will be done in a fume hood or more restrictive conditions.

Any other procedures involving volatile radioisotopes will be reviewed by the Radiation Safety Committee and need for bioassay will be determined on an individual basis using Reg Guide 8.20 Rev. 1 as a guide.

ITEM 24 - Personnel Monitoring Devices

Personnel monitoring will be by whole body film badge and for Nuclear Medicine Technologists, TLD ring badges.

All dosimeters are changed monthly and reports posted in the department where they are used. A copy of each report is also kept in the Radiation Safety Office and reports are reviewed monthly. Anyone receiving whole body exposure exceeding 400 mR/month or ring exposure exceeding 6 R/month will be notified as will his/her supervisor. The Radiation Safety Officer will contact the individual and attempt to determine the cause of the over exposure. When possible, action will be taken to prevent another occurrence.

Film and TLD monitors will be supplied by a commercial personnel dosimetry company. Our current service is provided by R.S. Landauer Co., Glenwood, IL.

APPENDIX A

The hospital incinerator is an Econotherm, double burn down incinerator with the following characteristics:

Double burndown in two chambers
Burn temperature: Chamber 1 - 1700°F
Chamber 2 - 3400°F
Total CFM at mouth of stack - 36100 CFM
Stack height - 150 ft
Total running time - 16 hr/day
5 days/week

The mouth of the stack is 76 ft above the roof of the building. There are no air inlets within this 76 ft.

Anticipated routine disposal would be weekly with an average activity disposed per week as follows:

C-14	1000 µCi/week
I-125	1 µCi/week
H-3	25 µCi/week

Based on a conservative 40 hour week of incinerator use (1/2 that anticipated), the maximum concentration at the mouth of the stack will be:

C-14	4×10^{-10} µCi/ml
I-125	4×10^{-13} µCi/ml
H-3	4×10^{-11} µCi/ml

Total effluent at the stack as a fraction of 10% the MPC for routine burns is:

$$\frac{4 \times 10^{-10}}{1 \times 10^{-8}} + \frac{4 \times 10^{-13}}{8 \times 10^{-12}} + \frac{1 \times 10^{-11}}{2 \times 10^{-8}} = .09$$

The maximum number of burns per year will be 65.

Non-routine burns would be of isotopes other than I-125, H-3 and C-14 or quantities of I-125 greater than those listed as routine disposals. This I-125 would be generated during iodination procedures which frequently utilize 2-5 mCi I-125 per iodination. Wastes resulting from each iodination will be assayed and contained. The specific activity will also be determine if appropriate. The material will then be stored until the total activity is less than or equal to 500 µCi. At most 500 µCi I-125 will be incinerated at any given time. At these times the maximum total stock emission will be 0.65 x MPC (0.63 x MPC for I-125, 0.02 x MPC other) based on a 40 hr/week air flow. In any case the effluent concentration resulting from non-routine burns should not result in greater than 70% of MPD.

The operating procedure will be as follows:

Maintenance staff will pick up the waste at the user's site. Wastes will be double bagged or otherwise contained to prevent spillage during transport to the incinerator. The isotope users will be responsible for maintaining disposal logs for their own labs, however, standard incinerator policy provides for a log of each burn. Thus an element of redundancy is built into the procedure. Workers will transport wastes directly to the incinerator where they will be mixed with other trash and burned immediately.

All ash is removed from the incinerator by a vacuum system and stored in a silo. When the silo is full, the ash (about 6 tons) is again transferred by a closed system to a truck and hauled to the landfill. Assuming that the silo is emptied once a month, the specific concentration of the ash <u>if all</u> radioactivity remained would be about 7×10^{-4} μCi/g.

In the case of routine burns an initial burn will be made with a representative amount of waste material. The material will not be mixed with other trash for this burn. After the incineration is complete, the ash will be checked with a Victoreen 491 survey instrument equipped with a model 489-35 thin window beta probe. If the activity of the ash is determined to be below 2X background, we will assume that routine burns, which will mix the radioactive waste with general trash, may be treated as any other ash and no further surveys will be made.

In the case of non-routine burns, a similar survey of the ash will be made at the time of each burn. Again, ash found to be less than twice background will be handled as nonradioactive. In either case any material surveyed and found to contain an activity above 2X background will be treated as radioactive material and handled as specified elsewhere in the license.

Prior to participating in the incineration program all maintenance personnel involved in the handling of radioactive wastes will be instructed in basic radiation safety as well as relevant NRC regulations. Workers will be instructed to wear gloves, to mix the radioactive wastes with other trash, and to dispose of their gloves with each use. They will receive an annual inservice and be provided a set of written safety guidelines (see attached).

The RSO will supervise any non-routine burns.

Guidelines for Safe Handling of Radioactive Trash

The radioactive materials to be incinerated are combined with paper, glassware, absorbents, plastics and petroleum solvents. They should be bagged or boxed so that they will not spill or drip during transport to the incinerator. With each transport, the following guidelines should be observed:

1. Wear disposable rubber gloves
2. Inspect each package for breaks or leaks. If the package is not intact, do not collect it. Inform the person at the pick-up site of the defect
3. Transport directly to the incinerator
4. Mix wastes with other trash as you place in the incinerator
5. Dispose of your gloves with the trash
6. Do not eat or smoke while handling this material. Since the solvents are extremely combustible, this is very important
7. Should a package break or spill during transport, notify your supervisor and/or the Radiation Safety Office (9022) immediately
8. Should you become contaminated, wash with soap and water and notify your supervisor and the Radiation Safety Office (9022).

U.S. NUCLEAR REGULATORY COMMISSION

Revision 1
September 1979

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 8.20

APPLICATIONS OF BIOASSAY FOR I-125 AND I-131

A. INTRODUCTION

Section 20.108, "Orders Requiring Furnishing of Bioassay Services," of 10 CFR Part 20, "Standards for Protection Against Radiation," indicates that the Nuclear Regulatory Commission (NRC) may incorporate into a license provisions requiring a specific program of bioassay measurements as necessary or desirable to aid in determining the extent of an individual's exposure to concentrations of radioactive material. In certain cases, the requirement of bioassay may also be included in the license by reference to procedures specifying in vivo measurements, measurements of radioactive material in excreta, or both.

This guide provides criteria acceptable to the NRC staff for the development and implementation of a bioassay program for any licensee handling or processing I-125 or I-131. It further provides guidance to such licensees regarding the selection of workers who should participate in a program to detect and measure possible internal radiation exposure. The guide is programmatic in nature and does not deal with measurement techniques and procedures.

B. DISCUSSION

The topics treated in this guide include determinations of (1) whether bioassay should be performed, (2) frequencies of bioassay, (3) who should participate, (4) the actions to take based on bioassay results, and (5) the particular results that should initiate such actions.

For the user's convenience, the following terms are presented with their definitions as used in this guide:

Bioassay–The determination of the kind, quantity or concentration, and location of radioactive material in the human body by direct (in vivo) measurement or by analysis in vitro of materials excreted or removed from the body.

Intake–The total quantity of radioactive material entering the body.

In vivo measurements–Measurement of gamma- or x-radiation emitted from radioactive material located within the body for the purpose of detecting or estimating the quantity of radioactive material present.

In vitro measurements–Measurement of radioactivity in samples of material excreted from the human body.

C. REGULATORY POSITION

1. Conditions Under Which Bioassay Is Necessary

a. Routine[1] bioassay is necessary when an individual handles in open form unsealed[2] quantities of radioactive iodine that exceed those shown in Table 1 of this guide. The quantities shown in Table 1 apply to both the quantity handled at any one time or integrated as the total amount of activity introduced into a process by an employee over any 3-month period. *

b. When quantities handled in unsealed form are greater than 10% of Table 1 values,

*Lines indicate substantive changes from previous issue.

[1] Routine means here that an individual is assigned on a scheduled and repeatable basis to submit specimens for bioassay or to report for in vivo measurements. Either radiochemical bioassay of urine or in vivo counting is acceptable to the NRC staff for estimating internal radioactivity burdens or intakes. In some cases, however, a licensee may wish to corroborate estimates from urinalysis data with in vivo determinations. Since there are adequate references in the literature to help devise bioassay measurements, this guide does not include recommended analytical procedures. Each installation should adopt procedures or obtain services best suited to its own needs.

[2] See discussion in the footnote to Table 1 of this guide.

routine bioassay may still be necessary under certain circumstances. A written justification for not performing such measurements should be prepared and recorded for subsequent review during NRC inspections whenever bioassay is not performed and the quantities handled exceed 10% of the levels in Table 1.

c. Except as stated in regulatory position 1.e, bioassay is not required when process quantities handled by a worker are less than 10% of those in Table 1.

d. In nuclear reactor installations, employees should be bioassayed by an in vivo count within 30 days after the end of exposure in work locations where concentrations exceeded, or might have exceeded, 9×10^{-9} µCi/ml averaged over any 40-hour period. Table 1 and regulatory position 4 regarding frequency of bioassays are not applicable to reactor licensees.

e. Special bioassay measurements should be performed to verify the effectiveness of respiratory protection devices and protective clothing. If an individual wearing a respiratory protective device or protective clothing is subjected to a concentration of I-125 or I-131 (in any form) in air such that his or her intake with no protection would have exceeded the limits specified in paragraph 20.103(a)(1) of 10 CFR Part 20,[3] bioassays should be performed to determine the resulting actual I-125 or I-131 intake. These special bioassay procedures should also be conducted for personnel wearing respirators if for any reason the I-125 or I-131 concentration in air and the duration of exposure are unknown or cannot be conservatively estimated by calculation.

2. Participation

All workers handling radioactive iodine or sufficiently close to the process so that intake is possible (e.g., within a few meters and in the same room as the worker handling the material) should participate in bioassay programs described in regulatory position 1.

[3]Multiplying the concentrations given in Appendix B to 10 CFR Part 20, Table I, Column 1, 5×10^{-9} µCi/ml for I-125 (soluble) and 9×10^{-9} µCi/ml for I-131 (soluble), by 6.3×10^{8} ml gives the corresponding quarterly intake of the respective iodines by inhalation. These quarterly intakes would be about 3.2 µCi for I-125 and 5.7 µCi for I-131, which would give a thyroid dose commitment of about 7.5 rems to a 20-gram thyroid integrated over all future time using effective half-lives of 41.8 days for I-125 and 7.6 days for I-131 and using a quality factor (QF) of 1.7 to calculate effective disintegration energy in the case of I-125. (This QF of 1.7 is used for conservatism, even though the International Commission on Radiological Protection (1969) and the National Council on Radiation Protection (1971) have published a QF of 1, because some calculations in more recent scientific literature have suggested the use of QF values higher than 1 for electron or beta energies of 0.03 MeV or less.)

3. Types of Bioassays That Should Be Performed

a. Baseline (preemployment or preoperational). Prior to beginning work with radioactive iodine in sufficient quantity that bioassay is specified in regulatory position 1.

b. Routine. At the frequency specified in regulatory position 4.

c. Emergency. As soon as possible after any incident that might cause thyroid uptakes to exceed burdens given in regulatory position 5.a(2), so that actions recommended in regulatory position 5.a(2)(b) can be most effective.

d. Postoperational and with Separation Physical. A bioassay should be performed within 2 weeks of the last possible exposure to I-125 or I-131 when operations are being discontinued or when the worker is terminating activities with potential exposure to these radionuclides.

e. Diagnostic. Followup bioassay should be performed within 2 weeks of any measurements exceeding levels given as action points in regulatory position 5 in order to confirm the initial results and, in the case of a single intake, to allow an estimate of the effective half-life of radioiodine in the thyroid.

4. Frequency

a. Initial Routine. Except in situations where thyroid burdens may exceed quantities specified in regulatory position 5.a(2), a bioassay sample or measurement should be obtained within 72 hours following entry of an individual into an area where bioassay is performed in accordance with regulatory positions 1 and 2 (but waiting at least 6 hours for distribution of a major part of the iodine to the thyroid[4]) and every 2 weeks or more frequently thereafter as long as the conditions described in regulatory positions 1 and 2 exist. When work with radioactive iodine is on an infrequent basis (less frequently than every 2 weeks), bioassay should be performed within 10 days of the end of the work period during which radioactive iodine was handled (but not sooner than 6 hours unless emergency actions to obtain an early prognosis and thyroid blocking treatment are appropriate[4]).

b. After 3 Months. When a periodic measurement frequency has been selected in accordance with regulatory position 4.a, it may be changed to quarterly if, after 3 months, all the following conditions are met:

(1) The average thyroid burden for each individual working in a given area was

[4]NCRP Report No. 55, "Protection of the Thyroid Gland in the Event of Releases of Radioiodine," National Council on Radiation Protection and Measurements, Washington, D.C., August 1, 1977, p. 21.

less than 0.12 μCi of I-125, less than 0.04 μCi of I-131, and less than the corresponding proportionate amount[5] of a mixture of these nuclides during the initial 3-month period;

(2) The quarterly average radioiodine concentration (μCi/ml) in air breathed by any worker (as obtained when measurements of radioiodine concentrations in air are required) does not exceed 25% of the concentration values for "soluble"(s) iodine given in Appendix B to 10 CFR Part 20, Table I, Column 1, (5×10^{-9} μCi/ml for I-125 and 9×10^{-9} μCi/ml for I-131), i.e., 25% of these concentrations multiplied by the total air breathed by an employee at work during one calendar quarter, 6.3×10^{8} ml, does not exceed 0.8 μCi of I-125 or 1.4 μCi of I-131. The appropriate proportionate amount[5] of a mixture of these nuclides should be used as a guide when both I-125 and I-131 are present; and

(3) The working conditions during the 3-month period with respect to the potential for exposure are representative of working conditions during the period in which the quarterly bioassay frequency will be employed, and there is no reasonable expectation that the criteria in regulatory positions 4.b(1) and 4.b(2) above will be exceeded.

c. After Use of Respiratory Protection Devices. Between 6 and 72 hours after respiratory protective devices, suits, hoods, or gloves are used to limit exposure as stated in regulatory position 1.e.

For individuals placed on a quarterly schedule, sampling should be randomly distributed over the quarter but should be done within one week after a procedure involving the handling of I-125 or I-131. This will provide a more representative assessment of exposure conditions.

5. Action Points and Corresponding Actions

a. Biweekly or More Frequent Measurements

(1) Whenever the thyroid burden at the time of measurement exceeds 0.12 μCi of I-125 or 0.04 μCi of I-131, the following actions should be taken:

(a) An investigation of the operations involved, including air and other in-plant surveys, should be carried out to determine the causes of exposure and to evaluate the potential for further exposures.

(b) If the investigation indicates that further work in the area might result in exposure of a worker to concentrations that would cause the limiting intakes established in § 20.103 of 10 CFR Part 20 to be exceeded, the licensee should restrict the worker from further exposure until the source of exposure is discovered and corrected.

(c) Corrective actions that will eliminate or lower the potential for further exposures should be implemented.

(d) A repeat bioassay should be taken within 2 weeks of the previous measurement and should be evaluated within 24 hours after measurement in order to confirm the presence of internal radioiodine and to obtain an estimate of its effective half-life for use in estimating dose commitment.

(e) Reports or notification must be provided as required by §§ 20.405, 20.408, and 20.409 of 10 CFR Part 20 or as required by conditions of the license pursuant to § 20.108 of 10 CFR Part 20.

(2) If the thyroid burden at any time exceeds 0.5 μCi of I-125 or 0.14 μCi of I-131, the following actions should be taken:

(a) Carry out all steps described in regulatory position 5.a(1).

(b) As soon as possible, refer the case to appropriate medical consultation for recommendations regarding therapeutic procedures that may be carried out to accelerate removal of radioactive iodine from the body. This should be done within 2-3 hours after exposure when the time of exposure is known so that any prescribed thyroid blocking agent would be effective.[4]

(c) Carry out repeated measurements at approximately 1-week intervals at least until the thyroid burden is less than 0.12 μCi of I-125 or 0.04 μCi of I-131. If there is a possibility of longer-term compartments containing I-125 or I-131 that require evaluation, continue measurements as long as necessary to ensure that appreciable exposures to these other compartments do not go undetected.

b. Quarterly Measurements. Carry out actions at levels as indicated under regulatory position 5.a(1) and (2). If measurements and surveys indicate an appreciable likelihood that a worker will receive further exposures exceeding the criteria of regulatory positions 4.b(1) and 4.b(2), reinstitute biweekly or more frequent bioassays.

D. IMPLEMENTATION

The purpose of this section is to provide information to applicants and licensees regarding

[5]See Appendix B to this guide for a description and example of using this condition for mixtures.

the NRC staff's plans for using this regulatory guide.

Except in those cases in which the applicant or licensee proposes an acceptable alternative method, the staff will use the methods described herein after December 15, 1979, in evaluating the radiation protection programs of licensees who have bioassay requirements incorporated in their licenses in accordance with § 20.108 of 10 CFR Part 20.

If an applicant or licensee wishes to use the method described in this regulatory guide on or before December 15, 1979, the pertinent portions of the application or the licensee's performance will be evaluated on the basis of this guide.

Table 1

ACTIVITY LEVELS ABOVE WHICH BIOASSAY FOR I-125 OR I-131 IS NECESSARY

Types of Operation	Activity Handled in Unsealed Form Making Bioassay Necessary*	
	Volatile or Dispersible*	Bound to Nonvolatile Agent*
Processes in open room or bench, with possible escape of iodine from process vessels	1 mCi	10 mCi
Processes with possible escape of iodine carried out within a fume hood of adequate design, face velocity, and performance reliability	10 mCi	100 mCi
Processes carried out within gloveboxes, ordinarily closed, but with possible release of iodine from process and occasional exposure to contaminated box and box leakage	100 mCi	1000 mCi

*Quantities may be considered the cumulative amount in process handled by a worker during a 3-month period; e.g., the total quantity introduced into a chemical or physical process over a 3-month period, or on one or more occasions in that period, by opening stock reagent containers from which radioactive iodine may escape. Quantities in the right-hand column may be used when it can be shown that activity in process is always chemically bound and processed in such a manner that I-125 or I-131 will remain in nonvolatile form and diluted to concentrations less than 0.1 mCi/mg of nonvolatile agent. Capsules (such as gelatin capsules given to patients for diagnostic tests) may be considered to contain the radioiodine in nonfree form, and bioassay would not be necessary unless a capsule were inadvertently opened (e.g., dropped and crushed). However, certain compounds where radioiodine is normally bound are known to release radioiodine when the material is in process, and the left-hand column may then be applicable. In those laboratories working only with I-125 in radioimmunassay (RIA) kits, the quantities of I-125 are very small and in less volatile forms; thus, bioassay requirements may be judged from the right-hand column. In field operations, where reagent containers are opened outdoors for simple operations such as pouring liquid solutions, the above table does not apply; bioassay should be performed whenever an individual employee handles in open form (e.g., an open bottle or container) more than 50 mCi at any one time.

Operations involving the routine use of I-125 or I-131 in an open room or bench should be discouraged. Whenever practicable, sealed bottles or containers holding more than 0.1 mCi of I-125 or I-131 should be opened at least initially within hoods having adequate face velocities of 0.5 m/sec or more.

APPENDIX A

SUGGESTED REFERENCES TO ASSIST IN ESTABLISHING A BIOASSAY PROGRAM

In response to public comments, this list of publications is provided to assist the licensee in establishing measurements and administrative procedures for a bioassay program appropriate to his operations. This list is not intended to be exhaustive and does not replace the need for professional assistance in establishing analytical procedures or services.

1. American National Standard, ANSI N44.3-1973, "Thyroid Radioiodine Uptake Measurements Using a Neck Phantom," American National Standards Institute, Inc., 1430 Broadway, New York, N.Y. 10018, approved August 24, 1973.

2. R. C. Brown, "^{125}I Ingestions in Research Personnel," Operational Health Physics, pp. 276-278, 1976, proceedings of the Ninth Midyear Topical Symposium of the Health Physics Society, Denver, Colorado, February 1976 (P. L. Carson, W. R. Hendee, and D. C. Hunt, Eds., Central Rocky Mountain Chapter, Health Physics Society, P.O. Box 3229, Boulder, Colorado 80303, $15).

3. E. J. Browning, K. Banerjee, and W. E. Reisinger, Jr., "Airborne Concentration of I-131 in a Nuclear Medicine Laboratory," J. Nucl. Med., vol. 19, pp. 1078-1081, 1978.

4. J. G. Dare and A. H. Deutchman, "The Decay Scheme of Iodine-125 and Its Relationship to Iodine Bioassay," op. cit., Ref. 2, pp. 250-254.

5. B. C. Fasiska, "Radiation Safety Procedures and Contamination Control Practices Involved in High Level I-131 Thyroid Therapy Cases," op. cit., Ref. 2, pp. 287-291.

6. A. Gavron and Y. Feige, "Dose Distribution and Maximum Permissible Burden of ^{125}I in the Thyroid Gland," Health Physics, vol. 23, pp. 491-499, 1972.

7. B. Y. Howard, "Safe Handling of Radioiodinated Solutions," op. cit., Ref. 2, pp. 247-249.

8. ICRP Publication 10, "Report of Committee IV on Evaluation of Radiation Doses to Body Tissues from Internal Contamination Due to Occupational Exposure," Recommendations of the International Commission on Radiological Protection, Pergamon Press, Oxford, p. 17, 1968.

9. ICRP Publication 10A, "The Assessment of Internal Contamination Resulting from Recurrent or Prolonged Uptakes," Recommendations of the International Commission on Radiological Protection, Pergamon Press, Oxford, 1969.

10. A. L. Orvis, "What Is a 'Reportable' Thyroid Burden?" op. cit., Ref. 2., pp. 268-271.

11. P. Plato, A. P. Jacobson, and S. Homan, "In Vivo Thyroid Monitoring for Iodine-131 in the Environment," Int. J. Applied Radiat. and Isotopes, vol. 27, pp. 539-545, 1976.

12. Radiological Protection Bulletin 25, "Safe Working with Iodine-125," National Radiological Protection Board, Harwell, Didcot, Oxon, England, pp. 19-20, 1978.

13. R. P. Rossi, J. Ovadia, K. Renk, A. S. Johnston, and S. Pinsky, "Radiation Safety Considerations in the Management of Patients Receiving Therapeutic Doses of ^{131}I," op. cit., Ref. 2, pp. 279-286.

14. C. T. Schmidt, "Thyroid Dosimetry of ^{125}I and an Instrumental Bioassay Procedure," Program and Abstracts: Twenty-Third Annual Conf. on Bioassay, Environmental, and Analytical Chemistry, IDO-12083, Sept. 15, 16, 1977.

15. A. Taylor, J. W. Verba, N. P. Alazraki, and W. C. McCutchen, "Monitoring of I-125 Contamination Using a Portable Scintillation Camera," J. Nucl. Med., vol. 19, pp. 431-432, 1978.

16. Technical Reports Series No. 148, "Control of Iodine in the Nuclear Industry," International Atomic Energy Agency, Vienna, 1973.

APPENDIX B

CALCULATION OF ACTION LEVELS FOR MIXTURES OF I-125 AND I-131

B.1 Controlling Instantaneous Thyroid Burdens

Regulatory position 4.b(1) is based on controlling the instantaneous amount in the thyroid and is taken as 25% of the maximum permissible organ burden (MPOB) of I-125 or I-131 that would give a dose rate of 0.6 rem/week if continuously present in the thyroid. If a mixture of both nuclides is present in the thyroid and X is the fractional activity that is I-125, a 3-month interval may be resumed when the total activity of I-125 and I-131 is below

$$0.12X + 0.04(1 - X)$$

Example

If the measurements of I-125 and I-131 in a worker's thyroid are 0.10 μCi of I-125 and 0.05 μCi of I-131, the fractional I-125 activity is

$$X = 0.10/(0.10 + 0.05)$$
$$= 0.667$$

Then

$$0.12X + 0.04(1 - X) = 0.12(0.667) + 0.04(0.33)$$
$$= 0.0932$$

$$\text{Total} = 0.10 + 0.05 = 0.15\ \mu\text{Ci}$$

Thus, in this case, the worker involved should remain on the biweekly (or more frequent) schedule and should not be put on the quarterly frequency.

B.2 Controlling Total Intakes

Regulatory position 4.b(2) is based on controlling total intakes[6] during a quarterly period when air concentration data are available to assess the potential exposure of the worker either to random single intakes or to variable or constant continuous exposures. The quantities of 0.8 μCi of I-125 and 1.4 μCi of I-131 were obtained by calculating 25% of the total quarterly intakes of 3.2 μCi of I-125 or 5.7 μCi of I-131 (see footnote 3) that would be inhaled when breathing a total of 6.3×10^8 ml per quarter working at the standard man breathing rate for 40 hours per week for 13 weeks.

Example

If the average quarterly concentrations estimated from air sampled in a worker's breathing zone are 3×10^{-9} μCi/ml for I-125 and 5×10^{-9} μCi/ml for I-131, the total quarterly intakes are:

$$3 \times 10^{-9} \times 6.3 \times 10^8 = 1.89\ \mu\text{Ci I-125}$$

$$5 \times 10^{-9} \times 6.3 \times 10^8 = 3.15\ \mu\text{Ci I-131}$$

$$\text{Total} = 5.04\ \mu\text{Ci}$$

Also, X, the proportion of I-125, is 1.89/5.04 = 0.375

Thus the control level for maintaining biweekly or more frequent bioassay checks is:

$$0.8X + 1.4(1 - X) = 0.8(0.375) + 1.4(1 - 0.375)$$
$$\text{Total} = 1.18\ \mu\text{Ci for this mixture.}$$

Since the intake of 5.04 μCi is greater than 1.18, this employee should stay on the more frequent bioassay schedule.

Note: The numbers of significant digits carried in the above calculations do not imply any given degree of accuracy of measurement. Enough digits are carried to allow following the arithmetic for purposes of the examples.

[6]The limiting total quarterly intakes are in different proportions for I-125 and I-131 than are the MPOBs. This difference is a result of the fact that permissible concentrations are inversely proportional to effective half-lives whereas an MPOB is calculated assuming a constant burden in the organ of concern that is maintained by continuous intake of activity balanced by an equal rate of elimination from the organ.