UNITED STATES
ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
REGION V
2111 BANCROFT WAY
BERKELEY, CALIFORNIA 94704

TELEPHONE: 841-5121
EXT. 651

May 25, 1972

H. E. Book, Chief, Materials Radiological Safety Branch
Region V, Directorate of Regulatory Operations

INSPECTOR'S EVALUATION
VETERANS ADMINISTRATION CENTER
WADSWORTH HOSPITAL
LOS ANGELES, CALIFORNIA
LICENSE NO. 04-00181-04

The unannounced reinspection of the subject licensed program on February 3, 1972, disclosed no items of noncompliance or safety significance. A Form AEC-591 reflecting these findings was given to the licensee at the conclusion of the inspection.

The licensee informed the inspector that as a result of structural inadequacies discovered in a number of the buildings in the VA complex the patient load at the hospital was being substantially reduced. Following this reduction a number of buildings including a large portion of the Wadsworth Hospital was to be razed and a new hospital meeting current seismic standards was to be constructed. Approximately 65% of the laboratories at Wadsworth Hospital will be relocated to Building 213. The remaining 35% remain in a temporary building near Wadsworth.

The licensee informed the inspector that as of February 7, 1972, the licensee planned to terminate the use of technetium generators and commence the use of prepacked, precalibrated technetium-99m.

It is the inspector's opinion that the licensee's activities have not presented a threat to the health and safety of the licensee's employees or the general public.

H. S. North
Radiation Specialist

Notes
North:blc
5-25-72

H. S. North Inspector 6/5/72

A. E. Book Reviewer 6/5/72

Veterans Administration Center
Wadsworth Hospital
Los Angeles, California

License No. 4-181-4

Introduction, Inspection History and Exit Interview

1. An unannounced reinspection of the subject licensed program was conducted on February 3, 1972, by H. S. North, Radiation Specialist, Region V. The inspector was unaccompanied. The inspection disclosed no items of noncompliance or safety significance. The subject licensed program was last inspected on July 22, 1970, at which time no items of noncompliance were found and a Form AEC-591 was issued.

2. At the conclusion of this inspection the results of the inspection were discussed with Mr. L. Wettereau, Physicist and RSO. W. H. Blahd, M.D., licensed identified chairman of the radioisotope committee was on vacation and unavailable at the time of the inspection. The licensee was informed that no items of noncompliance had been identified and a Form AEC-591 reflecting these findings was issued.

Administration

Persons Contacted

3. During the course of the inspection the inspector interviewed Mr. L. Wettereau, Physicist and RSO who is the administrative assistant to Dr. Blahd. Wettereau supervises the receipt, possession and use of licensed material and has shut down authority in cases of radiation safety. Wettereau is an employee of the hospital and not of the research functions, carried out at the facility. At the time of the inspection Dr. Blahd was not available.

Organization

4. Mr. Alton L. Puitt is the hospital director. Reporting to the director is the Administrative Service and Dr. Gordon, Chief of Staff. Report to Dr. Gordon are 7 or 8 various medical services plus the Research Service who use radioactive material in medical and biological research and Dr. Blahd, Chief of the Nuclear Medicine Service. Mr. Wettereau as RSO reports to Dr. Blahd. Reporting to Dr. Blahd under the Nuclear Medicine Service are 25 to 35 persons who have 80 to 90% of the direct contact with the licensed material experienced at this facility. The remaining users are part of the research service and Mr. Wettereau functions as the RSO for this group as well. The VA hospital is continuing a program of resident training in the field of nuclear medicine and the preparation of paramedical personnel and radioisotope technicians for state registry. This program is headed by Dr. Gambino, Ph.D., whom the inspector met during the course of the inspection. The licensee also has a radiopharmacy which is under the direction of Dr. Tubis, Ph.D., a research chemist who was introduced to the inspector during the inspection.

5. Mr. Wettereau stated that as a result of the recent earthquake in Southern California a structural evaluation was made of the building at the licensee's facilities. As a result a major reduction in patient load was undertaken because certain buildings require structual strengthening and others were to be razed and rebuilt. The research program was to be centralized in building 114. One wing (E) of the Wadsworth hospital was to remain (note: Cobalt-60 teletherapy device is housed in the E wing) and the remainder of Wadsworth is to be razed. Wettereau said that approximately 65% of the labs

in Wadsworth will have to be relocated to building 213 and 35% will remain in a temporary building at Wadsworth.

Isotopes Committee

6. The licensee has two Isotopes Committees, the first is generally referred to as the Human Use Committee and is made up of members who are identified by title only. Since the last inspection this committee has met on one occasion. The second Isotope Committee identified as the Research Committee deals with Non-Human use applications of materials and meets every two weeks. The members of the research committee are, in part, the same as the members of the Human Use Committee and are identified in the following list by (*), Chairman, (*) Chief nuclear medicine service, Dr. Blahd. Committee members; (*) Chief of Staff, Dr. Earl Gordon, who is also Chief of Surgery; (*) Chief of Laboratory Services, Dr. Ben Fishkin; Chief Radiation Therapy Radiology Section, Dr. Joe Thornhill; (*) Chief Medical Service; (*) Chief of Staff for Research and Education, Dr. Lucian B. Guze; Physicist Nuclear Medicine Service, Mr. Wettereau; Consultant to the committee (Representative of the Dean's Committee UCLA School of Medicine), Dr. Joe Ross; Resident, Nuclear Medicine Service, Dr. Julian Karelitz, (the resident member of the committee changes as the residents rotate). Items for review by either committee are prepared and submitted to the individual committee members on a form, a copy of which is attached to these notes (Radioisotope Research Protocol or Clinical Application). Wettereau stated that the infrequent meetings of the Human Use Committee resulted from the infrequent changes or additions to the human use program. The research program, not involving human use, receives frequent proposals and meets regularly and frequently to consider these applications. The notes of September 14, 1971 meeting of the Human Use Committee were examined. The

The meeting included a discussion of the committee's function and of premeeting information distributed to members of the committee. Items included involved a summary of the Radiopharmacutical Development Program, the Guide for Application for Medical Licenses parts B and F and the VA Department of Medicine and Surgery Manual parts XX M-2, Part 20 Nuclear Medicine Service, organization administration and function. The principal functioning of the isotope committee is in the administrative area with the exception of the few cases which require specific consideration from a human use standpoint.

Internal Review Program

7. Mr. Wettereau stated that when the new director, Mr. Pruitt arrived, he bagan a Center wide program of critical self review on a cyclic basis beginning in February 1971. Each group within the Center was required to develop a quarterly breakdown of areas to receive the critical self review for submission to the hospital director. The list prepared by Wettereau for use in association with the radioisotope program was as follows.

Self Review of Operations

Diagnostic and Theraputic Use

July - Inhouse Radiopharmacy, production procedures and quality control.

August - Radioisotope dispensing record.

September - Medical Uses

Program Administration

October - Supplies, equipment and sealed source survey

November - AEC and other regulations

December - Inventory of radioisotopes

Program Administration

January - Minor improvements and space utilization

February - staffing

March - New and improved tests

Radiation Safety

April - AEC record maintenance, sealed source survey

May - Review film exposures

June - Inventory of radioisotopes

Wettereau stated that the hospital director expects these critical self reviews to be just that and he expects to see improvement of the program as a result of this review procedure.

Radiation Safety

8. Mr. Wettereau stated that as the Radiation Safety Officer he has authority to control procurement, receipt, possession, use, and disposal of licensed materials, maintains and reviews dosimetry records, perform surveys and provides health physics training both to users and to the resident training program.

9. The licensee's procedures are identified in condition 21 of amendment 59 dated September 1, 1971. This amendment reflects the latest Radiation Safety Program Manual revision of July, 1971. Wettereau stated that any employee having an occupational contact with licensed materials, students, residents and rotating students are required to complete a form AEC-4 and receive a copy of the licensee's manual. Wettereau stated that the manual has not been changed since the July 1971 revision the licensee has found the manual to be sufficient and does not have additional written guidance for licensed material users.

Receipt and Transfer

10. The licensee has exported no materials. Wettereau described the procurement procedures by stating that finances are handled by Research Supply Service. Requests for materials are submitted through Mr. Kaufman, of the Supply Service on forms which must be signed by Wettereau. If Wettereau is not available he has designated an alternate. After the order is submitted the purchase request is sent to the warehouse. When the material is received at the warehouse it is sent immediately to Mr. Kaufman in the supply room who delivers the package to Wettereau who logs the receipt and surveys the package and places it in storage until it is picked up by the authorized user. The licensee's records include package labels, doctor who ordered the material, the isotope, quantity and date of measurement and in the case of therapy doses the individual to whom the material was administered and the quantity.

Inventory

11. The most recent inventory was conducted on December 7, 1971. At that time the licensee possessed the following quantities of materials. (Note: All quantities are listed in units of millicuries). H-3, 234.489; C-14, 12.950; Ca-45, 1.200; Cr-51, 2.500; Co-57, 0.010; Ni-63, 9.900; Sr-85, 0.800; Mo-99-Tc-99m, 400.00; Sn-113-In-113m, 3,000; I-125, 12.000; I-131, 92.000; Xe-133 25.000; Cs-137, 0.020; Au-198, 0.900; Ce-141, 1.000; Se-75, 0.663; Ga-67, 0.050; Chromatrography tritium sources, 4 at 100 and 1 at 250. The licensee's possession totalled 1.446 curies. The license authorized a maximum possession limit of 9 curies of all materials.

Use of Licensed Materials

12. The licensee uses materials both in research and in diagnostic and theraputic medical programs. A copy of the licensee's nuclear medicine service report for fiscal year 1971 is attached. This report covers a total of 5,593 procedures during that period. Wettereau said that the licensee has been using Nuclear England Nuclear generators for technetium-99m production but that they are going to Iso-Med premilked precalibrated technetium-99m to reduce exposure to personnel and reduce operating and disposal problems. The licensee is using technetium sulfide colloid macroaggregate for lung scans, technetium DTPA for kidney scans and Squibb technetium sulfur colloid for liver scans. Wettereau stated that sterility and pyroglivity tests are performed on all pharacuticals. All patient doses are checked with a Nuclear Chicago Mediac dose calibrator and a daily calibration log of the instrument is maintained. The licensee maintains a generator milking log which records the receipt and quantity received. Wettereau pointed out that on occasion generators shipped for use on Monday have been received the prceeding Friday when a 100 mCi generator is approximately 400 mCi. The records identify each elution by number, the date, specific and total activities of Tc-99m removed.

Facilities and Equipment

13. There had been no substantial changes in the facilities and equipment with the exception of the relocation of certain activities caused by the planned reconstruction and building strengthening program. During the inspection the inspector visited the licensee's hot laboratory and office area and laboratory in building 114 which were found to be as previously described in inspection notes. The licensee has added a germ free hood and a Nuclear

Chicago Mediac dose calibrator to the equipment already available. Wettereau stated that supplies of tritium and carbon-14 compounds are being collected in the hot laboratory from various facilities around the VA complex as research activities are curtailed by the reconstruction program. These materials are held in inventory until needed. The inspector met Dr. Art Euyler of the Neurobiochemistry laboratory, building T-85, who is using carbon-14 and tritium in a research program. Materials stored in this laboratory were generally contained in serum vials in refrigerators. Posting and labeling was observed to be as required by the regulations.

14. The inspector visited the Wadsworth hospital patient counting facilities and met Miss Panchita Thomas and Mrs. L. Shopp, RN, who is in charge of the clinic. Records maintained in the clinic showed dose calculations for patients and recorded the patient's social security number and name. Materials possessed and stored in this area were properly posted and labelled.

Storage

15. Materials possessed by research programs are generaliy stored in refrigerators in laboratories subject to surveillance by authorized users. The laboratories are locked at night. Based on observations during the tour of facilities locations of storage were adequately posted. The licensee defined as restricted areas the hot laboratory in building 114 and room E47 in Wadsworth Hospital and the Radwaste Storage Hut. Access to these areas is controlled by means of lock and key. Keys are available only to authorized users.

Instrumentation

16. Licensee's instrumentation remains as previously described however a Nuclear Chicago, Cutie Pie Model 2588 and GM model 2650 have been added to the available instruments.

Posting and Labelling

17. During the inspection the inspector noted that the licensee had posted forms AEC-3 at locations of use and storage within the facilities visited and that locations of use and storage were properly posted with respect to the presence of radioactive material. Radioactive materials were observed to be labelled as required by the regulations.

Radiological Practices

18. The licensee maintains a laboratory log of monitoring surveys and wipe tests and air and stack sampling results. 21 routinely surveyed laboratory areas and facilities ~~which~~ are included. The log records the type of survey, whether bioassay for tritium is required, the location of the laboratory, the authorized personnel, the date, maximum exposure in mr/hr observed, the maximum contamination detected by wipe, and space for remarks. When wipes reveal activity in excess of 75 dpm/100 cm^2, surfaces are cleaned to values less than 75 dpm/100 cm^2. An examination of the records of monitoring for airborne materials in the hot laboratory showed a peak I-125 concentration of from 2 to 5 x 10^{-9} microcuries/cc on January 28, 1971, and I-131 of 8 x 10^{-11} to 3 x 10^{-10}. The Appendix B table 1 values for I-125 are 5 x 10^{-9} and for I-131, 9 x 10^{-9}. Operations involving airborne iodines are of short duration, i.e., one to two hours and occur only infrequently.

Personnel Monitoring

19. The licensee possesses pocket dosimeters which are available for use although they are not routinely used. Monthly film badge service is provided by Radiation Detection Company. During January 1972 a total of 50 persons were subject to personnel monitoring. The licensee has completed forms AEC-4 and 5 on employees. An examination of the records revealed that most were up to date and that when combined with the records supplied by the film badge processor adequate records are maintained. Wettereau stated that one employee, Carol Walsh, who became pregnant, was arbitrary limited to a 500 mr/yr dose as measured by TLD's located on her waist. Personnel monitoring records for second quarter 1970 to fourth quarter 1971 were examined. Maximum quarterly exposures observed were as stated below.

1970

2nd Quarter	120 mr
3rd Quarter	210 mr
4th Quarter	140 mr

1971

1st Quarter	260
2nd Quarter	350
3rd Quarter	420
4th Quarter	Not complete

High finger ring exposures observed were 1,030 in the second quarter 1971 and 2,070 in 3rd quarter 1971. The finger ring program was begun on April 1, 1971 and on the basis of exposure measurements the licensee is going from generator production of technetium to purchase of precalibrated technetium. Most personnel exposures were 0, however, 5 to 10 individuals

received exposures ranging from the minimum observed to the maximum noted in the table above.

Bioassay

20. Mr. Wettereau stated that a bioassay procedure for tritium in urine has been developed at the Hospital. A copy of the procedure as published in Health Physics is attached to these notes. Wettereau stated that there is limited use of tritium at levels requiring bioassays. He said that one researcher might on occasion use 5 millicuries of tritium and 500 microcuries of carbon-14. Bioassays performed on this individual on September 15, 1970 and August 3, 1971 were background. Wettereau stated that in the past 20 to 25 bioassays were performed per year and that presently they are probably averaging from 15 to 25 bioassays per year. Wettereau stated that no one is using 100 millicuries of tritium. Condition 23 of the license, Amendment No. 56 states that individuals involved in operations which utilize more than 100 millicuries tritium in a noncontained form shall have weekly bioassays.

Waste Disposal

21. The licensee disposed of waste by transfer to Cal Salvage. The quantities of waste in individual disposals were as follows:

Disposal Date	H-3	C-14	S-35	Ca-45	Se-75	Rb-86	I-125	Mo-99	I-131
11/20/70	4.95	4.85	10.00	0.07	0.20	0.80	0.80	1.10	7.00
3/9/71	11.243	7.819	-	0.02	-	2.5	1.87	24.0	1.9
6/22/71	189.19	4.22	-	0.10	-	0.40	1.70	-	5.20
12/7/71	10.4	5.47	-	-	0.355	-	-	1.0	2.500

Also included in the December 1971 disposal were 0.15 mCi, Ce-141 and 0.05 mCi Au-198. All unites in the above table are in millicuries.

22. Wettereau stated that all materials are packed in drums prior to transfer to Cal Salvage.

Leak Tests

23. Leak tests are required by the license. The licensee performs leak tests on a Tracerlab R-30, 100 microcurie cobalt-60 source and a Tracerlab model RIA Strontium Medical Applicator. Leak tests conducted on October 5, 1970 and April 1 and October 4 of 1971 revealed no removable contamination.

Miscellaneous

24. Mr. Wettereau stated that since the last inspection the following occurrences had unusual interest. On February 4, 1971 a Mo-99-Tc-99m generator leaked resulting in the release of approximately 220 millicuries of Tc-99m. The leakage was confined to the tray on which the generator was located in the hot lab. Mr. Wettereau stated that the leakage was cleaned up and the licensee took precautions to insure that such leakage would not occur in the future. Mr. Wettereau noted that on February 7, 1972 the licensee plans to begin use of prepackaged precalibrated Tc-99m.

25. On February 10, 1971 the Southern California earthquake occurred. Mr. Wettereau stated that other than a few minor problems the licensee's radioisotopes program was not effected by the earthquake. As a result of the earthquake the licensee's program is experiencing a major dislocation because of reconstruction and reenforcement of facilities. Mr. Wettereau stated that on March 15, 1971 a leaking shipment of NaI-131 (17 mCi) was received. He stated that the contamination was all confined to the internal packaging and that there was no spread of contamination. The material was disposed as waste.

26. Mr. Wettereau stated that the licensee has no AEC contracts.

VETERANS ADMINISTRATION CENTER

Radioisotope Committee

Title of Radioisotope Research Protocol or Clinical Application:

Investigators or Applicants:

Brief Statement of Proposal:

Committee Member's Recommendation:

Approval ( )

Disapproval ( )

Comments:

Signature of Committee Member

Date

RCS 10-103

NUCLEAR MEDICINE SERVICE REPORT

VA HOSPITAL (Wadsworth)

CHIEF W.H. BLAHD, M.D.

FISCAL YEAR 1971

DUE AUGUST 15, 1971

Total Procedures 5593

I. DIAGNOSIS

	FORM	PURPOSE	DOSAGE RANGE	No. of PATIENTS
		By-product Material		
		131-Iodine		
1.1	Iodide	Thyroid function(uptake)	2-5 µCi (Ca)	256
1.2	Iodide	Thyroid scan	100 µCi-5 mCi	182
1.3	IHSA	Plasma volume	10-15 µCi	421
1.4	IHSA	Cardiac scan-output		
1.5	IHSA	Cisternography	100 µCi	49
1.6	MAA	Lung scan	250 µCi	33
1.7	MAA	Liver scan		
1.8	Rose Bengal	Liver function	250 µCi	34
1.9	Hippuran	Kidney function	40 µCi	10
1.10	Hippuran	Kidney scan	300 µCi	22
1.11	Fats/Fatty Acids	GI absorption		
1.12	T-3	In vitro		
1.13	T-4	In vitro		
1.14	Hippuran	Kidney transplants	300 µCi	25
1.15				
1.16				
		125-Iodine		
2.1	Iodide	Thyroid function(uptake)		
2.2	Iodide	Thyroid scan		
2.3	IHSA	Plasma volume		
2.4	T-3	In vitro	In vitro	1140
2.5	T-4	In vitro	In vitro	116
2.6				
2.7				
2.8				

	FORM	PURPOSE	DOSAGE RANGE	No. of PATIENTS
		99^m-Technetium		
3.1	Pertechnetate	Brain scan	15-20 mCi	1,136
3.2	Pertechnetate	Thyroid scan	1-6 mCi	37
3.3	Pertechnetate	Thyroid uptake		
3.4	Pertechnetate	Cerebral blood flow	15 mCi	76
3.5	Pertechnetate	Renal blood flow	15 mCi	31
3.6	Pertechnetate	Joint scan		
3.7	Pertechnetate	Cardiac scan		
3.8	Pertechnetate	Arterial flood flow		
3.9	Pertechnetate	Cardiac blood flow		
3.10	Pertechnetate	Brain blood flow		
3.11	Pertechnetate	Parotid scan		
3.12	Sulphur Colloid	Liver scan	500 µCi-2.5mCi	823
3.13	Sulphur Colloid	Spleen scan	500 µCi-2.5mCi	11
3.14	Sulphur Colloid	Bone marrow scan		
3.15	Sulphur Colloid	Cardiac scan	8 mCi	79
3.16	Sulphur Colloid	Lymphangiogram	4 mCi	1
3.17	Sulphur Colloid	Stomach & Duodeum		
3.18	Albumin	Cardiac scan		
3.19	Albumin	Cysternogram		
3.20	MAA	Lung scan		
3.21	Antimony-sulphur Colloid	Aerosol lung scan		
3.22	Sulphur Colloid MA	Lung scan	1-3 mCi	511
3.23	Tc DTPA	Kidney scan	1-3 mCi	35
3.24	Tc Diamox	Kidney scan	3 mCi	11
3.25				
		51-Chromium		
4.1	Sodium Chromate	RBC Survival	100 µCi	23
4.2	Sodium Chromate	Spleen scan		
4.3	Sodium Chromate	RBC volume	50-75 µCi	30
4.4	Sodium Chromate	Spleen sequestration	100 µCi	23
4.5	Sodium Chromate	G.I. bleeding		
4.6	Sodium Chromate	Liver/Spleen ratio		
4.7	Sodium Chromate	Platelet survival		
4.8	Albumin	GI protein loss		
4.9				
4.10				
4.11				

	FORM	PURPOSE	DOSAGE RANGE	No. of PATIENTS
		59-Iron		
5.1	Chloride	Iron turnover	<20 µCi	14
5.2	Chloride	Body distribution, external counts	<20 µCi	14
5.3	Citrate	Iron turnover		
5.4	Citrate	Plasma clearance		
5.5	Sulphate	Iron absorption		
5.6	Amomonium Citrate In vitro	Iron binding capacity		
5.7				
5.8				
5.9				
5.10				
		197 or 203-Mercury		
6.1	Chlormerodrin	Kidney		
6.2	Chlormerodrin	Brain scan		
6.3				
6.4				
		198-Gold		
7.1	Colloid	Liver scan		
7.2	Colloid	Lymph node scan		
7.3				
7.4				
7.5				
		111-Indium		
8.1	Transferin	Lymph node scans		
8.2				
8.3				
8.4				
		113^m-Indium		
9.1	Colloid	Liver scan		
9.2	Colloid	Lung scan		
9.3	Colloid	Cardiac scan-output		
9.4				
9.5				

	FORM	PURPOSE	DOSAGE RANGE	No. of PATIENTS
		57-Cobalt		
10.1	Vit. B_{12}	Absorption (P.A.)	0.5-1 µCi	39
10.2	Vit. B_{12}	Absorption (G.I.)		
10.3	Vit. B_{12}	Serum binding capacity		
10.4				
10.5				
		58 or 60-Cobalt		
11.1	Vit. B_{12}	Absorption (P.A.)		
11.2	Vit. B_{12}	Absorption (G.I.)		
11.3				
11.4				
11.5				
		85-Strontium		
12.1	Nitrate	Bone scan		
12.2	Chloride	Bone scan		
12.3				
12.4				
12.5				
		18-Fluorine		
13.1	Sodium fluoride	Bone scan	1-2 mCi	103
13.2				
13.3				
		133-Xenon		
14.1	Gas	Cardiac studies		
14.2	Gas	Pulmonary studies	5-10 mCi	19
14.3	Saline	Muscle blood flow		
14.4	Saline	Cerebral blood flow		
14.5				
14.6				
14.7				

	FORM	PURPOSE	DOSAGE RANGE	No. Of PATIENTS
		OTHER		
16.1	Methionine ^{75}Se	Pancreas scan	250 µCi	5
16.2	Hydrogen 3	Body water	100-150 µCi	17
16.3	Bromine 82	Extracellular water	50-100 µCi	15
17.1	Sodium 24	Exchangeable sodium	150-200 µCi	12
17.2	^{195}Au	Gold metabolism	100 µCi	98
18.1	^{40}K	Total body potassium		115
18.2				
19.1				
19.2				

II. THERAPY

131-Iodine

20.1	Iodide	Hyperthyroidism	2-20 mCi	6
20.2	Iodide	Thyroid CA	50-150 mCi	5
20.3	Iodide	Heart Disease		

198-Gold

21.1	Colloid	Intercavitary CA		
21.2	Colloid	Interstitial CA		

32-Phosphorous

22.1	Phosphate	Polycythemia Vera		
22.2	Phosphate	Leukemia		
22.3	Phosphate	Bone CA	2 mCi	5
22.4	Colloidal chromic	Intercavitary CA	10-15 mCi	1
22.5	Phosphate	Interstitial CA		

V. INDICATE SIGNIFICANT ADMINISTRATIVE PROBLEMS AND FUTURE PLANS

The major problems of the Nuclear Medicine Service at this Station have been alluded to above in IV., 4. They consist of a serious limitation in space for clinical as well as training activities. One thousand sq. ft. of additional space is urgently needed to accommodate the ever-increasing clinical activities of the Nuclear Medicine Service as well as the needs of the Service training program. An additional scintillation camera device is also urgently required since the Service's existing instrumentation is now used to capacity. Not only are clinical procedures chronically backlogged, but the instrument is rarely available for training purposes. Requests for both needed space and instrumentation have been made on numerous occasions but as yet, no positive action has been forthcoming. Unless additional space and instrumentation are acquired in the near future, it will not be possible, despite increasing demands, to expand either clinical or training activities.

Health Physics Pergamon Press 1970. Vol. 19 (Sept.), p. 449. Printed in Northern Ireland

Rapid Urine Assay For Tritium

(*Received* 2 *February* 1970;
in revised form 12 *February* 1970)

With the widespread use of tritiated materials in biological and clinical research, an efficient and rapid bioassay system is needed for the detection of tritium in human urine. Reproducibility and sensitivity are also essential requirements of such a system. Butler[1] reports that a sensitivity of 1 μCi tritium per liter is adequate for radiation protection. This level appears to be satisfactory in view of the fact that a 28 μCi/l. concentration of tritium in the urine is reported to be equivalent to a whole body radiation dose of 0.1 rem/week.[2] An improved radioassay method developed in this laboratory is reported below. Although it is not as rapid as counting and internally standardizing raw urines, the method offers less variation in efficiency from sample to sample which can result from variation in urine color.

Method

Decolorize all urine specimens by slurrying with Mallinckrodt #4394 activated charcoal and heating slightly. Charcoal quantities required vary from $\frac{1}{2}$ to 1 g, depending on urine color. Filter and assay 1 ml aliquots of filtrate. Prepare duplicate samples of each urine specimen for internal standardization. Add 16 ml of scintillation solution, described below, to 1 ml decolorized urine. Add internal standard of approximately 21,000 dis/min to the duplicate sample. The liquid scintillation system (Packard Model 3320) was optimized for the tritium energy spectrum and temperature control set for +10°C operation. The lower limits of detection using this method are approximately 5×10^{-2} μCi of tritium per liter of urine, at the 2σ confidence level, utilizing a counting time of 10 min.

It is estimated that from 20 to 30 samples could be prepared for counting within 1 hr.

Scintillation solution:

1 liter Toluene, 4 g PPO, 86 mg POPOP
1 liter Packard Insta-Gel(R)*

After thorough mixing and dissolution of the PPO and POPOP in Toluene, add Insta-Gel in equal volumes. Store fluor solution in dark until ready for use.

This solution is capable of producing counting efficiencies of up to 40% with 1 ml of water or decolorized urine. Variations in efficiency from sample to sample is less than 1%. Addition of larger water volumes (up to 5 ml) results in the production of an opaque gel in the counting vial. Resultant efficiencies at this volume are approximately 15–20%.

This counting system represents a significant improvement in both counting efficiency and ease of sample preparation as compared to the method of Vaughn and Boling used previously in this laboratory.[3] The decolorization step reduces time invested and uncontrolled losses during lyophilization, while the scintillator-gel solution offers improved efficiency with little quenching as a result of solutes present in the urine.

Further improvement in the efficiency of the system described may be possible by varying the concentration and type of dissolved scintillator. Substitution of BBOT for the PPO-POPOP system however, achieved no significant improvement. Increasing the scintillator concentration may produce further improvement in efficiency.

Radioisotope Research Bldg. 114, *Rm.* 209
Veterans Administration Center
Los Angeles, Calif., 90073.

Leonard W. Wetterau
Robert J. Huebotter

References

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